



White Paper Tires for Commercial Vehicles

Safe, Efficient and Contributing to the Circular Economy

Safe and Efficient

Tire label

Since 2021 the EU tire label has made it easier to switch over to energy-efficient tires.



Alternative drive systems

Concepts based on electric drive systems require a special level of tire performance.



The correct tire pressure

helps to save fuel, ensure the tires last a long time and minimizes punctures.

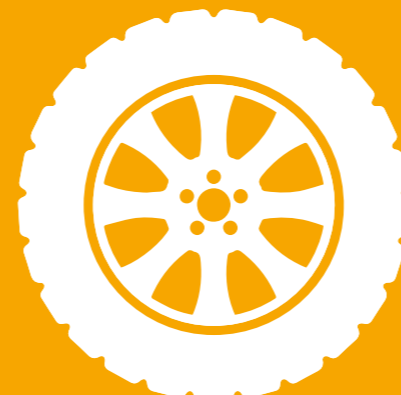
More than one life

Retreading solutions give tires a second - and sometimes even a third and fourth - life.



Generation 5 tires

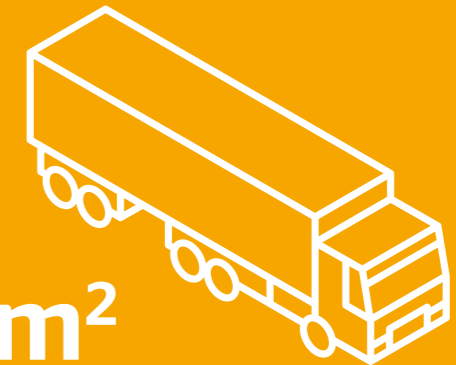
Premium tires offering high mileage, a long service life and outstanding traction, combined with optimized rolling resistance.



Up to
70%
of **material in a tire** can be saved or reused in the retreading process for commercial vehicle tires.

The combined contact patch of the tires on a 12-wheeler semitrailer tractor measures less than

1 m²



Efficient Tires Reduce CO₂ Emissions

We all need to do our bit to keep the world moving. Efficient tire solutions are making their own sustainable contribution.

Investing for change

We need to step up to the plate and invest in change today - so that we can stay competitive in the future and have a healthier planet to call home. That's why reducing fuel consumption and therefore also CO₂ emissions is so important. The introduction of the first CO₂ emissions regulations for new heavy-duty vehicles (HDV) is part of efforts to combat climate change in accordance with the Paris Agreement.

Cutting CO₂ emissions dramatically

Europe's first CO₂ regulations for heavy-duty commercial vehicles have one specific goal: achieving a radical reduction in the CO₂ emissions of trucks, buses and coaches. The average CO₂ emissions of

new heavy-duty commercial vehicles must be cut by 15 percent compared to the figures for 2019/2020 by 2025 and by 30 percent by 2030.

VECTO simulation tool

To ensure that these reduction targets are met, the European Commission has launched a computer-aided simulation tool known as VECTO - short for Vehicle Energy Consumption calculation Tool. Vehicle manufacturers can use VECTO to

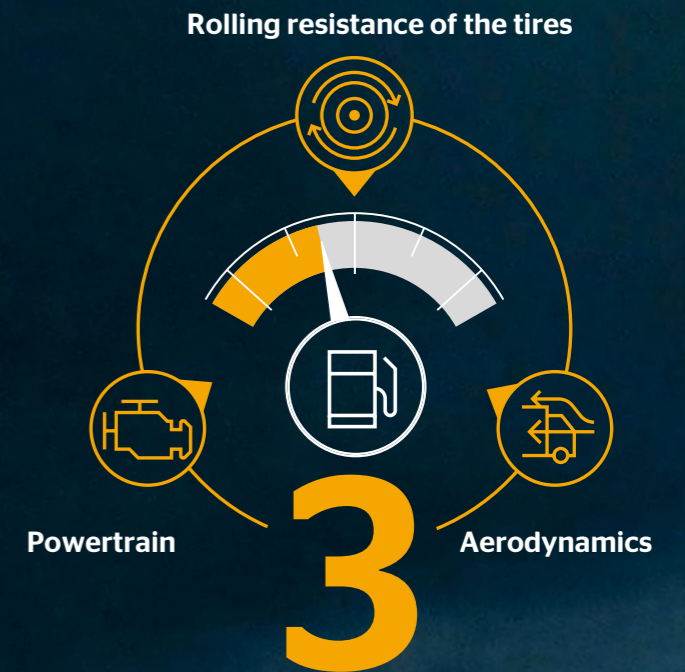
simulate the fuel consumption and therefore CO₂ emissions of various heavy-duty vehicle configurations.

Influence on the transport industry

The new regulation aims to bring down levels of CO₂ emissions. In order to achieve this goal, truck manufacturers need to invest in the development of technologies that make their vehicles more fuel efficient. After all, fuel consumption and emissions are directly connected.

Influence on vehicle configurations

The regulations apply to a huge range of trucks - from two axles upwards and either rigid or articulated. Vehicles like these account for 70% of the total CO₂ emissions from heavy-duty commercial vehicles. The regulations are being continuously reviewed and extended to include additional truck, trailer, bus and coach configurations and vehicle groups. Further regulations took effect in January 2020.



The level of CO₂ emissions is directly related to fuel consumption. The three main factors impacting on fuel consumption and CO₂ emissions are the drive system of a vehicle, its aerodynamics and the rolling resistance of its tires.

 [More information Vecto](#)

 [Watch the video for more info](#)

The video explains who is affected by the regulations and how the CO₂ emissions regulations will make road transport more efficient.



The Background to the Story

Reducing emissions despite increasing transport volumes

At the same time, the distances involved are getting longer. For Germany, experts expect the average distance travelled by road freight to increase to 167 kilometers by 2030 (19 percent up on 2010). The volume of freight transported in the EU in 2016 totaled more than 19 billion metric tons. Even so, most EU countries invest less than one percent of their gross domestic product in transport infrastructure. Around three quarters of all freight within the EU is transported by road. And while this share is set to decrease slightly in the coming decades, the drop will be more than offset by growing volumes. Commercial vehicles now account for around 19 percent of toxic nitrogen oxide emissions in German cities (source: Roland Berger).

The challenge

The goal here is to protect our environment and resources, and reduce our carbon footprint and emissions – in a highly competitive market and against a backdrop of staff shortages, rising energy prices and fragile supply chains. Achieving success in the markets of the future requires investment in sustainable logistics today. And that means sustainable fleet management. The journey to achieving this goal takes in modern vehicle technology with its multitude of assistance systems, digitalization, emissions reduction, the switchover to alternative drive systems, fuel/energy savings, resource-efficient driving, optimization of transportation and route planning.

Europe-wide provisions like the EU Taxonomy, future toll regulations and Green Vehicles Directive mean vehicle manufacturers and suppliers are also on board and play their part in developing the green logistics of the future. Continental has grouped together its eco-friendly fleet management activities within its Conti360° Solutions package of services and Lowest Overall Driving Costs (LODC) holistic consultancy approach. Tires are a significant factor in the sustainability of a fleet and its costs. Indeed, tire-related costs account for around half of a truck fleets operating costs.

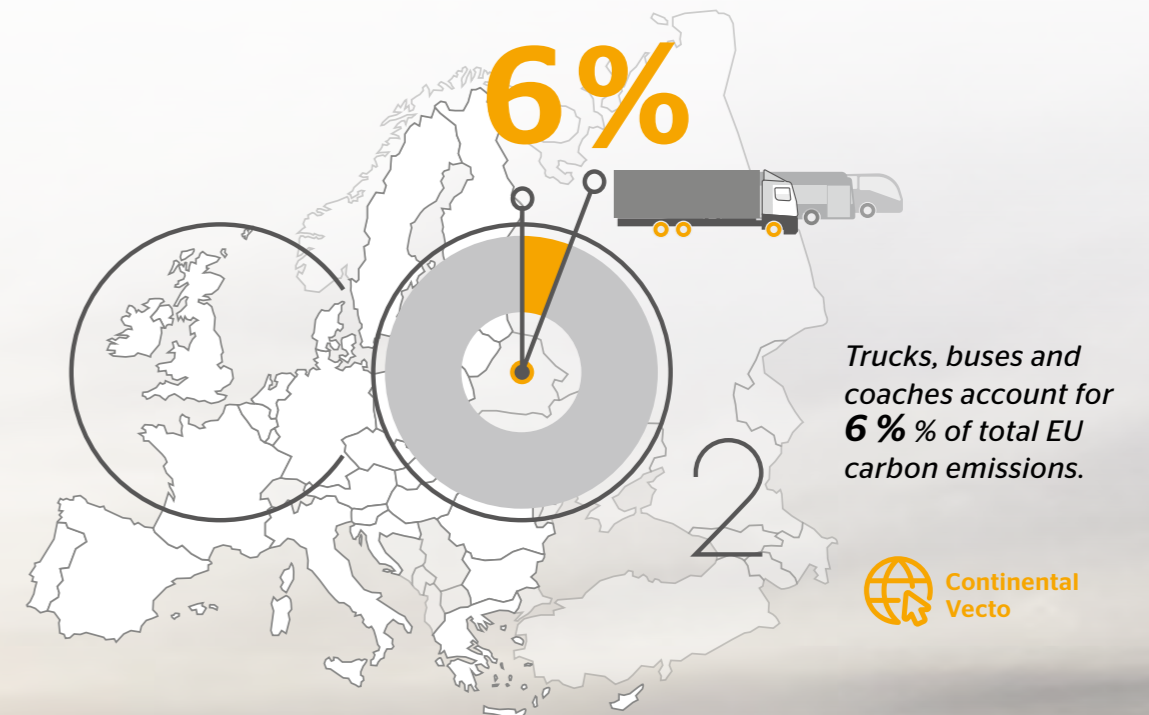


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Black, Round and Wide



Thanks to modern simulation tools, we were able to design the development of the Conti Eco 5 in a very efficient and targeted manner.

*Hinnerk Kaiser, Head of Product Development
Bus and Truck Tires EMEA at Continental*



Robust and durable

Commercial vehicle tires transfer much greater forces to the road than passenger car tires due to the higher wheel loads.



3 peaks + 1 snowflake

winter tires with verified suitability for use in wintry conditions can be marked with the “Alpine” symbol 3PMSF Three Peak Mountain Snow Flake as per UN/ECE Regulation No. 117.



Commercial vehicle tires have an average load-bearing capacity of around

5 metric tons

Rolling resistance

levels for tires are shown with a label valid Europe-wide. The five classes of rolling resistance range from “A” for the lowest possible resistance to “E” for the highest.

Tire development

negotiates competing requirements, such as **wet grip, mileage** and **rolling resistance**.

Small in Surface, Big in Importance

The design and use of commercial vehicle tires

High load capacities, higher aspect ratio

Commercial vehicle tires are distinguished by an average load-carrying capacity of around five metric tons. They have a much larger contact patch than passenger car tires due to the high loads they need to transport. However, on a 12-wheeler semitrailer rig, the total tire surface area in contact with the road measures well under one square meter. This underlines the importance of the tires. As the physical link between a vehicle and the ground, the tires take on the full vehicle load; when moving off and braking they deliver the requisite grip; and when cornering they provide lateral guidance.

Specialists for every purpose

Tires are developed for use on a wide range of surfaces, at different temperatures and with all kinds of

loads. Which is why there is a specialist tire for every application and every type of conditions. Compared with passenger car tires, commercial vehicle tires cover much higher mileages. Commercial vehicle tires also differ greatly according to their intended use.

Axle positions make the difference

First and foremost, there is the question of the axle on which the tire will be fitted - the steer axle, drive axle, trailer axle or lift axle. In freight transportation, there are differences between tires for tractors and trailers in long-distance, regional and on-/off-road use. And when it comes to taking people from A to B, special bus tires are available for the touring, intercity and urban sectors. For challenging winter conditions there is the Scandinavia range for buses and freight vehicles,

all of which carry the 3PMSF symbol. And we also have special winter tires for very severe winters, e.g. in the Scandinavian countries. Special tires have likewise been developed for construction machines such as excavators, wheel loaders and tractors. And when it comes to tires for vans, there are specific models for different applications and seasons.

Cross-ply and radial tires compared

There is a fundamental difference here between cross-ply and radial tires. Cross-ply tires are an older design and only sold today in modified form. Radial tires, meanwhile, were first introduced in 1948 in response to the need for a more flexible and durable tire which could absorb bumps and ruts more effectively than the cross-ply tires of the day. Even the very

first radial tires provided more than twice the service life of cross-ply models. Radial tires are superior in terms of wear resistance and do a more effective job of transferring engine power and braking force to the road. The name "radial tire" is derived from the structure of the layers in the casing. These run radially, that is to say at 90° to the tire circumference, from bead core to bead core. The layers of ply are also known as the casing and consist of thin wires and fabric, arranged in a series of simple arches. In radial tires, the layers in the casing are made from steel. In contrast to cross-ply tires, the steel cord plies in radial tires lie perpendicular to the direction of travel. This gives radial tires their very smooth sidewalls. In line with ECE regulations, this type of tire is identified by an R before the figure for the wheel rim diameter.



The Interplay of Tire Pressure and Contact Patch

A vehicle's tires are its connection to the road. The surface area of each tire in contact with the road can be calculated with the help of a formula.

The contact patch of a tire is the area of the tire that meets the road at any one time. This area is smaller than you might imagine - and therefore all the more important. The size of the contact patch of a tire on a commercial vehicle depends on several factors. The surface area can be calculated as follows:

Load-bearing behavior of a flexible membrane:

$$F_z = k * p_i * A$$

where p_i is internal pressure and A is the contact patch area.

The reinforced structure of the tire adds a structural load-bearing component or correction factor (k) of around 1.25 to 1.5 for commercial vehicle tires.

Assuming approximate values for a fully loaded semi-trailer of $F_z = 390 \text{ kN}$, $k = 1.25$ and $p_i = 80 \text{ N/cm}^2$ and re-

arranging the equation allows us to calculate the area of the contact patch (A) as $F_z/k*p_i = 390,000 \text{ N} / 1.25 * 80 \text{ N/cm}^2$. This produces the answer of $3,900 \text{ cm}^2$ or approximately **0,4 m²**.

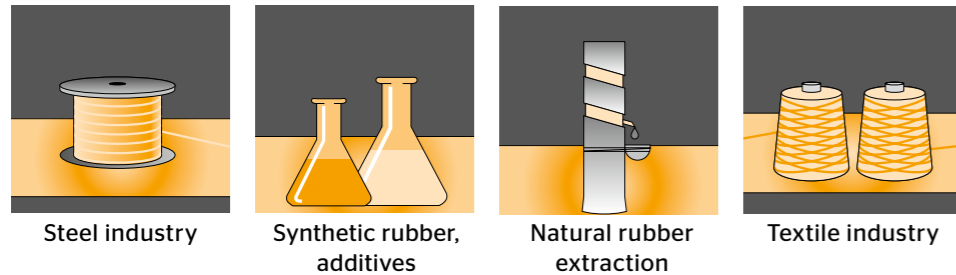


How a Tire Is Born

This six stages in the tire production process

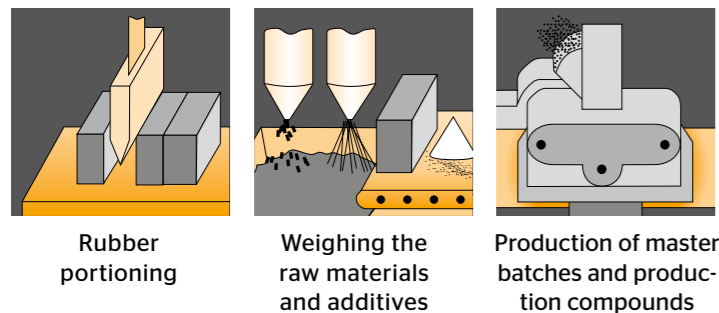
1. Sourcing materials

Various branches of industry supply tire manufacturers with raw materials. The **steel industry** supplies high-strength steel for the steel belts, the casing and the bead cores. The chemical industry contributes synthetic rubber as well as substances that add grip and extend the life of a tire. Natural rubber (latex) is tapped from rubber trees grown on large plantations in the tropics. And the **textile industry** supplies the materials for the production of textile cord.



2. Producing compounds

Natural and synthetic rubber are mixed with various additives. Tires are made of the best rubber compound for their respective function.



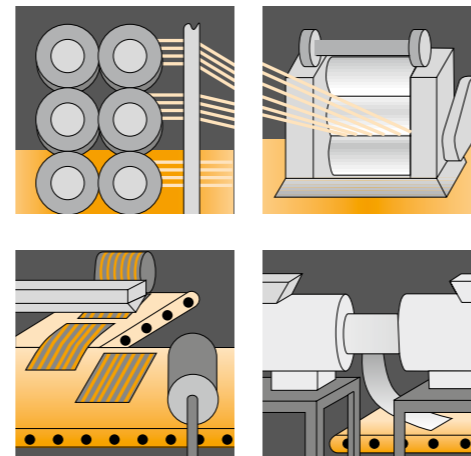
3. Manufacturing components

Steel cord: Pre-treated steel cord is embedded in one or more layers of rubber and cut to the required length.

Tread strip: A screw-type extruder shapes the rubber into an endless strip which is then cooled and cut to length.

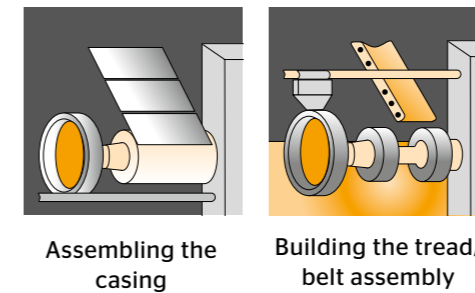
Bead core: The core of the bead is made up of several ring-shaped steel wires, each with its own rubber coating.

Sidewall/Inner liner: An extruder forms sidewall sections of various shapes and sizes. A calender produces a wide, thin layer of inner liner.



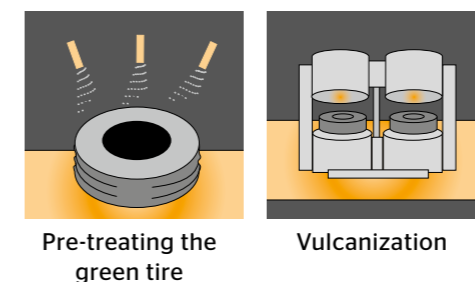
4. Building the tire

The various components come together on the tire building machine and are assembled into what is known as a "green tire".



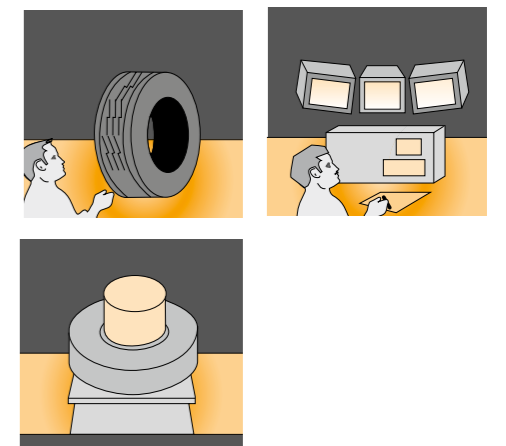
5. Vulcanization

The green tire is sprayed with a fluid and given its final shape when vulcanized in a curing press at a certain pressure. The raw rubber undergoes a physical change. Molds create the tread pattern and sidewall markings.



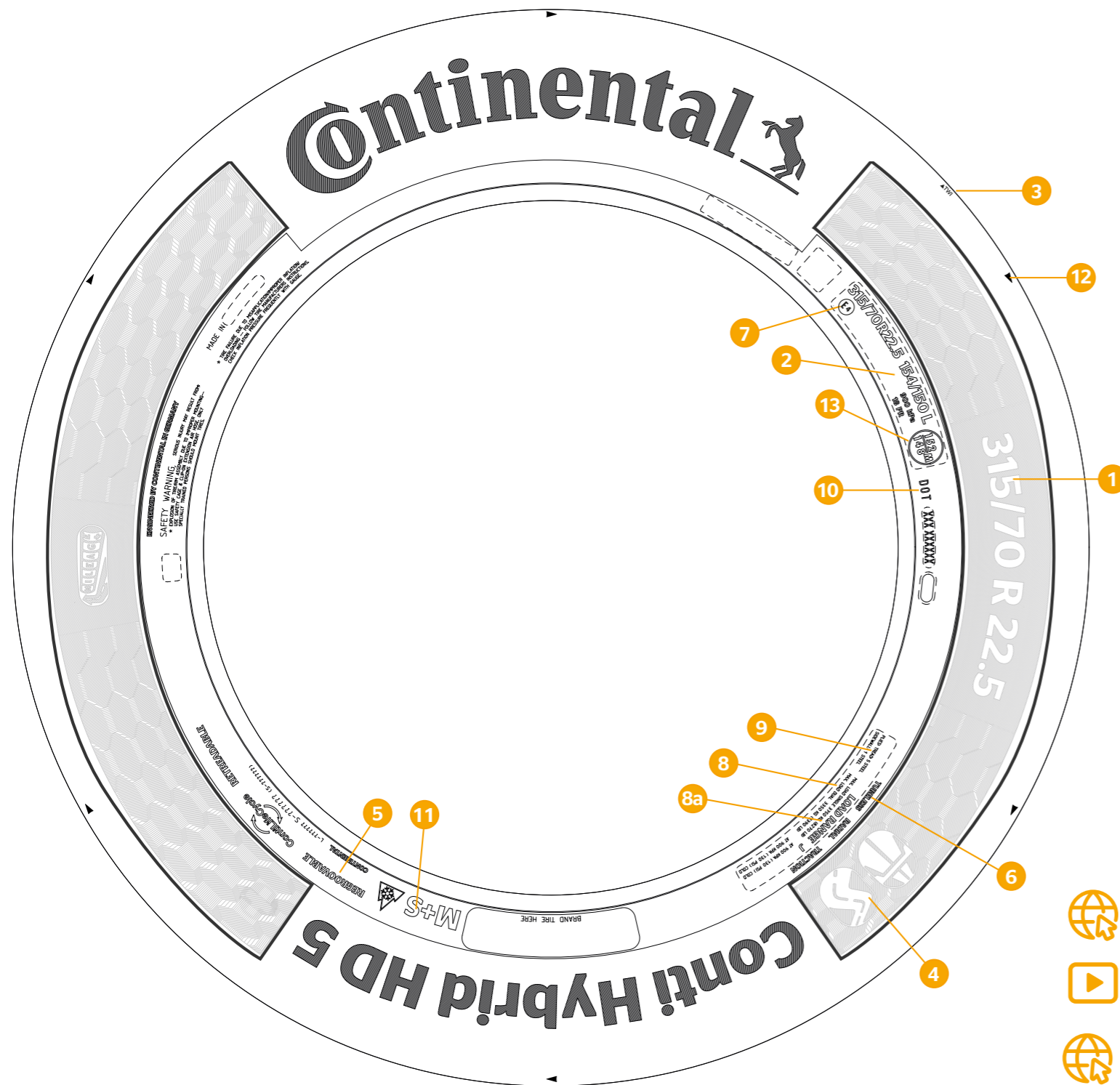
6. Quality control*

Then the tires are subjected to visual checks and X-ray inspection and checked for uniformity.



What It Says on the Sidewall

Size, recommended use and winter suitability are indicated by the information on the tire sidewall



- 1 Size designation**
315 = Nominal width of tire in mm
70 = Aspect ratio - height to width ratio (= 70%)
R = Radial design
22.5 = Wheel rim diameter (code)
- 2 Service description**
consisting of
154 = Load Index for single arrangement
150 = Load Index for twin arrangement
L = Code letter for the reference speed
- 3 TWI**
Tread Wear Indicator
- 4 Recommended use**
for Continental commercial vehicle tires
- 5 Regroovable**
The tire is intended for regrooving.
- 6 Tubeless**
Tubeless tires
Tube Type
Tires with a tube
- 7 E** = Tire meets the requirements of UN/UN/ ECE Regulation No. 54
4 = Code for the country where the approval number was issued (here: 4 = Netherlands)
- 8 US load designation**
for single/twin tires and indication of the maximum tire pressure in psi (pounds per square inch; 1 bar = 14.5 psi)

- 8a Load-bearing capacity class**
as per US Reg. FMVSS 119
- 9** Data as per US safety standard on inner construction or number of reinforcing layers, in this case:
Tread: under the tread there are five steel cord plies (including casing).
Sidewall: viewed from the side there is one steel cord ply (here it is the casing ply).
- 10 DOT**
= US Department of Transportation Responsible for tire safety standards. Tire complies with requirements set out in US Reg. FMVSS 119.
- 11 M + S and 3PMSF**
Designation for winter use suitability (Mud & Snow and mountain with three peaks and a snowflake (3PMSF).
- 12 Rotation**
Direction of rotation
- 13 Single Point**
Alternative load and speed

- [More information tire markings](#)
- [Film on sidewall information](#)
- [More information TireTech App](#)

Explanations
DOT = US Department of Transportation
ETRTO = The European Tyre and Rim Technical Organisation, Brussels
UN = United Nations
FMVSS = Federal Motor Vehicle Safety Standard

A Detailed Look at Tire Treads

Mandatory tread depths ensure optimum grip. As the tread depth decreases, so does the grip offered by the tire.

Regulations on tread depth

In Europe, the legal minimum tread depth for summer and winter tires is 1.6 millimeters. Tire manufacturers and automotive associations mostly recommend greater tread depths, as tires with a tread depth of 1.6 millimeters may already offer noticeably less grip. Fitness for wintry conditions is impaired as the tread depth decreases, with the result that the tire cannot deliver the necessary grip in rain or snow.

Measuring tread depth

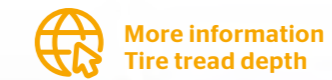
Depending on intended use, manufacturer and tire size, tread depths of between just over 10 millimeters and well over 20 millimeters are possible for new commercial vehicle tires. Tread depths are measured using special devices available in digital and analogue forms. The most simple means of checking your tread depth is to use a 1-euro coin. The golden outer ring measures exactly three millimeters. If the ring disappears

into the tread grooves, the tire still has enough tread. But if you can see it, then it's time to take a closer look and replace the tire if necessary.

Checking for wear

Tread Wear Indicators (TWI) are mandatory for passenger car and commercial vehicle tires. They are located in the base of the tread and become visible when the minimum permissible tread depth is

reached. Advances in the development of tire sensors make it possible to record and supply additional tire parameters.



An Overview of Tire Types

The right tire for every purpose

Winter tires


Developed for low temperatures and wintry road conditions, these tires have a silica tread compound that becomes more elastic in colder conditions and provides optimal grip on snow-covered surfaces. The tread has extra sipes, which improve the tire's ability to interlock with wintry surfaces.

On-road/off-road tires

These specialist tires are developed for mixed on-/off-road use - with a rough tread optimized for use on everything from surfaced roads to unmade roads and rough off-road terrain. Selection criteria include the anticipated proportion of on-road and off-road driving and the tread design.

Tubular tires (TT)

The outer shell of **tubular tires** consists of two to three layers of rubberized cotton or nylon fabric - the casing. Tubular tires require wheels with a concave rim well. Their main advantages lie in their lower mass and lower rolling resistance by virtue of higher inflation pressure.

 [More information](#)
Truck and bus tires

 [More information](#)
Generation 5 tires

Dual/twin tires

With **dual or twin tires**, two tires are fitted to two separate wheel rims or one single rim. This particular configuration is designed to distribute the axle load more effectively. The construction of the rims prevents contact between the two tires while under load.

Super Single tires

These are **specialist products** for fitment on the rear axles of semitrailer tractors and axles of trailers. Here, the usual twin tires are replaced by a wide single tire. The benefits of this tire type are its lower overall weight and lower rolling resistance.

Tubeless tires (TL)

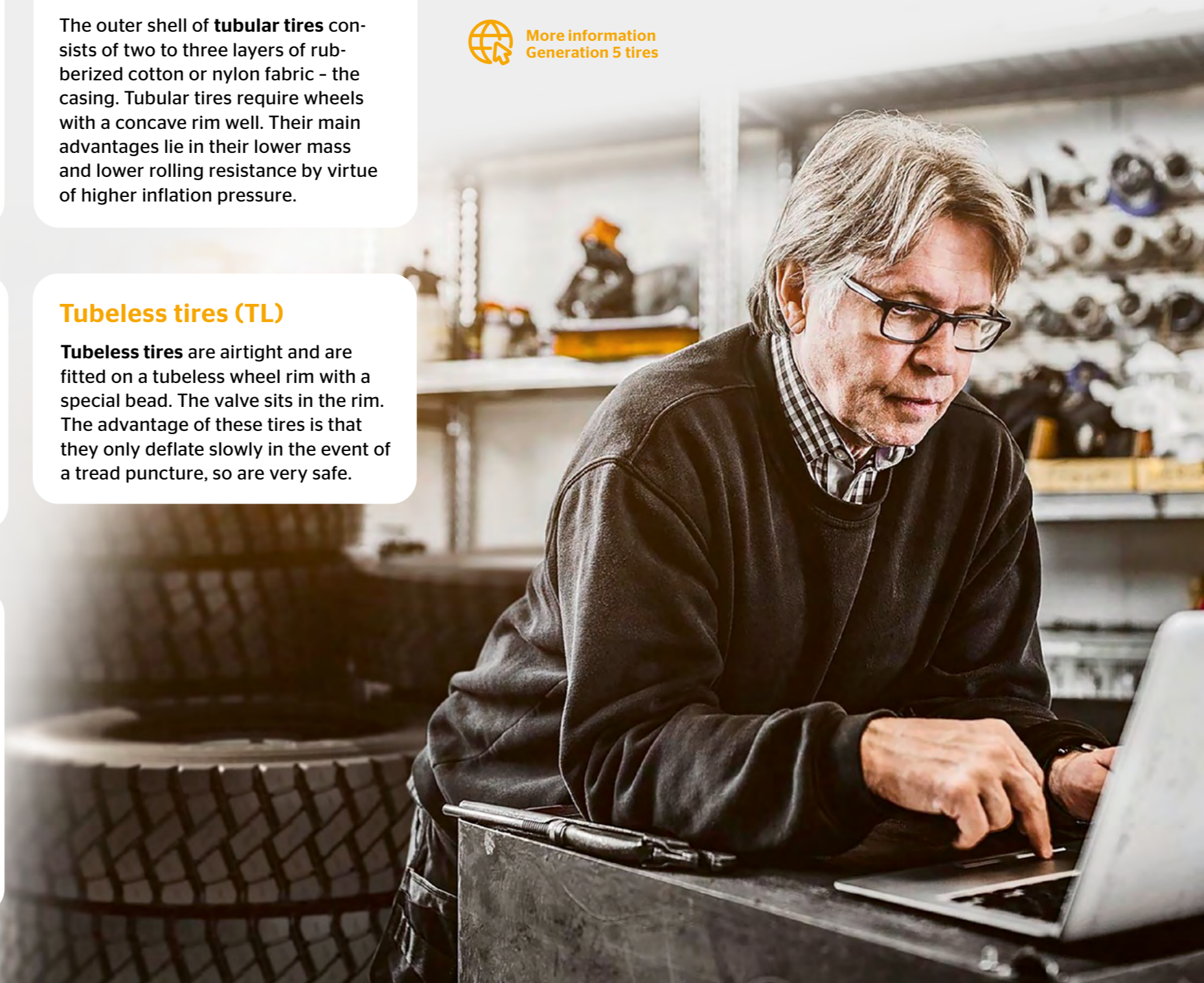
Tubeless tires are airtight and are fitted on a tubeless wheel rim with a special bead. The valve sits in the rim. The advantage of these tires is that they only deflate slowly in the event of a tread puncture, so are very safe.

Solid tires

Solid tires have been used on various vehicle types since 1871. They offer **three times the service life of pneumatic tires** and stand out with their resistance to punctures and ability to carry extremely high loads. The other side of the coin is a low level of damping and inferior traction. Today, almost all forklift trucks and pallet trucks are fitted with solid tires.

Tires and sensors

Intelligent tires are fitted with sensors which constantly record tire pressures and internal temperatures. The driver can view this data while on the road. Each sensor is battery powered and bonded with the tire's inner liner. With the development of measuring sensors ongoing, in future it will also be possible to record data for additional parameters.



The Journey to the Perfect Tire

Tire development has to take into account competing requirements, such as wet grip, mileage and rolling resistance.

Requirements placed on tires

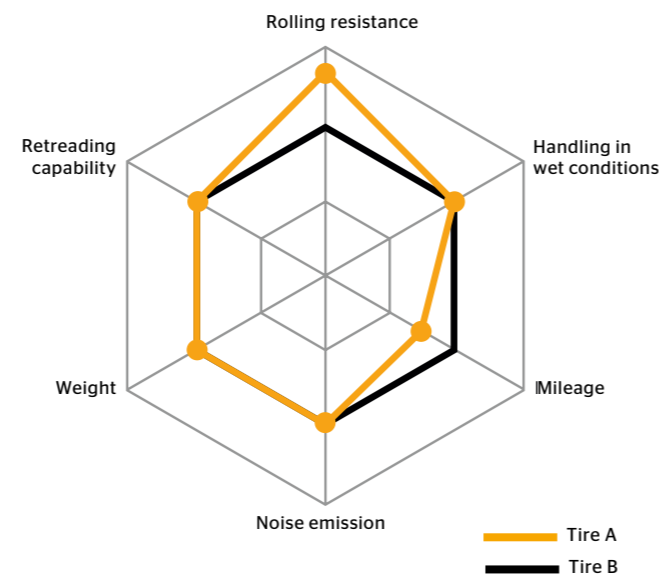
When developing a new tire, you have to make a call between competing requirements. For example, low rolling resistance will take priority for an energy-saving tire, while for a construction vehicle tire the spotlight will fall on traction over loose surfaces. With its high natural rubber content, together with the wheel loads involved, a commercial vehicle tire transfers the vehicle's power to the road very effectively all year round. Aquaplaning is not generally an issue for commercial vehicle tires, due to the high loads involved and the tread design.

Grip versus driving comfort

As grip and ride comfort are influenced significantly by the tire compound and tread design, it is important to find a good balance. Good frictional and therefore power transmission properties are enhanced by a certain flexibility in the tread elements, which manifests itself as "form slip" when the tire meets the road. On the other hand, tread vibrations caused by road contact are responsible for the high-frequency component of the noise created by the tire, which makes it necessary to limit tread flexibility. In addition to noise, the vibrations caused by the rolling of the tire must also be kept to a low level to ensure good ride comfort. The smooth running of the tire and wheel is crucial to ride comfort.

Rolling resistance versus mileage

A performance spider chart is an effective method of highlighting the characteristics of a particular tire, as it shows how the attributes of two different tires compare with one other. Reducing rolling resistance, for example, will have a negative impact on mileage. The challenge for tire developers lies in harmonizing the desired improvements in one characteristic with those opposed to it.



Talking about rolling resistance

Tire developers design tires with low rolling resistance to help save fuel and protect the environment. To achieve something like zero rolling resistance it would take a metal hoop that is not subject to deformation. But any such wheel would be hard to brake, offer very little grip on cornering and provide no ride quality whatsoever. Since 2012, a tire label valid Europe-wide has provided information on the rolling resistance of tires. There are five classes of rolling resistance, from 'A' with the lowest possible resistance to 'E' with the highest.

Tires for Alternative Drive Systems

The EU guidelines for low-emission and emission-free commercial vehicles have increased the pressure on fleet operators to make changes to their vehicles. Tires with optimized rolling resistance and low noise levels make a significant contribution to this process.

Electric, hydrogen, etc.

New vehicle concepts and those based on electric drive systems require a higher level of performance from their tires. As well as helping to achieve maximum range, the tires are expected to support low energy consumption by offering optimum rolling resistance. Which of course helps to minimize the already low CO₂ emissions of an electric truck. New vehicle concepts also bring changes in the center of gravity, wheel loads and torque levels. As a result, electric vehicles ask a great deal of their tires in terms of their load-bearing capacity and abrasion resistance, and their ability to transfer higher levels of torque to the road.

The tire development to-do list

For tire developers, the challenge for the next few years will be to come up with new tires that are geared to alternative drive systems and at the same

time offer the customary top level of safety, efficiency and environmental protection.

Changing requirements

Alternative drive systems bring about changes in various areas, above all load capacity, rolling resistance and abrasion resistance. Vehicles with electric drive systems are heavier on account of their batteries. However, they also accelerate faster than vehicles with conventional drive systems, with maximum torque almost entirely available from rest. The tires are therefore subject to greater forces. With the Conti Urban bus tire, Continental has developed a tire with an increased load index specifically for electric buses operating in urban areas. The load capacity of the tire is geared to the higher weight of electric buses. The Conti Urban HA3 315/60 R22.5 can carry up to eight metric tons per axle.

Rolling resistance and recuperation

Optimized rolling resistance allows the drive system's energy consumption to be reduced, and that also applies for vehicles with combustion engines. Since the EU emissions directive came into force and the VECTO tool was introduced - if not before - commercial vehicle manufacturers have been concentrating on lowering CO₂ emissions. Tires have been one of their main points of focus, especially smart tires fitted with sensors. And then you have the impact of recuperation - i.e. recovery of energy when braking. All of this subjects the tires to particularly significant forces.

Development partnerships

Continental has been in a development partnership with VDL Bus & Coach, a leading manufacturer of electric buses from the Netherlands, since 2020. Continental is also working with Futuricum, the electric trucks brand of the Swiss-based Designwerk Group.

Generation 5 tires

With its Generation 5 tires, Continental is offering customers a product range with innovative technology that can provide the ideal basis for green fleet management. Thanks to their optimized treads, rubber compounds and casing constructions, premium commercial vehicle tires provide outstanding mileages, superb durability and excellent traction, combined with optimized rolling resistance. These attributes allow them to play a significant role in the creation of a resource-conserving and environment-friendly fleet. Generation 5 tires are also an important element in Continental's Lowest Overall Driving Costs (LODC) holistic consultancy approach.



More information
Generation 5 tires



White Paper
Electric Mobility



With optimized components

Hinnerk Kaiser, Head of Product Development Bus and Truck Tires EMEA, provides an insight into the development of the Conti Eco Gen 5.

In what way does the Conti Eco Gen 5 add to the Continental product portfolio?

We have streamlined our product portfolio to align it with our customers' requirements of tires used in long-distance and regional haulage. The Conti Eco Gen 5 fits in perfectly here thanks to its optimized rolling resistance and extra reserves of traction. Digitalization is also a highlight feature of the new tire line. All Generation 5 tires come with an RFID chip and can be factory fitted with latest-generation tire sensors as an option, making them an integral part of the ContiConnect digital tire management solution.

What advances have been made with regard to the traditional trade-off between rolling resistance and mileage?

With the help of state-of-the-art simulation tools, we were able to put the Conti Eco Gen 5 through an extremely efficient and targeted development process. By using a new tread design we managed to combine the robustness of a long-distance tire with the traction capabilities of a regional one. For this, we employ a thicker base compound with low rolling resistance and a tread compound designed for optimized mileage. Optimized compounds are likewise used for the sidewall and inner layer. The geometry of the bead design has been modified. The drive axle tire now comes with a new tire contour whose ground contact patch in the shoulder area lowers rolling resistance. Overall, we have succeeded in harmonizing the conflicting objectives of rolling resistance and mileage with the Conti Eco Gen 5.

Sustainability is becoming increasingly important for fleet operators when selecting tires. What does the new Conti Eco Gen 5 have to offer in this regard?

When developing tires, low rolling resistance and a long tire life are the key levers for improving the carbon footprint of fleets and increasing their sustainability. Sustainability takes many forms for tires. The three most important are reducing their CO₂ contribution during the use phase, maximizing tire life and recycling the materials used. In the case of the Conti Eco Gen 5 it was important for us to make improvements in terms of rolling resistance and durability without compromising on the recyclability of the casings. The casing is likewise designed for optimum rolling resistance, while also being fully suitable for retreading. This is because consideration was also given to the tire's retreadability during the development process.

How does the Conti Eco Gen 5 perform in tire tests?

The Conti Eco Gen 5 achieves a noise rating of A. This, together with the improved rolling resistance figures, means the tire meets the requirements of the EU Taxonomy system of classification that has been in place since 2022. Consequently, fleet operators who make a suitable choice of vehicle and fit the Conti Eco Gen 5 will be able to declare their transport activities to be 'environmentally sustainable' as per the term's EU-wide definition. The Conti Eco Gen 5 helps to meet the requirements of VECTO, improve vehicle efficiency and, last but not least, save toll charges.

What is special about the design of the Conti Eco Gen 5 tire?

We have redeveloped the Conti Eco Gen 5 from scratch. Many of its components feature new compound formulas. One of the standout characteristics is the improvement in the casing's rolling resistance that has been achieved by redeveloping compound

and structural elements. The casing is reusable, allowing the tire to have a second or even a third life. Retreaded tires will also benefit from the optimized compounds and their improved rolling resistance. This all serves to underline the product's sustainability. The combination of full-width lamination, improved contact pressure distribution and traction-enhancing tread design allows this low-rolling-resistance product to be used in both long-distance and regional applications.



Circular and Sustainable

2030

From **2030** Continental wants to be sourcing all the natural rubber used in its tire production from responsible sources.



From start to finish

A circular process runs from the design process via the consumer's purchase to recycling - and then back again.

Rice husks

will in future provide the base material for sustainably manufactured silica. Producing silica in this way is more energy efficient than when conventional materials like quartz sand are used.



Pyrolysis

Here, end-of-life tires are broken down into their individual components in industrial furnaces in order to extract and recycle valuable raw materials.

2050

By **2050** The circular economy approach aims to separate continued growth from the consumption of finite resources. Continental is aiming to fully implement a circular economy in its tire production operations by 2050 at the latest.

”

Tires in their current design are optimized not for circularity but for performance. In the future, they will have to fulfil both briefs at the same time.

Martina Steppat, Program Manager Circular Economy at Continental's Tires Group Sector

Irreplaceable fillers

As well as rubber, fillers such as silica are also an essential ingredient in tires. Silica helps to significantly improve tire characteristics such as **grip**, **rolling resistance** and **mileage**.

Alternative Materials

Environmental protection, sustainability, energy efficiency and conserving resources: in tire production, as elsewhere, the focus is on achieving these goals.

Mission: circular economy

A circular economy aims to separate continued growth from the consumption of finite resources. A circular process runs from the design process via the consumer's purchase to recycling - and then back again. Continental has set itself the goal of using recycled materials in the design, development and manufacture of premium tires. The aim is to close the product and resources loops fully by 2050 at the latest. This will mean 100 percent sustainably produced materials will be used in the production of new tires.

Research into renewable raw materials

Continental's research into the use of renewable raw materials was launched in 2011 in collaboration with various partners. These include the Fraunhofer Institute IME in Münster, the Julius Kühn Institute in Quedlinburg, and expert plant breeder ESKUSA in Parkstetten (all in Germany). Their research work is subsidized by the German Federal Ministries of Education and Research, and Food and Agriculture.

Mission: circular economy

Continental is aiming for fully circular operations in its tire production by 2050 at the latest. In addition to the use of renewable materials, the company is working systematically on using recycled raw materials in tire production. This is intended to ensure that carbon black - another crucial filler in rubber compounds - can be obtained on a large scale in the future.

Pyrolysis oil made in a special process

Continental has signed a development agreement with Pyrum Innovations with a view to further optimizing the recycling of materials from old tires. To do this, Pyrum breaks the old tires down into their con-

stituent parts in an industrial furnace using a special pyrolysis process. In this way, valuable raw materials contained in end-of-life tires can be extracted and recycled. The two companies are working towards obtaining high-quality raw materials from the pyrolysis oil it has produced and using this for Continental's tire manufacturing in the medium term - alongside the direct use of high-quality carbon black.

Replacing fossil oils

Fossil oils are gradually being replaced by rapeseed oil, while cellulose fibers and viscose are supplanting polyester. The company is aiming to achieve a dramatic reduction in its consumption of crude oil and identify a replacement for the scarce resource that is natural rubber - while also ensuring that this presents equally good or better handling characteristics out on the road. Plant-based oils - such as rapeseed oil and resins based on residual materials from the paper and wood industries - already offer an alternative to crude-oil-based fillers in Continental's tires. Only oils that meet high technical quality standards and are not suitable for consumption are used. Oils and resins allow for flexibility in terms of tire compounds and so improve the material's grip.

Rice husks as a sustainable filler

In addition to rubber, fillers such as silica are an essential ingredient in tires. Silica helps to optimize characteristics such as grip, rolling resistance and tire life. In the future, rice husks will be used as the source material for sustainably manufactured silica. Rice husks are a waste product of rice production and cannot be used as food or animal feed. Producing silica from the ash of rice husks is more energy-efficient than obtaining it from conventional materials such as quartz sand.



On the Road to a Sustainable Future

The Vision 2023 plan from Continental Tires spans the whole of the value chain: procurement of materials, tire production, service life and disposal. Circular economy is the goal.

Four focus areas for sustainability

Carbon neutrality, emission-free mobility and industry, circular economy and a responsible value chain are the four focus areas for sustainability set out by Continental. The company is aiming to achieve these together with its partners by 2050. The Lowest Overall Driving Costs (LODC) consultancy approach and Generation 5 tires are effective levers for the logistics sector that will help withstand rising cost pressures and increase the sustainability of fleets.

Continental has signed a development agreement with Pyrum Innovations with a view to further optimizing the recycling of materials from old tires.

The right choice of tires

With high fuel costs, CO₂ taxation linked to the burning of fossil fuels and legal requirements to bear in mind, fleet operators need to invest heavily in vehicles with zero tailpipe emissions. It is therefore more crucial than ever to select the correct tires for the job at hand, which will in turn reduce operating

costs. The ContiLifeCycle concept, which is part of Conti360° contracts, provides an effective framework here.

Comprehensive expertise

Continental's holistic consultancy approach includes comprehensive expertise when it comes to tires, tire servicing, digitalization, data analysis and process mapping. The starting point is always the tires, as the core of our business model - complemented by re-treading, casing management and digital solutions.

LODC as a success factor

Continental is using its full range of products to help its fleet customers reduce their tire-related costs. After all, tires also have a significant impact on fuel, maintenance and repair costs, which account for up to 53 percent of a fleet's total costs, depending on the vehicle class (including new tires). Tires are therefore a key cost lever and LODC is a success factor for fleet customers in challenging times, in particular.



Sustainability at Continental



More information Sustainable mobility



Proof of sustainability



Strategy programme Vision 2030



White Paper "Efficient Fleet Management"



Broadening the Mind: Circularity in Design

Martina Steppat, Program Manager Circular Economy at Continental's Tires Group Sector, talks about the journey to a circular economy.

What is Continental focusing on most when it comes to its goal of a circular economy?

Circular economy is always a holistic concept. It is made up of various factors, all of which have the goal of keeping the materials we use within the value loop. Recycling technologies, resilient supply chains and adapted business models all have a role to play here. What issues do you face in achieving these goals? Our goals are realistic from today's perspective, but also quite challenging. The whole organization has to change and adapt its mindset in many areas if we are to achieve the transformation to a circular economy. Tires are designed to provide a secure connection with the road and to transport loads. These are non-negotiable criteria for us. One challenge in view of the exacting requirements involved is designing tires in the future that tick all the boxes - not just when it comes to safety but also with sustainability in mind.

What exactly does that mean when it comes to tires?

Tires in their current design are optimized not for circularity but for performance. In the future, they will have to fulfil both briefs at the same time. However, this means that, in the coming decades, we will need to perform a dual task: bring products

to market which are optimized for both sustainability and circularity, and find solutions for recycling and reusing products as we know them today.

How can that work?

We already have mechanical methods available to us, such as retreading or reclaiming. And the market for granulated tires has also been established for decades. With the three basic principles of circular economy (reduce, reuse, recycle) in mind, retreading gives us a way of extending the lifespan of casings and therefore saving a large chunk of the resources required for making tires. Reclaim can then be manufactured from the rough material and reused in tire production for specific parts. Granulating end-of-life tires to be reused for products like sports ground surfaces is now also an important part of the approach when it comes to extending the lifespan of materials.

What are the challenges?

Tires are highly developed performance products and present us with a major challenge - one which involves both the composition and the design of our products. In the past few years, we have made considerable advances and have demonstrated that it is possible to produce tires with renewable and recycled materials which continue to meet all the usual requirements when it comes to safety and perfor-

mance. **But that is only the first step along a path we will continue to follow.**

What is still important for tires as a product in terms of the transformation process? At the same time, we need to push back the recognizable limitations imposed by the design and composition of tires as they are today, with the introduction of new constructions and designs. In our view, the transformation to a circular economy can only be successful if the materials we use to make tires can be recovered as raw materials as easily as possible and to the highest quality standards. Around 80 percent of a product's sustainability factor will be determined during the development stage.

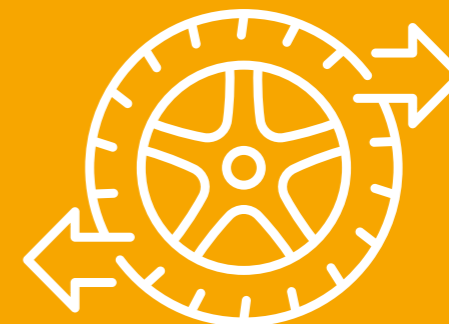
Long-lasting and Renewable

DOT

The DOT code indicates the tire's date of manufacture.

Manufacturing a retreaded tire instead of a new one can cut **CO₂ emissions** by up to

50 %



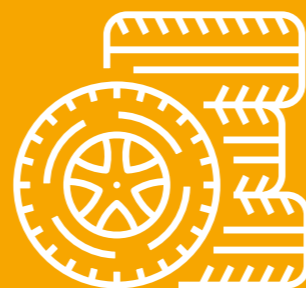
New lease of life

There is the option of cold retreading and hot retreading.



Tires age

chemically, physically and mechanically and their elasticity decreases.



3 years

Tires are considered to be brand new until they are three years old

Up to **70 %** of the **tire material** is reused when retreading



Tire Lifespan

A tire's mileage depends on both the type of ground it has to cover and whether it is being used in local transport or long-distance haulage operations. Optimum tire pressure extends mileage and reduces fuel consumption.

The tread wear process

Normal tread wear results from contact between the tire and the ground. Poor wheel alignment can lead to excessive wear on the inner or outer shoulder of the tire. Driving over unpaved roads and rough or rocky terrain also increases the rate of wear. Incorrect tire pressure, damage from foreign objects and wear damage are the most common causes of punctures. Even the smallest chassis misalignment increases wear and fuel consumption and damages the casing.

Reasons for uneven wear

Overinflated tires will wear unduly in the center of the tread, while underinflated tires will be subject to excessive wear of the outer ribs. Unbalanced wheels can likewise lead to uneven tire wear as the tire is not guaranteed to run evenly around its entire circumference.

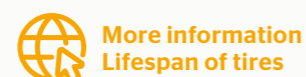
The tire aging process

Tires age as a result of physical and chemical processes triggered, for instance, by the ef-

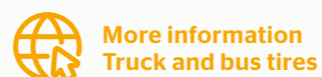
fects of weathering - such as UV light, moisture and extremely high or low temperatures. This causes the tire's elasticity and adhesion to change, something that also applies to tires that have been hardly used or are even completely unused.

Countermeasures

To counter this, various substances are added to the tire compound to slow down the aging process considerably. This ensures that a properly stored tire will continue to meet the same specifications as a new tire for up to a maximum of five years and remain fully fit for purpose. Tires should be replaced after ten years at the latest.



More information
Lifespan of tires



More information
Truck and bus tires

'Brand new' and 'good as new'

The German Tire Retail and Vulcanization Trade Association (BRV) defines tires as being 'brand new' when they are no more than three years old, while tires that are up to five years old are considered to be 'good as new'. The reason for setting out these exact definitions is that many tires are kept in storage for a considerable time before being sold. "There are a number of factors that can lead to tires being stored for prolonged periods to guarantee availability," explains René Siebeneicher, Continental's Head of Regional Service/Technical Customer Service, Replacement Tires Germany. First there is the high complexity of the product itself, he says, with a huge variety of treads and dimensions, different load index and speed rating variants, as well as differing OE specifications. "Added to which, there are seasonal fluctuations in demand or sometimes unpredictable market shifts," continues Siebeneicher.

Utilization of factory capacity also has to be organized as efficiently as possible - which has a beneficial effect on the purchase price for customers. "The customary storage period for new tires seen in practice has no drawbacks in terms of consumer rights either," the company's expert is keen to emphasize. For the consumer, the warranty period begins on the date of sale and not when the tire was manufactured. "We don't think that legal regulations on tire age are particularly advisable, as a tire's useful life and mileage will depend on the combination of storage, operational and servicing demands made on it." A tire is exposed to all sorts of strains during its lifetime, including load, speed, inflation pressure, longitudinal and lateral forces and damage. As these factors can vary widely, it is not possible to forecast life expectancy or define a legal expiry date solely on the basis of when the tire was manufactured.

Tire Age

Tires age due to chemical, physical and mechanical processes, resulting in irreversible material fatigue. The tires' elasticity decreases as a consequence.

Chemical aging of tires

Chemical aging of tires occurs when various tire components are oxidized as a result of exposure to oxygen, ozone, UV rays, heat, cold, moisture and the passage of time. The polymer chains making up the tire material are split, leading to the formation of new crosslinks. This is known as "post-crosslinking". Over time, this diminishes component adhesion and elasticity and therefore tire performance. Ozone cracking on the outside of the tire is an indication of this happening.

Static and dynamic antioxidants are added to the tire compounds to counteract these chemical aging pro-

cesses. Static antioxidants form a protective film of wax on the surface, whose effects include inhibiting the formation of ozone cracks. Dynamic antioxidants react more readily with oxygen and ozone than the polymers in the tire do, thereby protecting them. Antioxidants ensure that, if tires are properly used and stored, they will reach their wear limit long before they become too old to use.

Physical and mechanical aging

Tires age physically due to the diffusion of plasticizers from the material. This means that oil from a compound with high oil content penetrates areas with

low levels of oil at certain temperatures. Operational stability decreases due to mechanical aging of tires. Mechanical and thermal fatigue of the rubber components develops in line with the projected endurance limit.

Correct storage

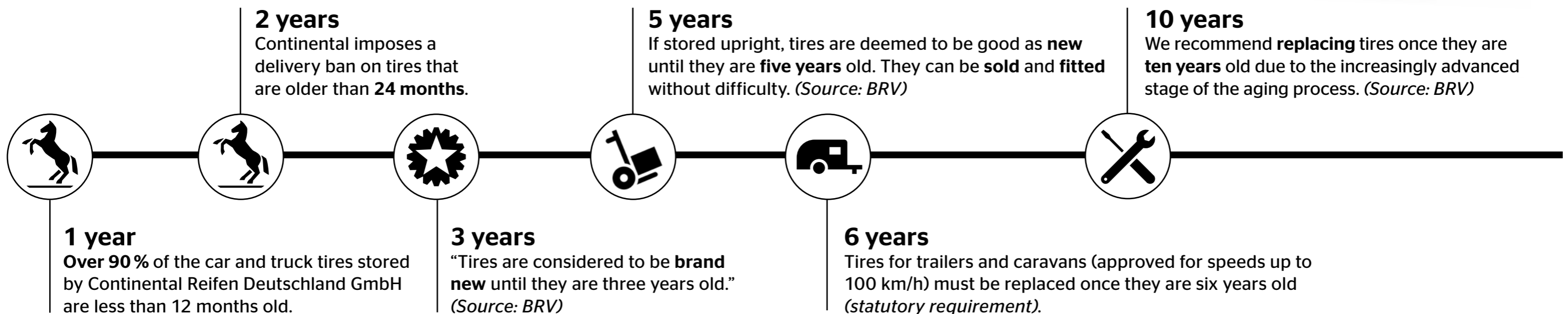
Proper storage leads to a marked slowdown in the tire aging process, meaning it effectively doesn't begin until the tires are first used. Ideally, tires will be stored in a cool, dry, dark place with minimal air exchange and away from any equipment that generates ozone, such as electrical machinery. Contact

with solvents, fuels, lubricants, chemicals, acids or disinfectants should be avoided. Stored tires should not be subjected to strain, pressure, tensile force or any other deforming forces. When stored for long periods, tires should be placed upright in suitable tire racks at least ten centimeters off the floor.

A Tire's Life in Years

The final four digits of the DOT code indicate the tire's date of manufacture. There is no legal basis for governing tire age.

The final four digits of the DOT code on the tire indicate the date of manufacture. A tire with DOT code 3223 was manufactured in calendar week 32 of 2023.



There is no legal basis in place for governing tire age.



The Principle of Retreading

Retreading grants a tire a second lease of life and sometimes even a third.

Retreading brings added value

Retreading saves - or rather reuses - up to 70 percent of the material in the tire, in the form of the casing and part of the rubber. Compared to production of a new tire, retreading requires some 50 percent less energy, around 80 percent less water and up to 70 percent less crude oil. A retread also requires 50 kilograms less raw material on average, which likewise equates to a saving of as much as 70 percent compared to production of a new tire. Overall, production of retreads generates around 30 percent less CO₂ than production of new tires. Two methods are employed here: hot retreading and cold retreading.

The cold retreading process

Cold retreading begins with an initial visual inspection of the used casing. Any casings unfit for retreading are already rejected at this early stage. Then comes a process called shearography. This optical, non-destructive test will identify any defects that are not visible from the outside - damage such as belt edge separation, separation between the casing layers, air bubbles or moisture. Here again, defective casings that cannot be repaired are weeded out.

The casing is then buffed by using computer-controlled machines to strip off the old tread. Once any damage has been carefully inspected and assessed, it

is time to repair the casing. This involves patching any nail holes and grinding rust off the steel cord. An unvulcanized bonding gum is then applied to the buffed surface in a computer-controlled process.

This is followed immediately by computer-controlled application of a pre-vulcanized tread strip on top. The tire is now packed into a curing envelope and a vacuum drawn. It is then cured in an autoclave (a pressure chamber with a hermetic seal), causing the casing, gum and tread strip to bond. Vulcanization occurs at a temperature of approximately 110°C and takes around four hours. Finally, the finished tire undergoes a thorough inspection.

Hot retreading

In hot retreading, the tread pattern is molded during the vulcanization process at a temperature of approximately 150°C. The procedure is exactly the same as for cold retreading up to the point where the casing is repaired. The next step involves bead-to-bead application of an unvulcanized rubber compound using a computer-controlled extruder. With this tread material applied, the casing is placed in a mold with the required tread pattern and vulcanized. Here too, the process finishes with a thorough inspection of the tire.

The Added Value of Retreading

Of the many arguments in favor of retreading tires, the most important is lower consumption of raw materials.

Effective conservation of resources

Production of a new bus or truck tire requires between 60 and 80 kilograms of rubber compound. A retread needs just 15 kilograms or so - roughly one quarter of the amount. And while producing a new tire calls for 83 liters of crude oil, a retread uses up a mere 26 liters. That represents a reduction of two thirds. Overall, a retreaded tire consumes about a quarter of the raw material required for a new one.

Effective reduction of carbon emissions

Scientists have registered a new record high for the level of the greenhouse gas carbon dioxide in the atmosphere. For the first time since measurements began, the global monthly average carbon dioxide (CO₂) concentration has exceeded 400 ppm. By opting to use retreaded tires, haulage companies, vehicle manufacturers and consumers are actively helping to ensure that this trend progresses no further than necessary. This is because the greenhouse gas emissions from production of a retread are one third lower compared to a new tire. At 100 kilograms of CO₂ per tire, that equates to annual savings of up to 500,000 metric tons of CO₂.

European study on retreading

As the German Tire Retail and Vulcanization Trade Association (BRV) points out, retreading truck tires in Europe aligns well with the principles of a circular economy, benefits the environment and safeguards local jobs. To provide public and private stakeholders with a quantified understanding of the socio-economic and environmental issues at stake for Europe due to recent developments in the industry, management consultants EY (Ernst & Young et Associés) teamed up with representatives from the retreading industry to compile a study. According to the findings, retreading supports over 19,000 direct, indirect and induced jobs in the EU today. Further information on this topic can be found (in German) on the BRV website. The study itself, entitled 'The socio-economic impact of truck tyre retreading in Europe - The circular economy of tyres in danger', can be downloaded here: <https://www.etrma.org/library/the-socio-economic-impact-of-truck-tyre-retreading-in-europe/>



New Tires, Multiple Lives

Retreading is one element of the ContiLifeCycle concept - a tire management approach that focuses on cost savings and eco-friendly operations.

One process with three steps

ContiLifeCycle is a holistic system rooted in reusing tires and prolonging tire life. The ContiLifeCycle concept comes under the umbrella of the Conti360° Solutions all-round tire management service for fleets. The process comprises three steps, each of which is driven by technology.

1. New tires

The ContiLifeCycle begins with the new tire. Designed for excellent economy in accordance with our cradle-to-grave approach. Continental truck and bus tires are long lasting, efficient, retreadable and a crucial element in optimizing a fleet's total operating costs.

2. Casing management

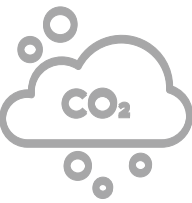
The ContiLifeCycle continues with the Continental casing. Its robust design makes it ideal for retreading truck and bus tires. The casing management solution provides transparency, flexibility and great service: Continental takes care of every aspect of the casings, from inspection and storage to purchasing and transport, and even final disposal if necessary.

3. Retreading

In the third step of the ContiLifeCycle there are two different options for tire retreads: ContiRe hot retreading and ContiTread cold retreading. Both are cost-effective, eco-friendly, premium-quality solutions for prolonging tire life and delivering proven performance and reliability.

LIFE CYCLE IN FIGURES


UP TO 50% CO₂-EMITTED
when making a new tire can be avoided by producing a retreaded tire instead.



35% LOWER TIRE COSTS
with retreading solutions from Continental



The share of recycled and renewable materials is **UP TO 85%**




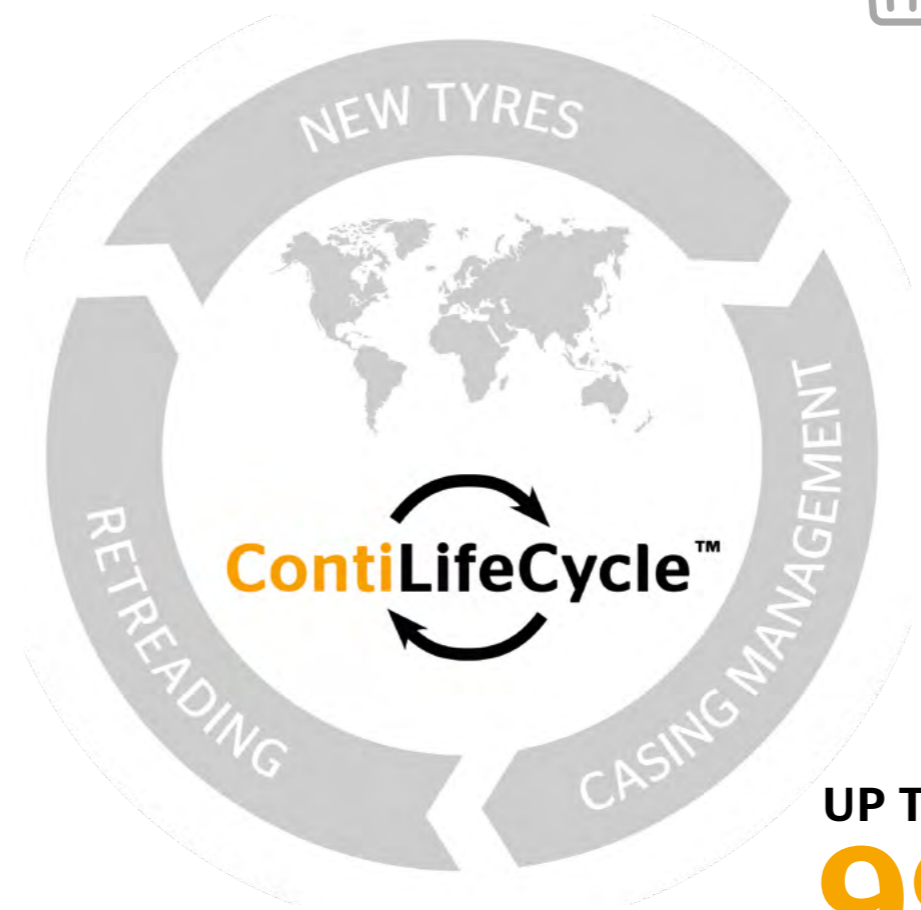
UP TO 55 kg OF WASTE
can be saved.



UP TO 18.3 MILLION TRUCK TIRES
were sold in the EU replacement market. 26% of these were retreaded.



UP TO 99%
higher mileage with retreaded tires

CONTI CASING ACCOUNT
Retreading solutions with well-maintained Continental casings reduce tire costs by 30 - 40%

The ContiCasingAccount

The credit account for used casings delivers added value through reduced fleet costs, improved tire life and lower emissions.

The ContiCasingAccount

Since early 2023, Continental has been offering its tire dealers an additional service in the form of the ContiCasingAccount. This allows dealers to earn credit by 'paying' used casings from their truck customers into an account.

The ContiCasingAccount reduces fleet costs, optimizes tire life and cuts emissions - in short, it brings added value for everyone involved. "Using our retread solutions with well-maintained Continental casings allows us to lower tire costs by 35 to 40 percent," explains Siljana Lietz, Head of ContiLifeCycle at Continental Tires Germany. "Retreading a tire saves around 70 percent of the materials required for manufacturing a new tire, greatly reducing the environmental impact. Besides these raw material savings, retreading also helps to bring down CO₂ emissions as well as water and energy consumption."

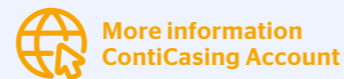
Added value for dealers and fleet customers

The tire dealer adds the used casings to their CasingAccount, receiving credit for them in return. This credit can then be used flexibly within a year to acquire retreaded tires for their customers as and when required. The dealer also benefits from an attractive exchange price for the retreaded tire, while ContiCasingAccount users benefit from a preferential delivery service.

Sustainability and minimized real-world fleet costs

Meanwhile, the ContiRe retreads business quietly plays its part in making fleets more sustainable, lowering costs and helping to keep real-world fleet costs

as low as possible. The casings are picked up by Continental so they don't take up valuable storage space at the dealer's premises. The ContiCasingAccount is part of the ContiLifeCycle concept from Continental, with its fuel-saving, retreadable new tires, casing management, premium hot retreading technique and cold retreading using lengths of tread. The ContiCasingAccount broadens the scope of casing management by adding another service offering benefits for all involved - and for the environment as well.



"Resource-efficient reuse of casings can give transport companies an edge over the competition."

Siljana Lietz, Head of ContiLifeCycle at Continental Tires Germany

"Continental's casing bank works very intuitively and digitally. It is practical, simple and sustainable. So it fits our corporate philosophy, strengthens customer relationships and makes our work easier."

Tire dealer Dirk Thomsen, Managing Director of Reifen Thomsen Tarp GmbH

"The ContiCasingAccount brings significant added value for all parties involved, in terms of costs, tire service life and emissions."

Eric Hofmann, Managing Director of Reifen Hofmann GmbH & Co. KG



Cutting Costs and Carbon Emissions

Tire retreading is an efficient way of helping to increase a fleet's sustainability. Siljana Lietz, Head of ContiLifeCycle at Continental Tires Germany, discusses ContiLifeCycle and the EU Taxonomy.

How much potential do you think retreading holds for the commercial vehicle industry?

The whole issue of carbon and material savings is becoming far more important for our customers as a result of the taxonomy regulation and the reporting obligation for companies. Purchasing and using retreaded tires goes part way toward fulfilling these taxonomy-related requirements. Consequently, re-treading will continue to grow in importance for the commercial vehicle sector.

For which customers and applications does retreading already offer an ideal solution?

Using retreaded tires is fundamentally a good option for any customer. For fleets especially, the use of retreads is already a key element now in the drive to save costs while reducing their carbon footprint.

How is Continental planning to promote retreading in the commercial vehicle sector?

Retreading is an issue that's close to our heart because sustainability is something that is so crucial to us. We are therefore seeking to expand retreading operations at Continental. Every day, we work together with our customers in an effort to optimize the use of new tires and retreads in order to pave the way for a LifeCycle solution that is tailored to each customer.

Cold or hot retreading - which process is best for which scenarios?

Hot and cold retreading solutions are not direct competitors. Both retreading techniques ensure a very high standard of technical quality for our Continental tires. And this is reflected by our motto: "Looks like new - runs like new".

Will both retreading methods continue to be offered in parallel?

Yes, we currently offer our customers both solutions and would like to continue to do so for years to come.

Does retreading form part of the ContiLifeCycle concept?

Continental presents its fleet customers with an effective portfolio of solutions for making fleet operations efficient and sustainable. Fleet operators can choose from a modular range of solutions thanks to the Lowest Overall Driving Costs (LODC) comprehensive consultancy approach including ContiLifeCycle and ContiConnect digital tire management. We also provide a certificate as proof of how this is helping to drive sustainability.

What sort of certificate is it?

Taking as a basis the ContiRe tires fitted to the vehicles, we are able to calculate the material and carbon savings achieved during the course of production and retreading. A study conducted by the Fraunhofer Institute for Environmental, Safety and Energy Technology (UMSICHT) showed that the carbon emissions of retreads are up to around 50 percent lower compared to similar new tires. Plus, recycled and renewable materials account for as much as 85 percent of a retreaded tire.

Why are you offering this certificate?

We devised the sustainability certificate at the request of our customers, whose day-to-day business increasingly calls for evidence of their efforts to improve sustainability and look after our planet's resources. The whole sustainability issue and climate-neutral transport are becoming ever more important in the logis-

tics sector - a trend driven not least by tightly defined statutory requirements.

Can retreading's contribution to sustainability be put into numbers?

Retreading extends the tire's lifetime - and therefore its mileage for the fleet - by as much as 99 percent by giving it another life. This method can save up to 55 kilograms of waste. We are generally able to reuse around 70 percent of the original tire. Fleets can reduce their tire costs by as much as 40 percent with our ContiRe retreaded tires and the ContiTread solutions.

How can the added value be summed up?

Our sustainable ContiLifeCycle concept combines with the cost-focused LODC approach to give fleet customers the advantage of being able to enjoy the benefits of our hot-retreaded ContiRe tires and the cold-retreaded ContiTread tires, service-oriented casing management complete with ContiCasingAccount, plus long-lasting and fuel-efficient new tires. This generates added value in the form of substantial cost savings and a reduced impact on the environment. ContiLifeCycle and Continental's LODC philosophy create sustainability that brings real benefits and can now be verified with a certificate.



Digital and in Optimum Shape

If tires are
underinflated by just
20%
they will achieve around
20 percent less mileage.



Tire pressure in the spotlight

Pressure that is too high causes excessive wear in the center of the tread. And if it's too low, the tire's outer ribs will suffer.

Smart family of tires

Since August 2023, Continental has been factory fitting its entire **Conti Urban tire family** with latest-generation sensors. This makes Continental the first manufacturer to offer an entire family of tires with sensors, allowing it to continue driving forward fleet digitalization.



ContiConnect & Co.

High-precision sensor technology combines with the intelligent tire management solution ContiConnect to provide a continuous stream of tire data.



With the Continental Tire Tech App, we are continuing the digitalization of tire service.

Catherine Loss, Head of Technical Customer Services EMEA at Continental



App calculates optimum pressure

With the **Pressure-Load Calculator**, fleet managers, technicians and tire dealers are able to determine the optimum inflation pressure for their tires, depending on the application. The **Continental TireTech app** helps to increase fleet efficiency and reduce tire operating costs.



Tire Pressure in the Spotlight

Inflating tires to the optimum pressure increases their dynamic stability and mileage at the same time as reducing fuel consumption and therefore CO₂ emissions.

Optimum tire pressure

User manuals from vehicle manufacturers and technical documentation from tire makers provide information on the correct tire pressures. These values always apply to cold tires because the internal pressure of the tire increases as it warms up out on the road. The pressures should be checked every two weeks, or every four weeks at most, when the tires are cold – and without forgetting the spare wheels.

Causes of pressure loss

Tire pressure impacts the safe handling and fuel consumption of the vehicle and the mileage of the tires. Tires invariably lose some air as a result of diffusion through the sidewall. And although this is initially a

tiny proportion, over time it adds up to a noticeable loss of pressure. As a result of this, the lateral guidance forces in the tire are no longer sufficient. The vehicle will respond sluggishly to steering commands, and there will be a deterioration in both directional stability and braking distances.

Consequences of underinflation

When a tire is underinflated, the contact patch becomes larger. As a result, a greater part of the wheel load acts on the outer edges of the tire, with reduced pressure on the center of the tread. Depending on the speed and weight of the vehicle, this variation in the distribution of forces causes the tire to flex more and reach temperatures in excess of 150°C. The tire over-

heats in the shoulder area, weakening the sub-structure and causing parts of the tread and belt to break off. Flexing also means greater rolling resistance with a corresponding rise in fuel consumption. Even a prolonged reduction in pressure of around 20 percent can reduce tire life by around 20 percent.

Reasons for air leaks

Objects embedded in the tread, damage to the sidewall or a defective valve can all cause an air leak when the tire is subjected to high loads. Dirt, dust and moisture can affect the functioning of a valve.

Regular checks are the answer

The quality and performance capabilities of modern premium tires can only be fully leveraged by regularly checking all the relevant parameters. This includes continuous monitoring of the pressure and regular visual inspections of the inner and outer sidewalls of all the tires fitted on the vehicle.



More information
Saving fuel



More information
Rolling resistance and
fuel consumption



Video
Rolling resistance

Digital Services

The ContiConnect digital tire management system offers haulage and fleet companies a modular product that can be individually tailored to their needs and specifications.

Providing a solution for a range of use cases: the components of the intelligent tire management solution supply real-time tire data and reinforce the four key pillars of fleet efficiency.

Sustainability

Cost Effectiveness

Predictive Maintenance

New Forms of Mobility





Digital Tire Management

High-precision sensor technology combines with the intelligent tire management solution ContiConnect to provide a continuous stream of tire data. If there are any anomalies, the fleet management team can take action fast.

Tire pressure monitoring systems

Today, the task of continuously monitoring the condition of the tires on a vehicle is made simpler by state-of-the-art tire pressure monitoring systems (TPMS) emerging out of the shift to Logistics 4.0. These smart data-system solutions provide a timely warning of tire failure.

Tire pressure monitoring with Continental

In 2013, Continental's Commercial Vehicle Tires unit started to roll out the ContiPressureCheck tire monitoring system globally. Designed for monitoring the tires on individual vehicles, it has now been integrated into more than 35 different telematics systems.

2017 saw the advent of ContiConnect - a tire monitoring solution for multiple vehicles, based on a reader station installed at the fleet yard. The Yard Reader, as it is known, is the connectivity component of ContiConnect that receives the data from the vehicles and transmits it to fleet management. It reads the data from the tire sensors and sends it via the cellular network to the backend.

The ContiConnect web portal is the interface where fleet managers can proactively monitor tire condition on all their vehicles. The web portal is a browser-based application and can be accessed from any web-enabled device.

ContiConnect is based on smart sensors that continuously measure the temperature and pressure inside the tires. Each sensor sends its readings in real time to the selected tire pressure monitoring system. Since August 2023, Continental has factory fitted its entire Conti Urban tire family with latest-generation sensors. This makes Continental the first manufacturer to offer an entire family of tires with sensors, allowing it to continue driving forward fleet digitalization.

Flexible monitoring regardless of vehicle location

This is achieved using ContiConnect Yard and, since 2022, ContiConnect Live. These systems enable digital tire monitoring anytime, anywhere. High-precision

sensors fitted inside the tires measure their pressure and temperature, making it possible to keep an eye on the condition of the tires at all times. ContiConnect Live is the ideal solution for fleets that are constantly in use and seldom return to the depot. The fleet's tire data can be accessed in real time, regardless of where the vehicles are located. The readings are relayed to the Continental backend, where they are processed and made available via the ContiConnect portal or the ContiConnect app - complete with detailed analyses and reports on tire status together with alerts sent by email or SMS.



Valve Cap Sensor as Entry-level Solution

The valve cap sensor from Continental is the company's quick entry-level digital tire monitoring solution. It helps to ensure safe, sustainable and cost-efficient fleet operations.

Continental offers entry-level digital tire monitoring tech in the form of a sensor that transmits data on the condition of the tires, regardless of the manufacturer. Tires can therefore be kept at the optimum pressure, leading to greater fuel efficiency and a longer tire life. "Our valve cap sensor solution offers fleets a quick entry into the world of ContiConnect," says Clarisa Doval, Head of Digital Solutions at Continental Tires. "The tires don't even have to be removed to install it." This has the benefit of allowing truck downtime to be reduced to a minimum. The information processed via the tire management platform enables fleet operators to optimize maintenance intervals and extend the operating times of their vehicles. This helps haulage and transport companies to operate their fleets in a safer, more sustainable and more cost-efficient manner.

Sensor technology for real-time data

A valve cap sensor is screwed onto the tire valve of buses, trucks, or trailers. From there, the sensor measures the tire pressure in real time. The sensor is compatible with commercial vehicle tires from all the main manufacturers and connects to ContiConnect receiver units with plug-and-play simplicity. Any deviations from the target values are registered via the ContiConnect tire management platform and forwarded to the user.

Vehicle configuration using On-Site app

A QR code on the valve cap sensor is used to assign the sensor to the respective tire position. The position can be set from a mobile device using the

ContiConnect On-Site app without the need for a special scanner.

Analysis of the tire data

There are two options for transmitting the data gathered by the valve cap sensor: via a Yard Reader station or as a live stream using a telematics unit. With the Yard Reader solution, the station is installed at the fleet's frequently used touchpoints within the depot, such as washing bays, filling stations or other checkpoints. The data from the tire sensors is read as the vehicles drive past the station and sent to the Continental IoT platform. In the case of the live solution, a receiver unit is installed in the tractor unit or trailer. These telematics units transmit the data to the Continental IoT platform in real time. All collected and transmitted data is displayed in the ContiConnect On-Site app and can be accessed in the web portal - via desktop app or mobile device.

For small and large fleets alike

Both small and large fleets can benefit from this entry-level solution. It only takes a few minutes to equip a vehicle with the valve cap sensor, while an entire fleet can be retrofitted in just a few hours. So when a vehicle is next due to have its tires changed, fleet operators can choose to opt for intelligent tires with a factory-fitted sensor from Continental, opening the door to a comprehensive package of digital-based tire services.



Mobile App for Advice on the Move

TireTech app drives forward the digitalization of tire servicing

Since early 2023, Continental has been helping fleet operators, dealers and service technicians to maximize the safety and efficiency of their tires with the TireTech mobile app. The tool is designed to ensure optimum tire pressures and the right tire selection in order to maximize tire performance and therefore fleet efficiency.

The added value of the TireTech app

The Continental TireTech app is a technical advice tool that has been carefully honed for dealers, fleet managers and technicians. It can be downloaded free of charge for iOS and Android. It provides quick and easy access to up-to-date tire and servicing information for Continental's full range of tires for agricultural and commercial vehicles. The app offers its content in multiple languages, is ready to use

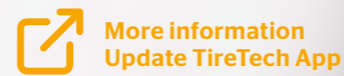
within seconds of installation, and can be easily configured to suit users' individual needs.

Straightforward and relevant information

Amongst the features offered by the Continental TireTech app is a built-in Pressure-Load Calculator, which helps users to determine the correct pressure for each tire based on the vehicle's axle load and tire size. The database of technical tire data and library of supporting images further enhance the app's functionality. The technical data can even be accessed without an internet connection. Completing the service app's features is a contact form that enables customers to get in touch with Continental's technical service team directly.



More information
TireTech App



More information
Update TireTech App

Three questions for Catherine Loss

Head of Technical Customer Services EMEA at Continental

What added value does the TireTech app have to offer?

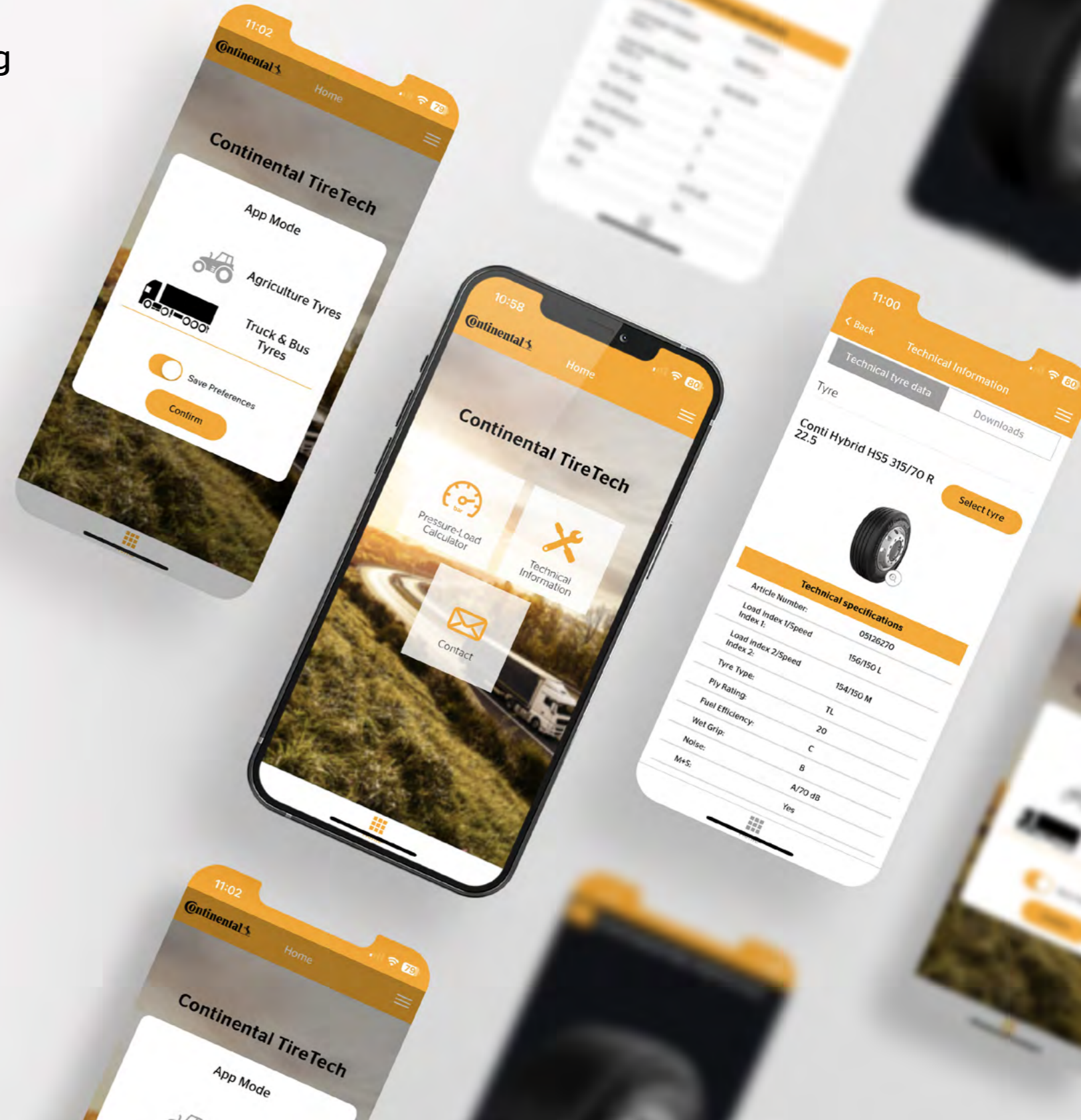
With our Continental TireTech app, we are driving forward the digitalization of tire servicing. Our technical service team is looking forward to expanding this app's functionality and adding further scope to our existing product offering for customers.

What is the app capable of?

With the Pressure-Load Calculator, fleet managers, technicians and tire dealers are able to determine the optimum inflation pressure for their tires, depending on the application. The Continental TireTech app helps to increase fleet efficiency and reduce tire operating costs.

Does the TireTech app help efforts to increase fleet efficiency?

The app does play a part in lowering exhaust emissions significantly, as correct tire pressure helps to reduce rolling resistance. The Continental TireTech app is therefore another building block in Continental's holistic Lowest Overall Driving Costs (LODC) approach.



The integrated solution portfolio

Tansu Isik, Head of Fleet Solutions EMEA at Continental Tires, on Continental's holistic consulting approach LODC and the LifeCycle concept

How does the new Conti Eco Gen 5 tire line fit into the solution portfolio for fleet customers?

Our holistic consulting approach focuses on the Low Overall Driving Costs, or LODC for short. We support our fleet customers in reducing their tire-related operating costs. The LODC incorporates all of our expertise in the areas of tires, tire service, digitalization,

data analysis and process optimization. The new Conti Eco Gen 5 is a tire with balanced rolling resistance, extra traction and a long service life. This makes it an ideal addition to our tire range and exactly the right tire for our LODC approach.

How does the Conti Eco Gen 5 fit into the LODC advisory concept?

Compared to its predecessors, the new Conti Eco Gen 5 offers a significantly better CO₂ balance. At the same time, it helps to further reduce tire-related operating costs. As a result, it fits perfectly into the LODC concept and strives for a balance between economic, ecological and safety-related aspects of fleet operation. When developing the Conti Eco Gen 5, our tire developers took both ecology and economy into account.

What are the most important levers in the LODC method?

The most important levers for LODC are optimal tire selection, introduction of lifecycle solutions, data-driven service management with tire checks at the right time, 24/7 breakdown service and digital services for maximizing uptime, increasing tire mileage and fuel efficiency, reducing repair and maintenance costs and the optimization of ordering, administration and billing processes. Basically, a complete lifecycle solution helps to fully exploit the potential of tires. For us, this includes tools and services such as digital solutions, carcass management and data transparency during tire use. During the usage phase, we are able to use

digital solutions to monitor tire inflation pressure and optimize tire maintenance. Such solutions extends tire life, increases uptime and helps to save fuel.

How does the Conti Eco Gen 5 help fleet operators to reduce CO₂ emissions?

When developing the Conti Eco Gen 5, we succeeded in harmonizing the interplay between low rolling resistance and high mileage. To achieve this, our development has focused on mileage-neutral measures to improve rolling resistance. To achieve this, new technologies were used in all tire components, for example in the carcass construction, in the tread area and in the development of the overall contour and tread design. After all, the greatest leverage in tire development to improve the CO₂ balance of fleets is low rolling resistance and a long tire life.

How important is retreading in terms of LODC and fleet efficiency?

As part of the holistic LODC concept, we always consider the appropriate retreading solution that is best suited to the customer's application profile when selecting tires - hot retreaded ContiRe or cold retreaded ContiTread tires. Our engineering teams for new tires and retreads work hand in hand. This makes retreading an important factor for our LODC approach and for more sustainability for the entire fleet.

Is the new Conti Eco Gen 5 suitable for retreading?

With the Conti Eco Gen 5, it was important to us to improve criteria such as rolling resistance and durabil-

ity without compromising on recyclability. This means that the Conti Eco Gen 5 and its carcass are fully retreadable. Retreading was taken into account during tire development.

What proportion of the total costs of a fleet do tire costs account for?

At first glance, tires only account for around 2 percent of the total operating costs of a truck. However, they also have a significant impact on fuel, maintenance and repair costs, administrative efforts, as well as tolls, which account for on average 50 percent of total costs. This makes tires an important cost-saving lever and the LODC concept a real success factor for our fleet customers.

How will the general market conditions for your fleet customers develop in the future?

Forecasts are always difficult, but cost pressures are likely to increase further. Fuel prices will remain high for the foreseeable future and this will be exacerbated by the European CO₂ tax on fossil fuels. Besides, overall inflation and shortage of labor will add additional burden on our customers. European and national regulations will push fleet operators to invest heavily on the domain of sustainability as well, such as zero-emission vehicles, or circular solutions. Through such investments, they can avoid tolls and restrictions and take advantage of incentives. So, there is strong economic pressure to reduce operating costs, at the same time improve sustainability by choosing the right tires and effective solutions beyond tires.



Targets and Regulations

VECTO

stands for: **Vehicle Energy Consumption calculation Tool**. It is used as the basis for calculating CO₂ emissions.



2.5 liters

of fuel saved every 100 kilometers - achievable by selecting a B-rated tire rather than C-rated one.

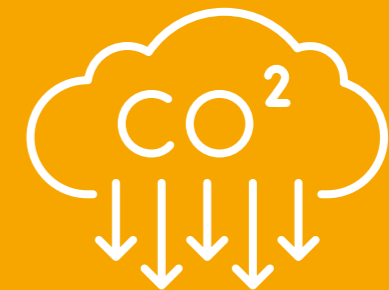
From A to E

Efficiency, safety and environmental impact are indicated on the EU label in the form of fuel efficiency, wet grip and external rolling noise. These are graded using a five-step scale: from the best rating A (green) to the lowest rating E (red).



Of the 740 million metric tons of CO₂ generated by road transport in the EU, trucks and buses account for

207 million metric tons.



The transport sector is responsible for around

1/4 of the EU's total CO₂ emissions.

(Source: Eurostat, 2021)

The European Union has established a classification system for sustainable economic activities in the form of the

EU Taxonomy.

The EU Tire Label

Since 2021, tires have been clearly marked with an EU tire label, making it easier for customers to switch to energy-efficient tires.

Key performance characteristics at a glance

Covering three aspects – efficiency, safety and environmental impact – the label indicates a tire’s performance in terms of fuel efficiency, wet grip and external rolling noise. The principle is similar to the energy efficiency label on washing machines, refrigerators and other electric household appliances. The various criteria are rated using five grades from A to E, each assigned its own color, with A (green) indicating the best rating and E (red) the lowest.

Safer, greener and more cost-efficient

The aim of the label is to increase the safety and cost efficiency of road transportation while reducing its environmental impact by promoting the use of fuel-efficient, safe and quiet tires. The labeling provides consumers with a broader range of information before they buy, allowing them to take these criteria into account, along with the findings of other tire tests, when deciding which tire to purchase.

The EU label is mandatory for car, van and truck tires (currently not yet for retreads), tires not approved for road use such as racing tires, temporary-use spare tires, classic car tires, motorcycle tires, studded tires, as well as tires for earthmoving machines or agricultural vehicles. A clear and comprehensive list of the EU label ratings for Continental tires can be accessed online at any time. And you can quickly and easily find the right tire using the EU Tire Label Generator.

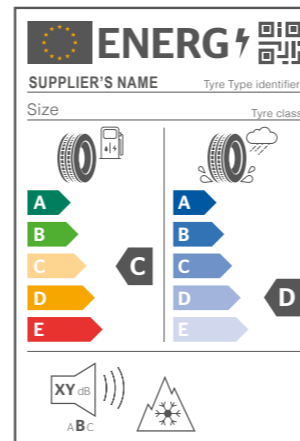
EU Tire Label Generator

To find the EU label ratings for Continental tires online, check out the EU Tire Label Generator.

What the label shows in detail

Wet grip / braking performance

Wet grip is one of the most important safety properties of a tire. A good rating means a short braking distance on wet roads. Improving by one grade means a reduction in the braking distance of between five and ten meters – under emergency braking from a speed of 80 km/h. And, in an emergency, every meter counts.



Fuel efficiency / rolling resistance

Tire rolling resistance has a direct bearing on a truck’s consumption of drive power and therefore fuel. This makes it an important factor for evaluating cost efficiency and environmental impact. The difference between two grades – such as B and C – can translate into a fuel saving of as much as 2.5 liters per 100 kilometers in a commercial vehicle. Lower fuel consumption reduces a vehicle’s carbon footprint.

External rolling noise / noise emission

The rolling noise of a truck tire contributes to traffic noise and thus environmental noise pollution. Besides indicating the noise emission reading in decibels (dB), the label also shows the noise level as a grade symbolized by sound waves. Tires with three sound waves do not comply with the current noise limits introduced in 2016. Tires whose noise emissions are under the limit or more than three dB below it are marked with two sound waves or one sound wave respectively.



VECTO: Less CO₂ by 2030

The aim here is to reduce fuel consumption and carbon emissions – and so deliver lower fleet costs, greater efficiency and increased competitiveness.

Transport industry has a big contribution to make
Protecting the environment involves us all – on both a private and commercial level. Greenhouse gas (CO₂) emissions need to be cut globally to make the world a sustainable place. The entire transport industry can make a major contribution to climate action by reducing fuel consumption and the associated carbon emissions. Lower carbon emissions are key to keeping the planet clean.

30 percent reduction by 2030

The European Union regulation setting CO₂ emission performance standards for new heavy-duty commercial vehicles was enacted on March 14, 2019. In so doing, the EU introduced new regulations for commercial vehicle manufacturers with the aim of

substantially lowering CO₂ emissions by 2030 when measured against the baseline period of 2018/2019. Average emissions from new heavy-duty commercial vehicles should be cut by 15 percent by 2025 and by 30 percent by 2030.

A challenge for all concerned

Manufacturers who do not comply with the regulations must pay a financial penalty for every vehicle. Although the current regulations are targeted primarily at truck manufacturers, further regulations are anticipated in future that will affect fleet operators.

Rolling resistance is a key lever

When it comes to tires, rolling resistance is one of the main factors affecting fuel costs – which can account for

as much as 30 percent of overall fleet expenditure. The efficiency factor of a combustion engine's powertrain means that at least 60 percent of the input chemical energy contained in the fuel is converted into thermal energy, so cannot be used to drive the vehicle. Rolling resistance is the second biggest factor, using up just over another 15 percent of the input energy. The level of CO₂ emissions is directly related to a fleet's fuel consumption and the rolling resistance of its tires. Premium tire manufacturers offer the right tire for every application. There is now a wide range of products available, in particular with regard to sustainability and fuel efficiency.

VECTO simulation tool

The European Commission has devised the VECTO simulation tool and introduced it for OEMs. VECTO stands

for: Vehicle Energy Consumption calculation Tool. It is used as the basis for calculating CO₂ emissions. VECTO allows vehicle manufacturers to simulate the CO₂ emissions and fuel consumption of individual truck configurations. Standardized parameters – such as simulated handling characteristics, engine output, aerodynamic drag and rolling resistance – are used as the input values. This provides more transparency about the CO₂ emissions and fuel consumption of different vehicle configurations and has a positive impact on fleet fuel efficiency.



More information
CO₂ and VECTO



More information
VECTO and tire choice

Opportunities of the EU Taxonomy

The European Union (EU) has introduced a classification system for sustainable economic activities in the form of the EU Taxonomy. And now Continental is providing fleets in the transport and logistics industry with information on the requirements.

Transparency and decision-making aid

Under the provisions of the Green Deal and as part of its 'action plan on financing sustainable growth', the EU has introduced a classification system for sustainable economic activities. The EU Taxonomy is designed to help investors make decisions and in so doing direct orders and investment into activities that can be considered environmentally sustainable. This should then encourage companies in the EU to make their economic activities increasingly sustainable.

Information portal with explainer video

In line with Continental's Lowest Overall Driving Costs (LODC) consultancy approach, the company is using an information portal to provide fleets in the transport and logistics industry with extensive information on how to get ready for the EU Taxonomy requirements. The Taxonomy is being implemented gradually. The reporting obligation will extend to more and more companies from 2025.

Incentives for more climate action

The classification system allows business activities to be evaluated in terms of their environmental impact. It creates incentives to keep reducing any negative impacts on the environment and climate. The EU Taxonomy also facilitates transparency. Customers can make comparisons and obtain products and services from companies who actively contribute to meeting climate goals. Financiers wishing to invest in firms benefit in a similar way.

Lower carbon emissions in the transport sector

The Taxonomy sets out a total of six environmental objectives. Climate action and the reduction of carbon emissions are of particular relevance for companies in the transport and logistics industry. After all, according to the European Union's statistical office Eurostat, the transport sector is responsible for about a quarter of the total of around 3.54 billion metric tons of CO₂-equivalent emissions generated in the EU (as of 2021). Road transport accounts for 740 milli-

on metric tons of these CO₂ emissions, of which 207 million metric tons can be attributed to trucks and buses.

EU tire label and carbon reduction

To shrink the carbon footprint of their economic activity, companies are able to invest in low-emission or zero-emission drive systems and in improving the energy efficiency of vehicles by fitting energy-efficient tires. The EU tire label indicates which products are deemed to be Taxonomy-compliant. They must be rated in the two best classes/the best class for rolling resistance and external noise in which there is more than one model of tire already available on the market (according to the EPREL product database).

Gaining a competitive advantage

Transport companies who get their vehicle fleet ready in accordance with the Taxonomy's provisions are able to use the reduced carbon footprint as a selling point. This is particularly relevant when dealing with

clients who, due to their size, are already obliged to carry out the reporting required for the Taxonomy. Implementation of the EU Taxonomy poses a challenge, but it is also an opportunity for companies to set themselves apart from their competitors.

Funding in Germany

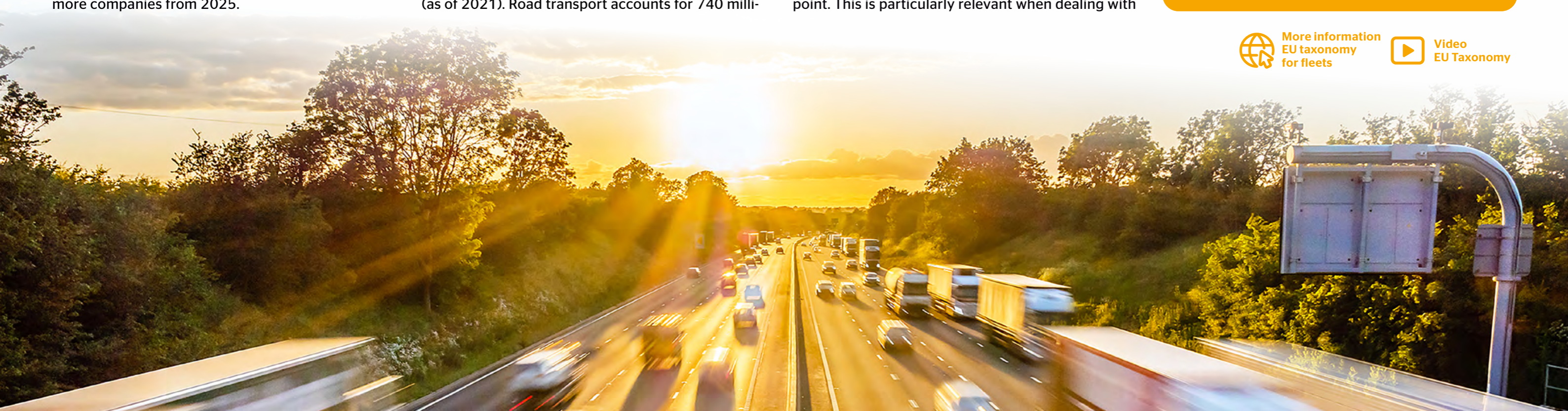
Germany has set up a publicly financed "Environmental Protection and Safety Funding Programme" (formerly De-minimis), to fund safety and environmental protection measures in road haulage companies using heavy-duty commercial vehicles. Under this funding program, companies can apply for subsidies when investing in vehicle tires (new, used or retreaded). The relevant requirements are set out in the latest version of the funding guideline. Detailed information on this funding program can be found on the website of the Federal Logistics and Mobility Office (BALM).



More information
EU taxonomy
for fleets



Video
EU Taxonomy



Related Topics



Contacts

On request, we can put you in touch with our colleagues from the various departments at Continental, who will provide expert information and answers to your questions.

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