

The background of the advertisement is a photograph of a woman with long dark hair, wearing a white t-shirt and blue jeans, standing in a field and plugging a blue charging cable into the side of a silver electric car. The scene is captured at sunset, with a warm, golden glow on the horizon and scattered clouds in the sky. In the foreground, a car's side-view mirror is visible, reflecting the woman and the car she is charging. The overall composition suggests a sustainable and modern mode of transportation.

White Paper **Electric Mobility and Tires**

Ready for change

Sustainable Future

Our Vision 2030

The mobility industry overall, and vehicle manufacturers and suppliers in particular, are working to make personal mobility and the value chain as a whole more sustainable in the future.

The Tires business area of Continental has made sustainability an integral part of the company's "Vision 2030" strategic program and enshrined it in the premium tire manufacturer's fundamental values. "We are convinced that sustainable and responsible business practices enhance our capacity to innovate and create - and, in so doing, bring added value to the company and to society as a whole," says Philipp von Hirschheydt, Head of Business Unit Replacement Tires EMEA. "We are aiming to achieve 100 percent carbon neutrality throughout our value chain by 2050 at the latest."

Continental has been sourcing 100 percent of its electricity from renewables at production sites worldwide since 2020, reducing its own direct and indirect emissions by 70 percent from 2019 to 2020. Continental will also break new ground in making its global business in zero-emission transportation carbon-neutral from 2022. The neutralization of carbon dioxide (CO₂) emissions involves generating an equal quantity of "negative emissions". To achieve this, all emissions generated during the procurement and supply of raw materials and other materials, in internal production processes and during end-of-life recycling are neutralized.

How people and goods are transported from A to B will continue to be at the heart of social and economic development in the future. Continental is working on lightweight components, solutions for automated driving, new transport concepts, long-lasting tires optimized for rolling resistance and, last but not least, technologies for vehicles that do not cause drive-related emissions - e.g. battery-electric vehicles and those using fuel cell or hydrogen technology. "We therefore view the growing registration figures for electric vehicles in Europe (and Germany specifically) as very positive," adds von Hirschheydt. "However, we are only in the early stages of this development.

The majority of vehicles are still powered by a combustion engine, and that is likely to remain the case in the medium term. With this in mind, we are focusing not only on optimizing vehicles with electric motors, but also on reducing the emissions generated by vehicles with combustion engines."

Let's Get Started ...

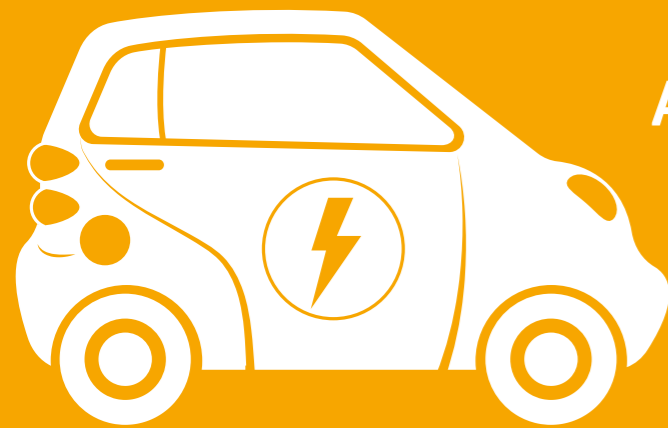
Are tires for electric vehicles different from normal ones?

Tires for electric vehicles and those for conventionally powered vehicles are essentially the same; there are no differences in tread or sidewall design. However, owners should still be aware of certain things with tires for electric vehicles, as electrification fundamentally changes the conditions in which the tires have to work.



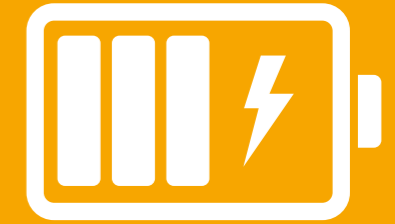
Are tires for electric vehicles complicated to develop?

The developers have a stronger focus on areas such as optimizing rolling resistance, tire wear and noise.



Can the battery be charged under braking?

Deceleration in urban traffic is a key factor in the energy recovery process in electric vehicles, in particular electric buses. Here, the electric motor acts as a generator and, driven by the deceleration of the vehicle, produces energy to charge the battery. Recovering energy via the wheels in this way is known as 'recuperation'.



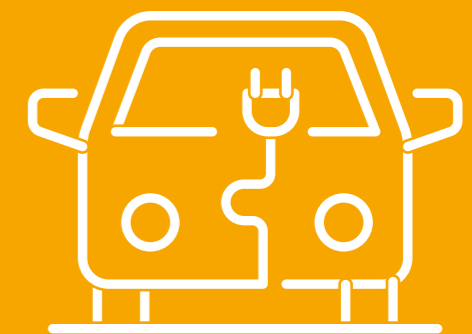
Some interesting listening material

Continental Tires podcast "Runde Sache" (available in German only)



What is different about tires for electric vehicles?

The tires have a higher load index due to the greater vehicle weight involved. Added to which, an electric motor generates maximum torque instantly, and the tires have to be capable of dealing with that.



Can tires help to save energy?

Yes. Energy consumption can be reduced by minimizing the tires' rolling resistance, for example, and ensuring they have good aerodynamic properties.



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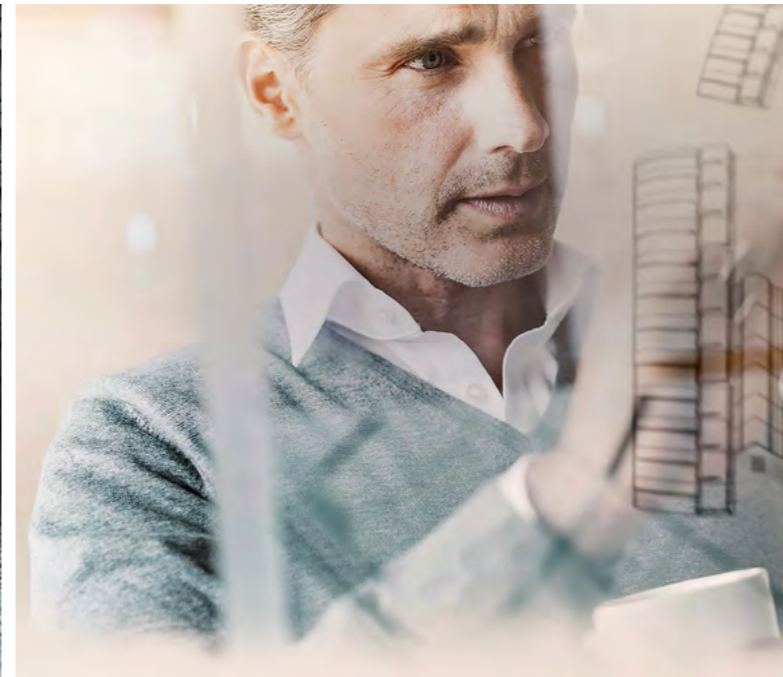
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Trend electric mobility

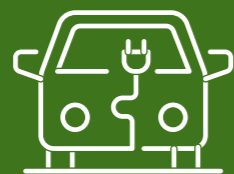
17.4 million electric cars worldwide

6.7 million electric cars were newly registered. According to one forecast, there will be 116 million electric vehicles on the world's roads in 2030.



Source: German Association of the Automotive Industry (VDA), April 2021

Share of new registrations



Germany: **14 %**
 Norway: **82 %**
 France: **11 %**
 Netherlands: **18 %**
 Sweden: **27 %**
 Iceland: **32 %**

” **In the fleet business, in particular, the pace of development will be more rapid in the future, as the focus on electric vehicles will gain even greater momentum.**

Ralf Benack, Director Business Field Fleet Solutions EMEA at Continental

One in **10**

cars in Europe has an electric drive system



Source: Trendbarometer Elektromobilität, BearingPoint 2021

Electric drive concepts



Battery-electric drive (BEV)



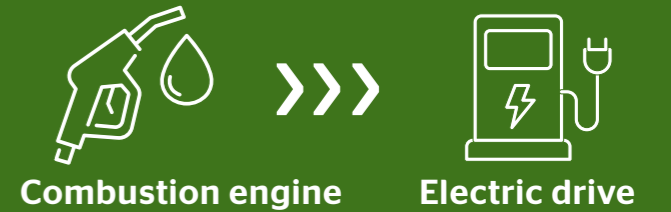
Plug-in hybrid drive (PHEV)



Fuel cell drive (FCEV)



LPG and natural gas systems



Source: ACEA 2023



of all urban buses in Europe run on an alternative drive system (2022).

Source: electrive.net

Leading the way for charging

Publicly accessible charging points in 2021



Netherlands **68,170**
 Germany **59,410**
 France **37,128**

Source: Statista

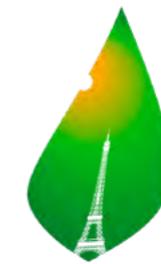


The Changing Face of Mobility

Mobility is undergoing a process of reinvention. Electric vehicles have become an important part of this process and now play a key role worldwide in developing climate-friendly and future-proof mobility. Electric vehicles produce less climate-impacting CO₂, especially when the contribution of electricity generated from renewable sources is factored in. Demand for electric vehicles is on a constant upward curve. Sustainable and safe electric cars and commercial vehicles require tires able to meet the challenges they present. To this end,

The Paris Climate Agreement, the German Sustainable Development Strategy based on the 2030 Agenda for Sustainable Development launched by the UN and the growing awareness in society of the importance of climate and resource protection have underlined the need for new mobility solutions. They have prompted industry and business to come up with fresh innovations and concepts. And governments worldwide have adopted measures to drive forward electric mobility. These include purchase grants, the expansion of the charging infrastructure and, in Germany, a public procurement program put in place by the Federal Ministry for Economic Affairs and Energy (BMWi).

In August 2021, the EU launched the “Fit For 55” package of measures heralding the phasing-out of internal combustion engines. Under the terms of “Fit For 55”, all vehicles newly registered in Europe should have zero carbon emissions by 2035. Some European countries – including Norway, the Netherlands and Denmark – have put in place even more ambitious targets and aim to reach this stage as early as 2025 or 2030. And VW, Fiat, Ford, Opel and other automakers have given specific phase-out dates. “A clear phase-out date will provide clarity to industry and consumers for the transition ahead, and ensure the EU stays at the forefront of global market uptake for electric vehicles,” says Philippe Vangeel, Secretary General of AVERE, the European Association for Electromobility.



PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

Paris Climate Agreement

The Paris Climate Agreement was concluded under the auspices of the United Nations (UNFCCC) with the aim of building on the climate protection measures in the Kyoto Protocol. The Agreement was signed by all the UNFCCC participating member states (at the time: 195 countries and the European Union) at the UN Climate Conference in Paris in 2015. Its goal is to keep man-made global warming to well within 2 °C above pre-industrial levels. The Paris Climate Agreement stipulates that greenhouse gas emissions should be reduced by 55 percent compared to 1990 levels by 2050. Transport accounts for a large proportion of that figure, but emissions from the transport sector have actually increased since 2010.

Representation in Brussels

The majority of EU countries are represented at AVERE, and Germany's Solar Mobility Association (BSM) is one of its members. Founded in 1978, AVERE is a network of around 1,000 end users, NGOs, associations, public institutions, research and development institutes, automakers and suppliers.

Electric Mobility Convinces



The upsurge in electric mobility continues worldwide. The positive user experiences, reliable technologies and growing pool of available models are winning people over. The incentives on offer and statutory requirements are also powerful factors.

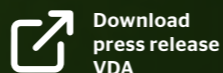
The trend to electric mobility among new car registrations continues unabated according to the German Association of the Automotive Industry (VDA). After around two million electrically powered vehicles were registered worldwide during both 2018 and 2019, the figure for 2021 shot up to 6.5 million. One in nine cars sold globally now has some form of electric drive system (BEV, PHEV or FCEV). All-electric BEV vehicles make up nearly 70 percent of these, with a total volume of 4.5 million units. Fuel-cell-powered vehicles (FCEV) play a very minor role with just 15,000 sold. The remainder are plug-in hybrids (PHEV).

The transformation is in full swing

This means the transformation from the internal combustion engine to the electric motor – vital to the achievement of the United Nations' ambitious climate goal – is well underway in the automotive industry. However, progress varies hugely across the different markets.

Global electric car market

The largest market for electric cars in 2021 by some margin was China, accounting for more than one in two of all electric cars sold worldwide with a total of 3.34 million units (year-on-year increase of 168%). Second in the sales list for 2021 was Germany with 681,900 newly registered electric cars (+73 percent). Three out of every ten electric cars sold in Europe were destined for the German market, where they achieved a share of 26.0 percent. This means that electrified cars are now more popular than diesels (including mild hybrids), which recorded a figure of 25.5 percent last year. Plug-in hybrids play a major role here with a share of 48 percent of all new registrations of electric cars. The USA was ranked third in 2021 with a volume of 607,100 electric light vehicles (+97 percent), taking a 4.1 percent slice of the market. Electric mobility does not have any great importance outside California, which is responsible for two in five of all electric car sales in the USA.



Zero-emission heavy-duty vehicles

“The draft law presented by the European Commission for regulating fleets of heavy-duty commercial vehicles is extremely ambitious in view of the charging and hydrogen infrastructure – which has unfortunately been inadequate up to now,” says VDA President Hildegard Müller. The new fleet targets mean that carbon emissions will be regulated for over 98 percent of heavy-duty vehicles from 2030, as opposed to 73 percent previously. According to the VDA, this would rightfully close the previous regulatory loophole.

The VDA believes the EU Commission is now setting very demanding goals by planning to reduce the fleet limit for 2040 by 90 percent compared to 2019. Tough intermediate targets have been laid down too of 45 percent by 2030 already and 65 percent for 2035. There is enormous potential for cutting carbon emissions with zero-emission heavy-duty vehicles – heavy trucks and buses are currently responsible for around one third of CO₂ emissions from road traffic. In 2021, there were 8.1 million commercial vehicles (over 3.5 t) and buses on Europe's roads (EU, EFTA & UK). This number is likely to increase to nearly ten million by 2030.

What matters now is getting everyone to put their heads together and think strategically about the set targets and the basic conditions required to meet them.

The manufacturers are making every effort to meet the demand for battery electric and hydrogen-powered trucks and buses. Between 2022 and 2026, companies from the German automotive industry are planning to invest a total of around €220 billion worldwide in research and development, mainly in electric mobility (including battery technology) and digitalization. A further €100 billion will be spent on modifying plants by 2030. “Tightening CO₂ limits alone won't enable the transition; it will just make it impossible to use trucks and buses with conventional drive systems,” warns Müller, going on to say that the commercial vehicle industry is very cost-sensitive as it is. Consequently, trucks and buses with zero carbon emissions will only begin to be added to fleets in large numbers once battery electric or hydrogen-powered vehicles become more profitable to run than vehicles with a conventional engine.



Tires for Electric Vehicles



**Higher weight
+
Instant torque = Greater loads
on the tires**

” Tires for electric vehicles and those for conventionally powered vehicles are essentially the same. However, electrification changes significantly the conditions in which the tires have to work.

Ralf Benack, Director Business Field Fleet Solutions EMEA at Continental

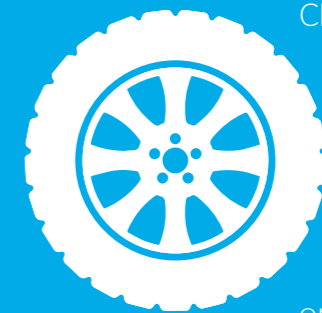


Not so quiet

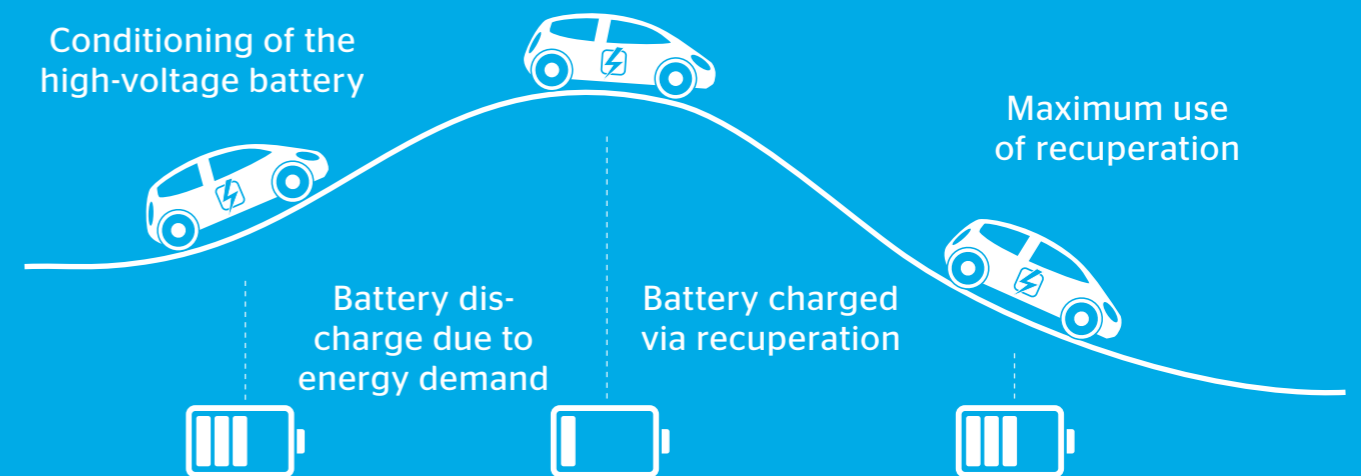
The lack of engine noise means those on board notice other sounds - including tire noise - more intensely.

Continental supplies its tires to **9 of the 10**

most successful electric vehicle manufacturers in the world



Changes need to be made to the **tire structure** and tire compound to ensure the tires meet the requirements of electric vehicles without compromising on mileage, safety or fuel efficiency.



Charging the battery under braking

Deceleration is a key factor in the energy recovery or 'recuperation' process in electric vehicles. Recovering energy via the wheels is known as 'recuperation'. Here, the electric motor acts as a generator and, driven by the deceleration of the vehicle, produces energy to charge the battery. This can lead to a marked increase in the vehicle's range. Compared to conventional brake management systems, this process of recuperation puts added strain on the drive axle tires.



Tires for Electric Cars

When it comes to tires, the same essentially applies for a highly efficient electric vehicle as for a low-emission combustion-engined vehicle: lower energy consumption equates to a higher level of sustainability - regardless of the type of drive system. With a combustion engine, this is reflected in lower fuel consumption and therefore lower emissions. For an electric vehicle, travelling further while using less power is the measure of particularly high sustainability.



Maximum torque

One of the characteristics that set electric drive systems apart is that they develop torque differently to a combustion engine. When an electric car pulls away, its tires have to transfer all of the torque produced by its drive system to the road instantly. The increased loads and higher torque generated by an electric vehicle can increase tire wear.

Heavier batteries

Most electric cars are around a third heavier than combustion-engined equivalents; for instance, a VW ID.3 has a curb weight of approximately 1.8 metric tons - which is really quite high compared with other models of its size. The reason for this is its still very heavy battery. A Golf VIII weighs on average 1.3 metric tons.

Low tire/road noise

For over a decade now, Continental has been refining its tires in order to keep bringing rolling resistance down while ensuring high mileages and low levels of tire/road noise. The tire manufacturer achieves this with a number of technologies whose benefits are particularly noticeable in the case of electric vehicles. These include ContiSilent, a solution that greatly reduces tire/road noise in the vehicle interior.

Higher load capacity

Electric vehicles need tires that have been designed to handle the higher loads involved. Continental manufactures the first passenger tire with the new "HL" load index code. Inflated to the same pressure, this tire has a higher load capacity than those built to the customary XL standard. The load capacity of this HL tire stands at 825 kg (load index 101), which equates to a 10 percent increase over the familiar XL standard of 750 kg (load index 98).

Optimized rolling resistance

The energy consumption of a vehicle can be reduced by minimizing rolling resistance. For example, cutting rolling resistance by 1 kg/t increases a vehicle's range by some 3-4 percent.




EV Marking for All Tires

All new tire lines brought out by Continental now have a logo on the sidewall to show they are EV compatible. The tire developers at Continental give careful consideration to the demands of electric mobility from the outset.

Fully electric models are available in all car segments today. The selection spans from micro-, compact and midsize cars through to SUVs and high-performance sports cars, some of which achieve ranges on a par with diesels. As with combustion-engined vehicles, every model requires its own specific tire configuration. As there is no one single tire universally suitable for all-electric vehicles, Continental has optimized its entire portfolio of tires for this type of drive system. The tire developers design all tires to have ideal characteristics for electric mobility, so the entire product range meets the requirements of electric vehicles. At the same time, the tires are also capable of bringing about a sustained reduction in emissions from cars with combustion engines. All vehicles basically benefit from technological advances in tire development, regardless of their drive system.



 [Download press release and images](#)





Range Versus Safety

In January 2021 Continental began production of the first passenger tires with the new HL load index code. Inflated to the same pressure, these tires have a higher load capacity than those built to the customary XL standard.

Products with the new maximum load capacity display the HL code ahead of the size, as in HL 245/40 R 19 101 Y XL. The load capacity of this HL tire stands at 825 kg (load index 101), which equates to a 10 percent increase over the familiar XL standard of 750 kg (load index 98). Passenger tires of this size built to the SL standard, adequate for many cars, up to and including mid-size models, can take a maximum load of 670 kg (load index 94). That makes the load capacity of the new HL tires almost one quarter higher.

The range versus safety debate

The ongoing wave of technological progress means the requirements placed on our products in the passenger car development process are constantly changing. The huge advances made in battery technology and the charging infrastructure will push the question of range - currently a hot topic - increasingly into the background.

New generations of batteries will enable ranges in excess of 1,000 kilometers. We are currently seeing

ever-increasing numbers of high-performance electric vehicles on the market, for which tires offering strong levels of safety at high speeds are in greater demand. All of which shines an even brighter spotlight on safety.

High load capacity

High load index (HL) for a higher load bearing capacity to handle increased weight of BEVs.

Interior noise

ContiSilent reduces the sound components of tire/road noise perceived as particularly annoying in the vehicle interior by up to 9 dB.

Mileage

New abrasion-resistant rubber compounds extend mileage. Supercomputer-based research collaborations to drive development even further.

Rolling resistance

Weight reduction, innovative compounds and specific tire designs can significantly reduce rolling resistance.

Extended mobility & functional integration

ContiSeal seals 80% of punctures, eliminating need for emergency tire changes. This decreases load and increases safety as well as available installation space for the battery.





Rolling resistance

Rolling resistance is one of the main fleet cost factors, accounting for as much as 30 percent of overall operating costs.

Tires for Electric Trucks

With electric mobility evolving at such a rapid pace, there is also a growing demand for suitable tires in the commercial vehicle segment. Manufacturers have been focusing their efforts on reducing CO₂ emissions ever since the EU regulation governing emissions came into force and the VECTO tool was introduced, if not before. Tires have a significant part to play here. While electrically powered commercial vehicles can be fitted with conventional tires for the time being, the new drive systems - and the new vehicle concepts some of them will be fitted in - will transform the requirement profiles for commercial vehicle tires.

Tires and CO₂

A fleet's carbon emissions are directly related to its energy consumption and the rolling resistance of its tires. Tires are therefore an important lever for sustainability, efficiency and green fleet management.

VECTO as a key driver

In August 2019, the EU regulation governing emissions came into force and the Vehicle Energy Consumption calculation Tool (VECTO) was introduced. According to this legislation, OEMs need to cut CO₂ emissions from vehicles covered by the regulation by 15 percent by 2025 and by 30 percent by 2030, compared in each case to the reference year of July 2019 - June 2020. These targets are the main drivers behind the development of electric trucks for zero-emission haulage.

Conti Urban

The Conti Urban is a bus tire with a higher load index developed by Continental specifically for electric buses on urban routes. The tire's higher load capacity makes allowance for the increased weight of electric buses. The Conti Urban HA3 315/60 R22.5 can support up to eight metric tons per axle. Continental engaged in a development partnership with Volvo Trucks as official tire supplier for the Volvo Concept Truck project back in 2016. The aim was to achieve a significant improvement in the transport efficiency of future trucks and also cut greenhouse gas emissions. At the 2018 IAA Commercial Vehicle Show, the tire manufacturer teamed up with MAN to present the Conti e.MotionPro concept tire, fitted to the MAN CiTE truck. This joint development work provided the launchpad for the development of tires for electric commercial vehicles.



Valuable collaborations

"Right now, we are acquiring useful experience for developing tires for electric trucks and buses through several collaborative ventures," relates Hinnerk Kaiser, Head of Tire Development at Continental. "Starting this year we are providing the tires for a Futuricum electric truck that is based on a Volvo FH and has been converted to electric drive by Designwerk Products AG. Parcel service DPD Switzerland is going to be using this 19t truck for regional Swiss transport. Together with our customers - commercial vehicle manufacturers and municipal bus operators - we are aiming to develop tires featuring the very latest technology for series-production electric vehicles."



Tires for Electric Buses

There is particularly strong demand for zero-emission electric fleets from municipalities and transport operators. The EU's revised 'Clean Vehicles Directive' from 2019 is one of the factors driving the switch to electric. This high demand and the rapid pace of progress in the electric mobility segment are feeding the need for suitable tires for electric buses. As a rule, the development cycle for a new tire from initial prototype to series production takes three to five years. Things are now set to get faster for electric bus tires.

Working together with partners

Continental follows the same philosophy for electric buses as with its passenger car tires: tires for new drive technologies and vehicle concepts are designed in close collaboration with partners, i.e. leading vehicle manufacturers. Everyone works together on multiple joint testing and development projects for a variety of uses and applications. Initial prototype tires are already undergoing intensive testing.

Shorter development cycle

When working on concept tires for electric buses, the developers at Continental are not restricted by what has gone before in previous generations of tires. That gives them the freedom to try out entirely new concepts and ideas. If these are successful, they are put into practice very quickly and the findings fed into the development of next-generation tires. This can shorten development times significantly, enabling Continental to react faster to market requirements.

Clean buses in Germany

In May 2021, the German Parliament passed a law that implemented the 'Clean Vehicles Directive'. The minimum targets for carbon reduction from using low- and zero-emission buses in local public transport in Germany are 45 percent by the end of 2025 and 65 percent by the end of 2030. At least half of these minimum targets for public transport buses will have to be met by procuring zero-emission vehicles. This means half the procured buses must emit less than 1 g of CO₂ per kilometer, such as is the case with electric or fuel-cell vehicles.

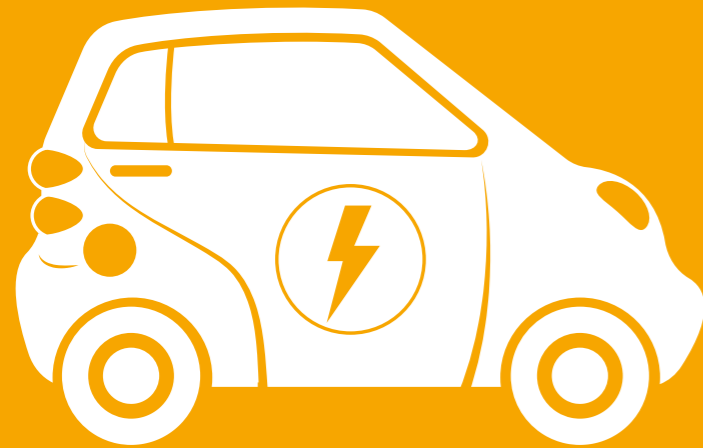
 More Info
"Clean Vehicle Directive" BMVI

A cleaner Europe

The EU's revised 'Clean Vehicles Directive' promotes clean mobility solutions in public procurement tenders, providing a solid boost to demand for and further deployment of low- and zero-emission vehicles in municipal fleets throughout Europe. The Directive defines "clean vehicles" and sets national targets for their public procurement. It applies to different means of public procurement, including purchase, leasing, rental and relevant services contracts. Adopted by the European Parliament and Council in June 2019, the Directive was intended to be transposed into national law by August 2, 2021.



Tire Development



The **EcoContact6** has a wear-resistant polymer compound which can withstand the higher drive forces generated by electric cars.

← Additional range can be added by fitting tires with **optimized rolling resistance**. ↓



EU regulations require a drastic cut in carbon emissions by **2030**. The right choice of tire is a key lever for truck manufacturers and fleet operators striving to meet these targets.

59 percent

of newly registered buses in Europe run on alternative drive systems.



HL for electric cars

When inflated to the same pressure, passenger car tires with the HL load index code have a higher load capacity than those built to the customary XL standard.



” One important consideration with regard to electric vehicles is the amount of noise produced by tires. When traveling at higher speeds especially, tire/road noise and turbulence become clearly audible.

Andreas Schlenke, tire developer at Continental

A Shift in Focus

Electric mobility is altering the focus of tire development. The challenge here lies in matching the tire characteristics to exacting requirements in terms of safety, handling, comfort and other aspects. In the race to find ideas offering the best possible solution, time is a key factor. The rapid pace of progress in the electric mobility segment means demand for suitable tires is on the rise.

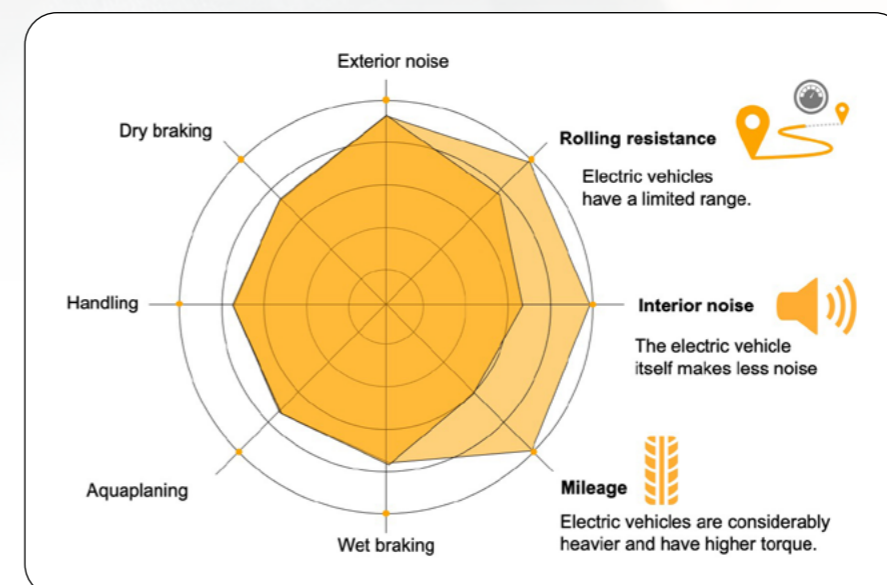
Electric vehicles are heavier than their combustion-engined counterparts. Consequently, their tires must be suitable for handling higher loads. Increasing the load capacity while at the same time meeting customer requirements calls for a number of changes in both the tire structure and the rubber compound.

Trade-offs

This involves expertly managing the trade-offs between conflicting objectives. As far as tire construction is concerned, the development team at Continental has reinforced the bead and enhanced the contour of the tire to reduce tire/road noise. The tread compound was optimized at the same time. This makes it possible to achieve low rolling resistance while still ensuring precision handling and keeping mileage at its customary high level.

The additional weight is absorbed by increasing the load-bearing capacity of the carcass, as indicated by the XL symbol on the sidewall of most tires. This does not mean, however, that every electric vehicle needs a tire with an XL marking - that depends on their actual weight.

In their efforts to reduce wear, the tire developers use belt constructions for components and are developing new tread materials. Rolling resistance can be improved by modifying the sidewall design of the carcass and using new tread or sidewall materials. And to optimize tire noise, changes are being made to tread geometry and the use of ContiSilent™ technology increased.



Trade-offs: battery electric vehicles (BEV) pose new challenges for tire development.

Rolling Resistance in the Spotlight

Investigations carried out by Continental show that tires account for as much as 20 percent of the total resistance acting on a vehicle. Consequently, customers can gain additional range by using tires with optimized rolling resistance. Low rolling resistance is a particularly sought-after quality for electric cars.

A tire based on a Continental EcoContact 6 (215/60 R17 96H) has achieved an energy efficiency exceeding the criteria for the EU tire label's A classification by some 17 percent. It has also been awarded the top A rating for grip in the wet. Reduction of rolling resistance and exceptionally high braking power represent conflicting objectives physically speaking, making the development work carried out by Continental's team of tire engineers and materials experts all the more remarkable. "Tire development is always a balancing act between conflicting technical objectives," explains Andreas Schlenke, tire

developer at Continental. "For example, a high rolling resistance can enhance safety, but also increase energy consumption. Our engineers' skill lies in improving both aspects at the same time."

The absence of engine noise means drivers of electric cars attach greater importance to low tire/road noise. Manufacturers of high-end vehicles offering a particularly high level of comfort therefore also look for ContiSilent™ technology when selecting tires. Here, a special layer of foam absorbs the vibrations from the road, reducing the transmission of noise into the vehicle interior. This is particularly important for electric vehicles as there is virtually no noise from their electric motor.

Rolling resistance can be defined as the amount of energy a tire uses over a defined distance. It is one of five forces - along with climbing resistance, aerodynamic drag, inertia and mechanical friction - that must be overcome for a vehicle to move forward. There are a number of factors that affect rolling

resistance: the design, bead, belt, sidewall, tread and inflation pressure of the tire itself, as well as the vehicle's load and how it is distributed, the road surface conditions and the weather.

The rolling resistance and aerodynamic efficiency of the tires affect the energy consumption of a vehicle. Lower energy consumption equates to greater sustainability - regardless of the type of drive system. In combustion-engined vehicles, this is reflected in lower fuel consumption and, by extension, lower CO₂ emissions; in electric vehicles, it means better energy efficiency and therefore greater range. Reducing rolling resistance by 1 kg/t would increase an electric vehicle's range by some three to four percent. This is why tire developers have been placing particular emphasis on continually reducing rolling resistance for many years now.



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and images

Standard for fuel and energy consumption

Energy efficiency is likewise an important consideration for vehicle manufacturers and, consequently, the OE tire business, as it enables them to bring down the CO₂ emissions of their vehicle fleets. This is measured using the WLTP (Worldwide Harmonized Light Vehicles Test Procedure) method, a global standard indicating a vehicle's fuel and energy consumption.

Comfort-enhancing Silence

 More Info
ContiSilent

One important consideration with regard to electric vehicles is the amount of noise produced by the tires. When traveling at higher speeds especially, tire/road noise and turbulence become clearly audible. Due to the lack of noise from the drive system, all other sounds (including tire noise) are much more noticeable. Without the sound generated by a combustion engine, tire noise can suddenly become annoying – hence the need to reduce it. The problem is that high load requirements call for tires with a larger cavity. The resonance inside the cavity is therefore also greater, and so noise levels are generally higher. And this is the quandary facing developers: designing a tire to meet the load requirements makes it louder.

Tough public transport roles

Developing tires for electric buses used in local public transport is particularly challenging from a technical standpoint. As is often the case in electric vehicles, such tires are exposed to higher torque when moving off and accelerating. And in downtown traffic, buses are constantly having to stop and pull away again.

This is also exactly where vehicles need to run quietly to ensure tire noise does not spoil the hushed comfort of electric drive. On top of this, there is the recuperation process during vehicle deceleration that forms a key element of energy recovery. As a result, tires for electric buses have to withstand different loads than their counterparts on buses with combustion engines. Yet they also need to offer the same long lifespan and meet the same high safety standards as tires for buses with conventional drive systems. The conflicts between different objectives – particularly mileage and braking/handling performance – pose a demanding technical challenge.

Quieter thanks to ContiSilent

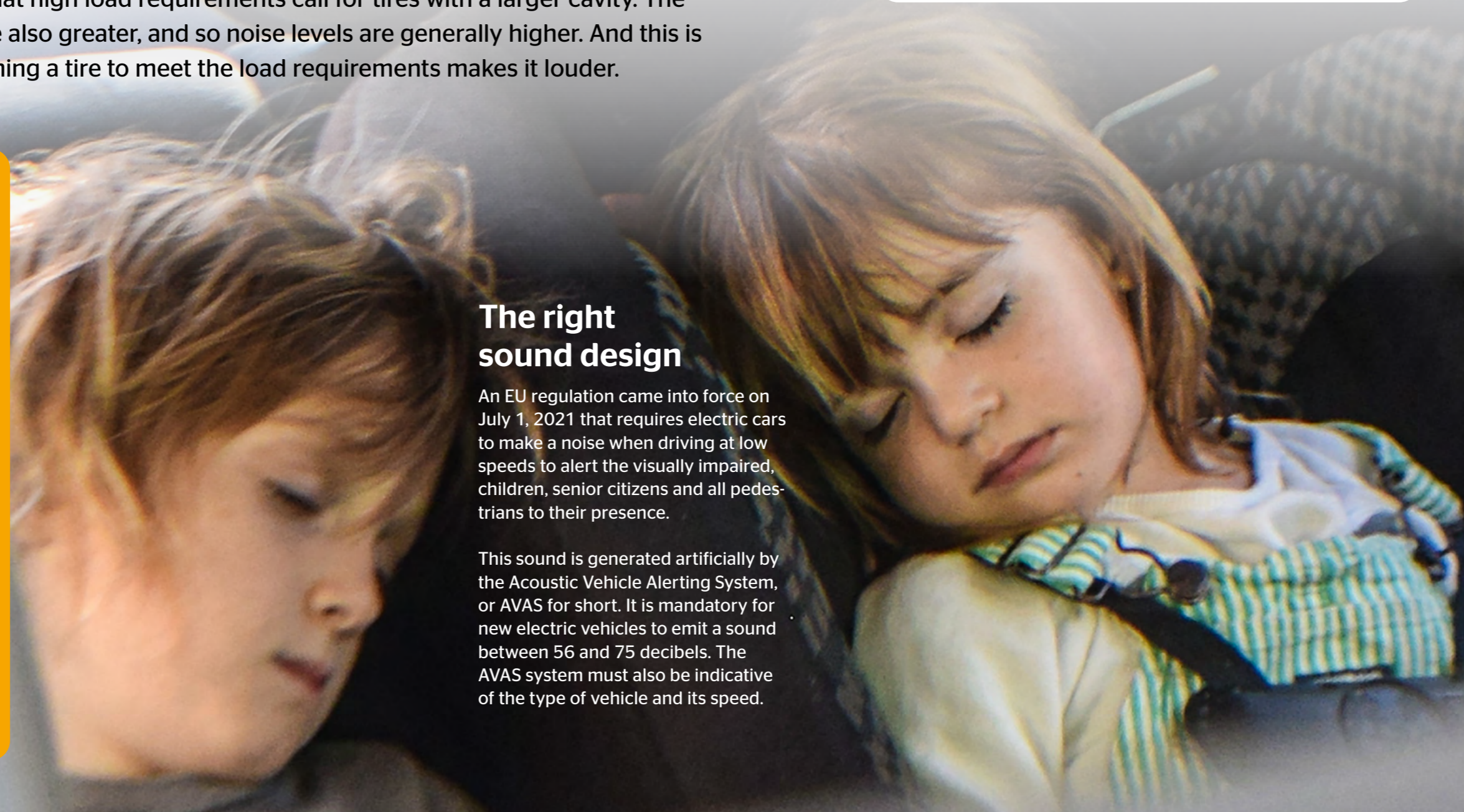
One technology that helps prevent tire noise reaching the cabin is ContiSilent, which was developed for car tires back in 2016. Here, a special layer of polyurethane foam is bound to the inner surface of the tire tread to absorb tire cavity noise and prevent it being transmitted via the vehicle body, meaning road noise cannot reach the vehicle's interior through the tire. The foam prevents vibrations from the road being transferred via the tire to the wheel and axle, and from there to the cabin, so reducing the level of road noise inside the car.



The right sound design

An EU regulation came into force on July 1, 2021 that requires electric cars to make a noise when driving at low speeds to alert the visually impaired, children, senior citizens and all pedestrians to their presence.

This sound is generated artificially by the Acoustic Vehicle Alerting System, or AVAS for short. It is mandatory for new electric vehicles to emit a sound between 56 and 75 decibels. The AVAS system must also be indicative of the type of vehicle and its speed.



Increased Weight, Same Lifespan

Electric vehicles are heavier by design due to their batteries. This is true of passenger cars, trucks and buses, with an electric car weighing around a third more than a combustion-engined equivalent. This means that electric vehicles must be fitted with purpose-developed tires designed to handle the higher loads. Continental is manufacturing the first passenger tires with the new “HL” load index code. Inflated to the same pressure, these tires have a higher load capacity than those built to the customary “XL” standard.

Tires for electric vehicles have to support a heavier load, resulting in increased tire wear, so they are designed with thicker sidewalls and more robust rubber compounds. The rubber compound has to offer not just good adhesion and low rolling resistance, but also maximum robustness.

Tire manufacturers such as Continental are seeking to not only reduce the energy consumption of vehicles, but also offer a product with a high level of sustainability throughout its lifecycle. Along with investment in sustainable raw materials and produc-

tion processes, this also involves designing tires to have lower rolling resistance and an exceptionally long lifespan. Excellent durability and low wear are therefore crucial qualities for tires. The tire development experts at Continental were quick to recognize the importance of lifespan and rolling resistance. That is why the product range has been designed to help all vehicles run efficiently - irrespective of the type of drive system.

Boosting Efficiency with Digital Tire Management

As well as helping to optimize the handling dynamics and driving characteristics of electric vehicles, the tires themselves will increasingly act as sensors within the vehicle architecture to assist connected and automated driving. In future, data generated by tire sensors and communicated autonomously, such as tire pressure, temperature, wheel load, tread depth, wheel speed, wheel slip and structural damage, will serve to enhance handling properties and improve road safety. Future sensors will also be capable of measuring and relaying parameters such as road surface and weather conditions and the tire's rolling circumference.

Evaluation of such data paves the way for **predictive maintenance** and for packaging a variety of services. This in turn makes for more efficient fleet management and lower operating costs. On a wider scale, companies using these tires are also playing their part in achieving Vision Zero by avoiding accidents due to tire damage.



All-seeing fleet management

In 2020 Continental launched ContiConnect™ Live, the next-generation digital solution for tire monitoring designed to complement ContiPressureCheck™ and ContiConnect™ Yard. The system sends the tire pressure and temperature data it gathers to the cloud in real time by means of a central telematics unit. The unit additionally transmits the vehicle's location using GPS and records the operating hours of the tires. This provides fleet managers with a quick and convenient overview of the condition of their vehicles regardless of location. By evaluating the information, the fleet benefits from reduced downtimes, lower maintenance costs and an extended service life. ContiConnect™ Live is available for all special tires from Continental equipped with sensor technology.

RFID

In 2020, Continental supplied the first OE passenger car tires fitted with RFID (Radio Frequency Identification) technology. A special device can be used to read the transponder in the tire. This transponder contains information required for the tire's correct fitting and identification on the customer's assembly line. The complete wheel can then be tracked through the downstream manufacturing and logistics processes until it is mounted on the correct vehicle. In this way, Continental is aiming to safeguard the high quality of OE tires for Swedish automaker Volvo Cars - including after the tires have been delivered to the assembly facility - and also prepare the groundwork for future OEM collaboration within the connected manufacturing ecosystem of Industry 4.0. Tires featuring the RFID technology, such as the EcoContact 6, are fitted to models from Volvo Cars.





World premiere

Conti GreenConcept: Sustainable, Lightweight, Efficient

Continental unveiled its innovative Conti GreenConcept for passenger car tires at the IAA MOBILITY show in 2021. The sustainable tire concept seeks to minimize resource consumption throughout the tire's value chain: from the sourcing and procurement of raw materials through production to ways of extending the tire's useful life.

The Conti GreenConcept encompasses a three-pronged approach: a particularly high percentage of traceable renewable and recycled materials, an innovative, lightweight design that conserves valuable resources and a renewable tread that extends service life. "The Conti GreenConcept underscores our commitment to becoming the most progressive tire company in terms of environmental and social responsibility by the year 2030, and this ambition applies to every single link

in the value chain," comments David O'Donnell, responsible for Continental's global original equipment tire business, adding: "The way we see it today, sustainably sourced raw materials, lightweight design and tread renewal are the key ingredients for making future generations of tires more sustainable. Our concept study exemplifies Continental's ongoing efforts to fully transition its global tire production to sustainable materials."

Facts & figures

- ✓ 35 percent renewable raw materials
- ✓ 17 percent recycled materials
- ✓ COKOON bonding agent technology
- ✓ Tire's lightweight design makes it up to 40 percent lighter
- ✓ Tread with reduced rolling resistance - around 25 percent lower than class "A"
- ✓ Range increased by up to six percent
- ✓ Natural rubber in the tread compound is 100 percent Taraxagum natural rubber

Extreme E

” It’s a sport which we can use to showcase electric vehicles and motivate people to rethink their views on the consequences of climate change.

Mikaela Ahlin-Kottulinsky, racing driver

MOIA

” We developed the **VanContact-4Season** tire for the MOIA vehicle in line with Volkswagen’s requirements.

Annika Lorenz, Head of Fleet Business Germany at Continental

Transport operator Verkehrsbetriebe Hamburg-Holstein (VHH)

” **Field tests** like the one with VHH in Hamburg are a source of very valuable experience for us because they help us develop our tire lines to meet the needs of the new electric buses and trucks.

Hinnerk Kaiser, Head of Tire Development at Continental

SHARE NOW

” Our **pilot project** with **SHARE NOW** offers another glimpse into the future of Continental’s smart, digital tire solutions.

Tansu Isik, Head of Business Development and Global Marketing at Continental Tires

ID.4

” **Emission-free vehicles**

are the future of mobility. Groundbreaking technologies from Continental have a key role to play here, as our contributions to the ID.4 demonstrate to impressive effect.

Dr. Ariane Reinhart, Member of the Continental Executive Board responsible for Sustainability and Human Relations

Futuricum

” For years now, **Continental** has been focusing on the development of products designed to help fleet operators reduce emissions from commercial vehicles. We are delighted to have the opportunity to be involved in the exciting Futuricum project with our products.”

Andreas Schlenke, tire developer at Continental

VDL

” When working on this **concept tire** for VDL buses, our development work is not restricted by what has gone before in previous generations of tires.

Michael Koch, tire developer at Continental

Pilot Projects and Collaborations



” I want to be the first female world champion, in an e-car series.

Mikaela Ahlin-Kottulinsky, racing driver

Swedish racing star **Mikaela Ahlin-Kottulinsky** is a Continental test driver and brand ambassador. She is part of the Drivers' Programme in the Extreme E electric off-road racing series and was involved in the development of the new CrossContact Extreme E high-speed tire. Continental is a founding partner and, as of 2021, premium sponsor of Extreme E, as well as being the official tire supplier. The technology company equips all vehicles competing in the races with tires designed for the richly varied and extremely demanding events.

Extreme E is more than just another motor sport. “It’s a sport which we can use to showcase electric vehicles and motivate people to rethink their views on the consequences of climate change,” says Ahlin-Kottulinsky. “If we can make this racing series exciting, innovative and interesting to follow, the willingness to make big and small changes will grow - for the benefit of our world and everyone on the planet.”



” The VanContact 4Season is an all-season tire with low rolling resistance for greater energy efficiency, which also delivers good braking performance on wet and slippery roads, maximum ride quality and top-class safety.

Annika Lorenz, Head of Fleet Business Germany at Continental



Tire breakdown service 365 days a year

Continental and MOIA are joining forces to help deliver the sustainable mobility of the future. The premium tire manufacturer is supporting MOIA, a ride-sharing company in the German cities of Hamburg and Hanover, by providing tires and services as part of the Conti360° Fleet Solutions mileage contract. Together with its service partner Vergölst, Continental will take care of tire performance and breakdown service, having successfully transferred its established 360° Fleet Solutions approach from the commercial vehicle sector to MOIA's new and innovative mobility concept. The combination of the all-season tire specially developed for MOIA and the Conti360° Fleet Solutions concept enables the mobility provider to ensure even greater safety, while the 24-hour tire breakdown service will greatly boost the efficiency of its fleet. With its professional all-round tire service, Continental also guarantees that tire pressures are monitored and that the tires of MOIA's EV fleet are kept in top technical condition. This makes optimum use of tire service life, conserves resources and reduces the drain on the battery.

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“Our technologies also now play a crucial role in increasing the efficiency of electric trucks.

*Andreas Schlenke,
tire developer at Continental*

zero emissions

Continental provides the tires for all electric trucks from Designwerk. Tires from Continental's Eco product line have been approved for the vehicle's front, drive and trailer axles. Parcel service DPD Switzerland will deploy this 19t truck for regional Swiss transport. Together, the three companies are pioneering eco-friendly transport solutions for heavy-duty trucks too. Continental has been focusing on the development of products designed to help fleet operators reduce emissions from commercial vehicles for many years. These technologies also now play a crucial role in increasing the efficiency of electric trucks. The truck tires, with their striking design, form part of the EcoRegional range. In addition to low rolling resistance and high mileage, they are also designed for short braking distances and low tire/road noise - two further important qualities for sustainable transport.

In fall 2021, an electric truck fitted with Continental EfficientPro tires set a new world record for range after covering 1,099 kilometers on a single charge.

 Download
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images DPD-E-Truck

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The electrification of urban delivery vehicles has huge potential. Using electric trucks for delivery work is helping to bring about a substantial reduction in CO₂ emissions and noise pollution in downtown areas. However, before fleets of electric vehicles can operate, certain elements must first be in place - a new charging infrastructure, for example, as well as different power networks, operating procedures and, last but not least, the right tires. So as the tire developers at Continental take the company's range of products for the electric mobility segment forward, they have been looking closely at their customers' needs. The company has been involved in field trials of electric trucks for several years now, in the process collecting information for a commercial vehicle tire specially adapted to vehicles with electric drive. The robust Conti Hybrid tire for regional applications is currently racking up the miles.

In late 2018, the Stiegl brewery in Austria added an electric truck from MAN to its fleet. Since then, its Conti Hybrid HS3 and HD3 tires have covered more than 23,000 kilometers. The truck is on the road eight hours a day in downtown Salzburg and within an approximately 50-kilometer radius of the city. "The Continental tires perform exceptionally well in all driving situations," reports Stiegl driver Dominik Lackner. "It's great to be able to rely on so much grip, not least when pulling away."



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” This new drive system
has prompted us to come
up with fresh development
concepts.

Hinnerk Kaiser, Head of Tire Development at Continental



” Developing tires for electric urban buses is particularly demanding in technical terms.

Hinnerk Kaiser, Head of Tire Development at Continental

For local transport operators Hamburg-Holstein GmbH (VHH), future-proof mobility is all about delivering sustainable mass transit for the greater Hamburg region. That's why, in 2020 VHH switched to procuring exclusively zero-emission vehicles for its bus fleet. The plan is to convert the entire fleet to zero-emission drivetrains between now and the 2030s. Support has come from commercial vehicle manufacturer MAN and its fully electric Lion's City bus. The electric motor in this 12-meter bus is mounted on the rear axle. The energy is provided by battery modules with an installed capacity of 480 kWh.

To ensure that its tires are a match for the weight of the batteries and the vehicle itself, the electric MAN Lion's City buses in Hamburg run on the Conti Urban HA3. The tire developers at Continental have stepped up the load capacity of this tire, specifically to cater to the requirements of electric mobility. This increase in the load index is just one of several criteria that need taking into account when developing tire concepts for electric vehicles. For several years now, Continental has been acquiring valuable experience in real-world tests, like the one with MAN. Given strong demand from municipalities and local transport operators for zero-emission electric fleets, and the rapid pace of progress in the electric mobility segment, demand for suitable tires is also on the increase.

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” With tires for electric urban buses there are other considerations involved, above and beyond those we experienced in previous EV projects.

Michael Koch, product development truck tires at Continental

Automakers and commercial vehicle manufacturers are not alone in having to change their processes in response to electric mobility. Tire manufacturers too need to come up with new development concepts to accommodate this new form of propulsion. One particularly demanding field in technological terms is the development of tires for electric urban buses. In response, at the end of 2020, Continental and VDL Bus & Coach – a leading manufacturer of electric buses – entered into a development partnership, pooled their expertise, and jointly developed initial prototype tires. These were then tested at Continental’s Contidrom proving grounds. VDL Bus & Coach launched its first electric Citea urban bus back in 2013. Since then, electric buses from VDL have covered more than 75 million kilometers in various European cities, reducing CO₂ emissions by 11 million metric tons. As in all electric vehicles, the tires are exposed to higher torque when these buses pull away and accelerate. At the same time, the deceleration of electric buses in urban traffic is a key factor in the energy recovery or ‘recuperation’ process.

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” With this pilot project we are the first in the market to offer significantly accurate tread depth monitoring via an algorithm. Our accuracy of within one millimeter has set an industry benchmark for smart digital tire solutions.

Tansu Isik, Head of Business Development and Global Marketing, Continental Tires




Towards the end of 2020, in a pilot project involving electric vehicles from carsharing provider SHARE NOW Denmark, Continental successfully demonstrated real-time tire tread depth monitoring. In cooperation with telemetry specialist Traffilog, the premium tire manufacturer connected information from tire sensors and telemetry data from the fleet's cars with a proprietary algorithm in the cloud. This enables Continental to assess tire tread depth in real time to within one millimeter. In the future, smart digital tire solutions like this will be a key driver in enabling need-based tire servicing, instead of regular, scheduled service stops.

” It is important to ensure that emission-free mobility is absolutely sustainable from the start.

Dr. Ariane Reinhart, Member of the Continental Executive Board responsible for Sustainability and Human Relations



Continental supplies key technologies for the Volkswagen ID.4. Almost all systems and functions of the new electric “world car” contain ideas, systems and solutions from Continental. As was the case with the ID.3, this e-SUV marks a decisive step forward for Continental in an era when the “e” in e-mobility stands not only for “electric” but for “emission-free” as well. With its system solutions and products, Continental is already ideally prepared to meet the special requirements of emission-free vehicles and has no need to start from scratch. By way of example, the company ranks among the global technology leaders in areas such as state-of-the-art tires and connectivity solutions – not least for electric vehicles.

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