

BRAKING NEWS



INNOVATIVE TRAILER

Reducing a fleet's carbon footprint

TRUCK GRAND PRIX HIGHLIGHTS

Jochen Hahn unveils first electric race truck and wins comeback victory

KNORR-BREMSE ITEBS® X

The next generation of Trailer EBS

EDITION
62

September 2023 – the Customer Magazine
of Knorr-Bremse
Systeme für Nutzfahrzeuge GmbH



KNORR-BREMSE

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Head of Aftermarket/TruckServices EMEA
at Knorr-Bremse Commercial Vehicle Systems

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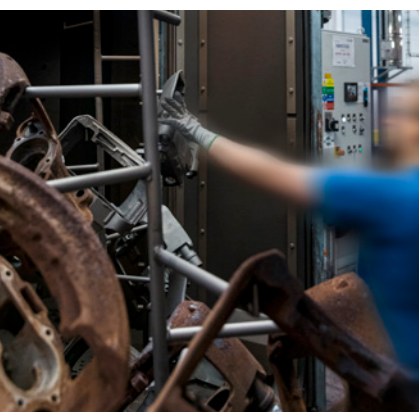
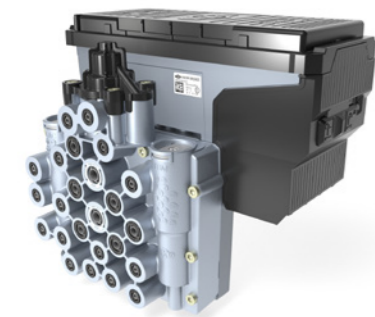
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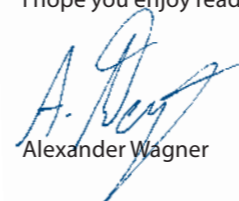
Dear reader,

In the spectacular fourth race of this year's Truck Grand Prix at the Nürburgring, our partner Jochen Hahn topped the podium in front of 130,000 spectators. Congratulations on a great performance! In the supporting events program, the Knorr-Bremse Go & Stop race produced thrilling duels between amateurs and professionals. Despite the typically mixed weather at the Eifel race track, the event was a real highlight in the motorsports calendar. In both disciplines, it was clear that the brakes are the difference between winning and losing. For us, this is more than a nice demonstration of our products' performance. By exposing our series parts to the higher stresses encountered on the race track, we gain information about their robustness and valuable insights to help us develop cutting-edge technology. And it's not just about improving safety. In Misano and at the Nürburgring, Team Hahn Racing for the first time unveiled an electric prototype. Beneath its spectacular exterior, this vehicle benefits hugely from the know-how of Knorr-Bremse engineers. They know that brakes win trophies and will continue to do so in the future. On page 12, the six-time European champion speaks about the positive emotions that the eRacer will bring with its breathtaking driving performance. This will help to further drive electrification of commercial vehicles on our roads.

Planning for the future calls for a solid platform, as shown by our Lisieux facility in Normandy. This year marks the 30th anniversary of this Knorr-Bremse site. Happy birthday! The impressive product range of over 200 models already includes two special designs for electric vehicles, both of which are experiencing high demand.

Trailer manufacturers know that their customers make most of their money from the trailers in their fleet. This is another area where electrification is becoming increasingly common. But particularly strong innovations continue to be made in the trailer EBS market. This is demonstrated in our cover story, which describes the features of Knorr-Bremse's iTEBS® X, a unique, highly-integrated system that can be affordably adapted to a wide range of requirements. With its electric and pneumatic control elements, this system is a genuine all-rounder for safety, efficiency and comfort. Learn all about this state-of-the-art technology on page 20.

I hope you enjoy reading this edition – and find some useful information, too!


Alexander Wagner



ALEXANDER WAGNER,
Head of Aftermarket/TruckServices EMEA at
Knorr-Bremse Commercial Vehicle Systems

Compressor production

At its Lisieux facility in Normandy, Knorr-Bremse draws on 50 years of development know-how to produce air compressors for conventional and electric drive systems. There is huge demand for the diverse product range of over 200 models. The Lisieux team produced more than 400,000 units in 2022 alone. That's 2,000 units a day! This year marks the facility's 30th anniversary. Happy Birthday!



1 Honing

Lisieux has three machines for honing the crankcases. Once this step has been completed, they are cleaned in a washing and drying station. A robot transports the heavy, cast-iron crankcases between stations.



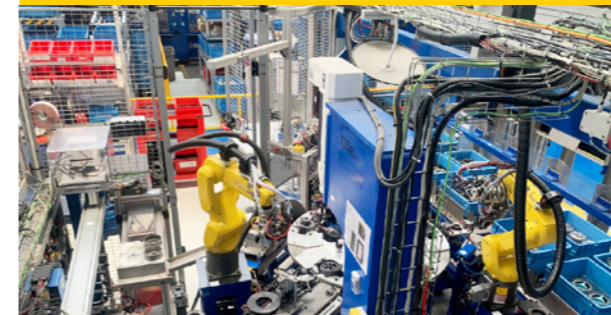
2a Semi-automated compressor assembly

Members of the Lisieux team assemble the compressors on two semi-automated production lines. Individual components and subassemblies that have previously been prepared at special stations are brought to these lines for processing. First, the production line workers complete the module comprising the crankcase, crankshaft and rear cover. They then mount the pistons, connecting rod and sump plate and assemble the valve plate and cylinder head. At the end of the line, the finished product is tested and packed.



2b Automated compressor assembly

In addition to the two semi-automated lines, the Knorr-Bremse facility also has one fully automated production lines where the compressors are assembled by a pair of robots. The different steps are exactly the same as on the semi-automated lines – but only the packing step is performed manually.



3 Clutch pack assembly

Developed by the Lisieux R&D team, the High Torque Clutch (HTC) is a best-in-class energy-saving system for compressors. It saves energy and prevents unnecessary wear by disconnecting the compressor from the drive during idling. The HTC is also assembled and tested on a fully automated line. Knorr-Bremse produced more than 100,000 clutch packs last year and is planning on over 150,000 next year.



4 Integrating the clutch and compressor

Once the compressors and clutches have been assembled on semi-automated or fully automated lines, they are integrated into a single unit. The full system's functionality is then tested at another semi-automated station.



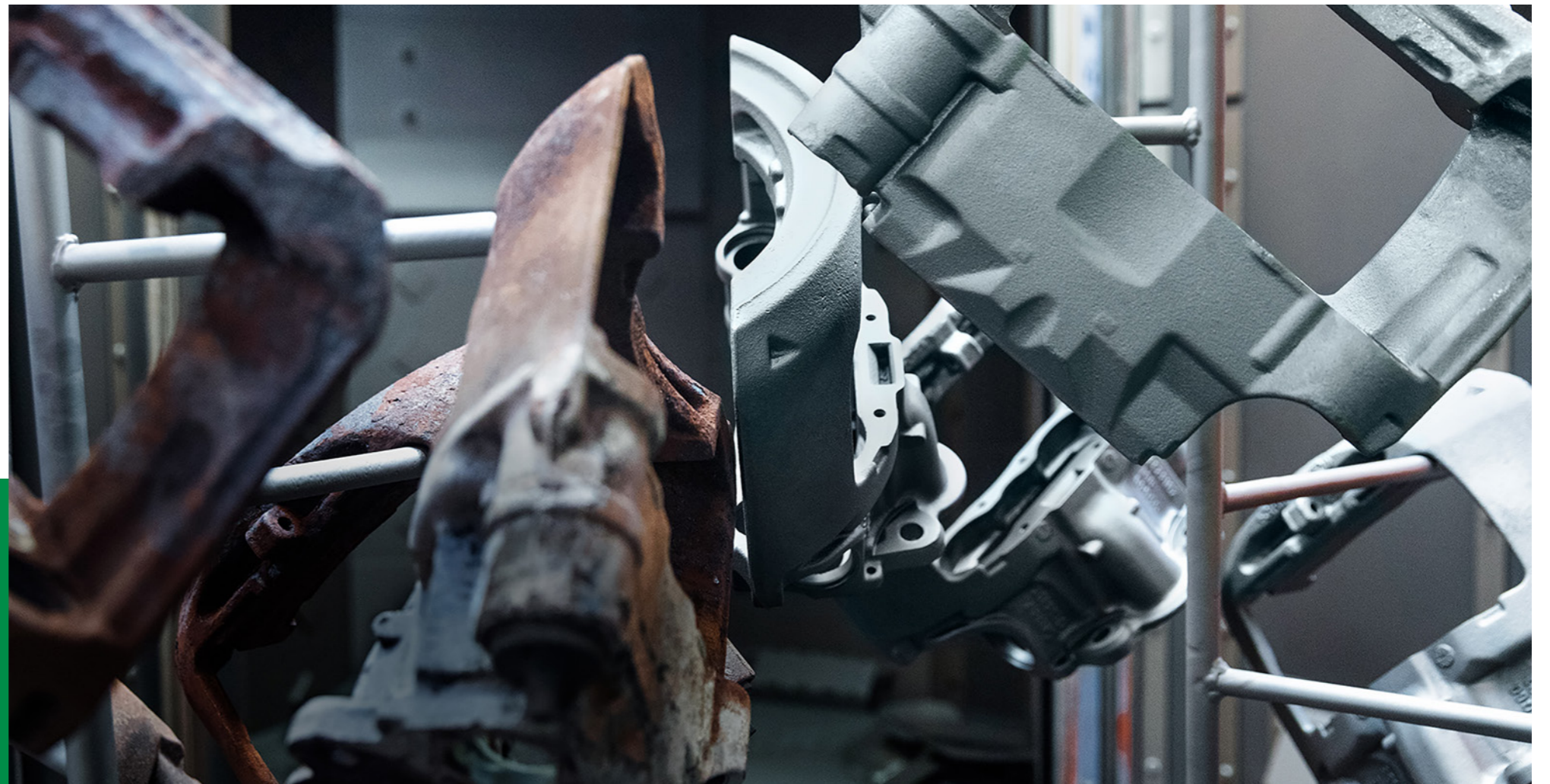
5 E-compressor assembly

Electric vehicles require special, very low-noise, electrically-powered compressors. Knorr-Bremse's Lisieux facility has developed two models for this steadily growing market: a screw compressor for applications with high air demand and a rotary vane compressor for vehicles with lower air demand. The electrically powered compressors are still assembled manually, but due to the rising volumes this will happen on an automated line from 2025 on. The assembly happens in five key stages. First, the compressors are assembled, followed by the oil separator and electric motor. Once they reach the end of the line, the e-compressors undergo functional testing before being packed.

An economical solution

Giving braking systems a new lease of life

Patented processes, rigorous quality assurance and state-of-the-art machinery ensure the functionality and safety of the EconX® products from the Liberec remanufacturing facility.



No matter how old their fleet is, commercial vehicle operators expect spare part functionality and safety to be just as good as new service products. But the cost of repairs must also reflect the vehicle's current market value. Knorr-Bremse's EconX® products meet these challenging requirements. Since 2015, they have been made at the Company's Liberec remanufacturing site in the Czech Republic. The 12,000 square meter facility uses patented cleaning and testing procedures and state-of-the-art machinery to recondition parts to OE product standards.

Used parts are returned by our customers using the established core deposit system to Liberec, where specially trained workers check the returned components, known as "cores", for wear, damage and design condition. The materials from cores that no longer meet the required quality standard are recycled. The remaining cores are now ready for remanufacturing. The first step is to disassemble each core into its component parts. A two-channel pressure control module can have as many as 80 of these. Each part is individually rechecked and cleaned, with any worn parts being rejected. Knorr-Bremse uses thermal, chemical, mechanical and combined cleaning processes to remove all traces of dirt. These include spray washing systems, chamber washing systems, pyrolysis

installations for removing old paint, blasting units employing different media, and ultrasonic baths.

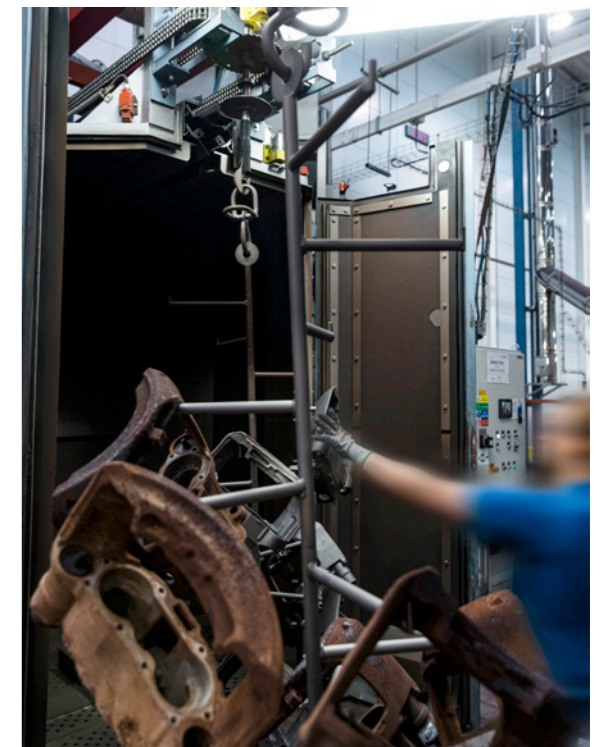
Some parts are reconditioned before reassembly. Compressor crankcases, for example, need to be honed and resized in order to keep oil emissions to a minimum during their second life, too. Defective electronic components must also be replaced and resoldered, and software updates installed. Reassembly follows similar processes to the production of new products – and in some cases is even carried out on the same assembly lines. End-of-line testing for each product forms a key part of the quality assurance process. This can involve more than 90 individual testing and measurement steps for some parts.

The EconX® range now comprises over 1,000 products. It includes key components such as caliper units, EBS components, electronic air treatment units, compressors, desiccant and oil separator cartridges and clutch actua-

tors for trucks, buses and trailers – all in the EconX® range's characteristic blue packaging. And more products are being added all the time.

Knorr-Bremse's EconX® products offer two key benefits. As well as being attractively priced, remanufactured products are also extremely sustainable. Remanufacturing uses significantly less energy and fewer resources than manufacturing new products. By lowering its own carbon footprint and that of all the transport fleets that use its products, remanufacturing brings Knorr-Bremse one step closer to achieving circularity. In 2022, Knorr-Bremse saved approximately 2,000 tons of CO2 by reconditioning used parts.

IN THE WASHING CHAMBER the brake calipers are suspended and sprayed with stainless steel particles to remove stubborn dirt.



Comeback Sunday

More than 130,000 fervent fans cheered on the truck racers at the Nürburgring Truck Grand Prix. At first, it seemed that Norbert Kiss would sweep the board at the Ring, too. But in the final race, at least, it was one of his rivals who topped the podium.



JOCHEN HAHN TAKES FIRST PLACE AHEAD OF NORBERT KISS AND JAMIE ANDERSON: After a battle of titans, Jochen Hahn tops the podium in the final race.



In the first race, the local favorites were quick to show Hungary's Norbert Kiss he wasn't going to have it all his own way. Sascha Lenz put Kiss under pressure from the off and even edged ahead of him in the Mercedes Arena. But at the Kurzanbindung (short-cut) U-turn, the two adversaries ran out of track. Lenz collided with Jamie Anderson and was forced off wide into the gravel trap. Jochen Hahn took advantage of the chaos to move up from fourth to second. The U-turn was also a fateful moment for Mark Taylor, who overshot spectacularly, plowing through the gravel trap.

While Norbert Kiss consolidated his lead, things were heating up further down the field. About halfway through the race, Lukas Hahn was hot on Steffi Halm's tail and made his first attempt to pass her in the start-finish straight. Then, on lap six, a murmur ran through the crowd as Lukas Hahn momentarily thrust past Steffi Halm, while Sascha Lenz finally caught and passed André Kursim. But at the end of the first race, the podium places eventually went to Norbert Kiss, Jochen Hahn and Antonio Albacete.

Eifel weather and yellow flag

Conditions took a turn for the worse at the start of the second race. True to form, the rain came down at the Eifel race track, forcing the race to start under a yellow flag as a safety precaution. André Kursim and Lukas Hahn were on the front row of the grid for the second race: the rules state that the seventh and eighth placed drivers in the first race start the second race in the first two grid positions. While Kursim forged into the lead, Lukas Hahn was overtaken first by Steffi Halm and shortly after by Sascha Lenz. By lap two, Norbert Kiss had already closed in on Hahn junior and wasted no time in overtaking him.

The leading trio of Kursim, Lenz and Halm were engaged in a fierce battle for the podium places. Sascha Lenz launched an attack at the end of the start-finish straight and took the Iveco drivers on the outside in the Mercedes Arena. But suddenly, there was Kiss again. After reeling in Kursim and Halm, he passed them in an audacious maneuver on bends 7 and 8. And he had already closed the gap on Lenz by the finishing straight. Once again, the Hungarian was in a league of his own. He hit the front before the Kurzanbindung U-turn and half a lap later had already built up a 2.3 second lead.

A chaotic race in the rain

At the end of a gripping few minutes, there was a surprise at the other end of the leaderboard. On the first bend after the start-finish straight, Jochen Hahn went too wide and ended up in last place. It was as if the old pro was driving on eggshells. As he said after the race: "My head wasn't clear. You need a clear head as a driver, or you won't get the result you're looking for". Another flag, this time a red one, brought a chaotic race to an

end after an accident on lap nine. This time, the top three places went to Norbert Kiss, Sascha Lenz and Steffi Halm.

But for all the excitement of the battle for the top spots in the first races, it was the last of the four races that provided the weekend's real highlight for German fans. If they were to win Sunday's race, both Norbert Kiss and Jochen Hahn would have to work their way up through the field. But right after the start, like any good father, Hahn's first priority was to look out for his son as Kiss tried to pass Lukas Hahn. Dad was having none of it – Jochen Hahn made sure he blocked Kiss off, preventing him from taking the ideal line.

A gripping duel ends in joy for Jochen Hahn

Hahn wouldn't need his rearview mirror for the rest of the race as Kiss stayed glued to his tail for the remainder of the twelve laps. While he never actually managed an attempt to overtake, it was still a gripping duel for the fans in the stands, not least because, this year, the two giants of the sport have seldom gone head-to-head like this. The race was won by Jochen Hahn, with Norbert Kiss and Jamie Anderson taking second and third. After the first four race weekends, Norbert Kiss has a healthy 54-point lead over second-placed Jochen Hahn in the overall standings.

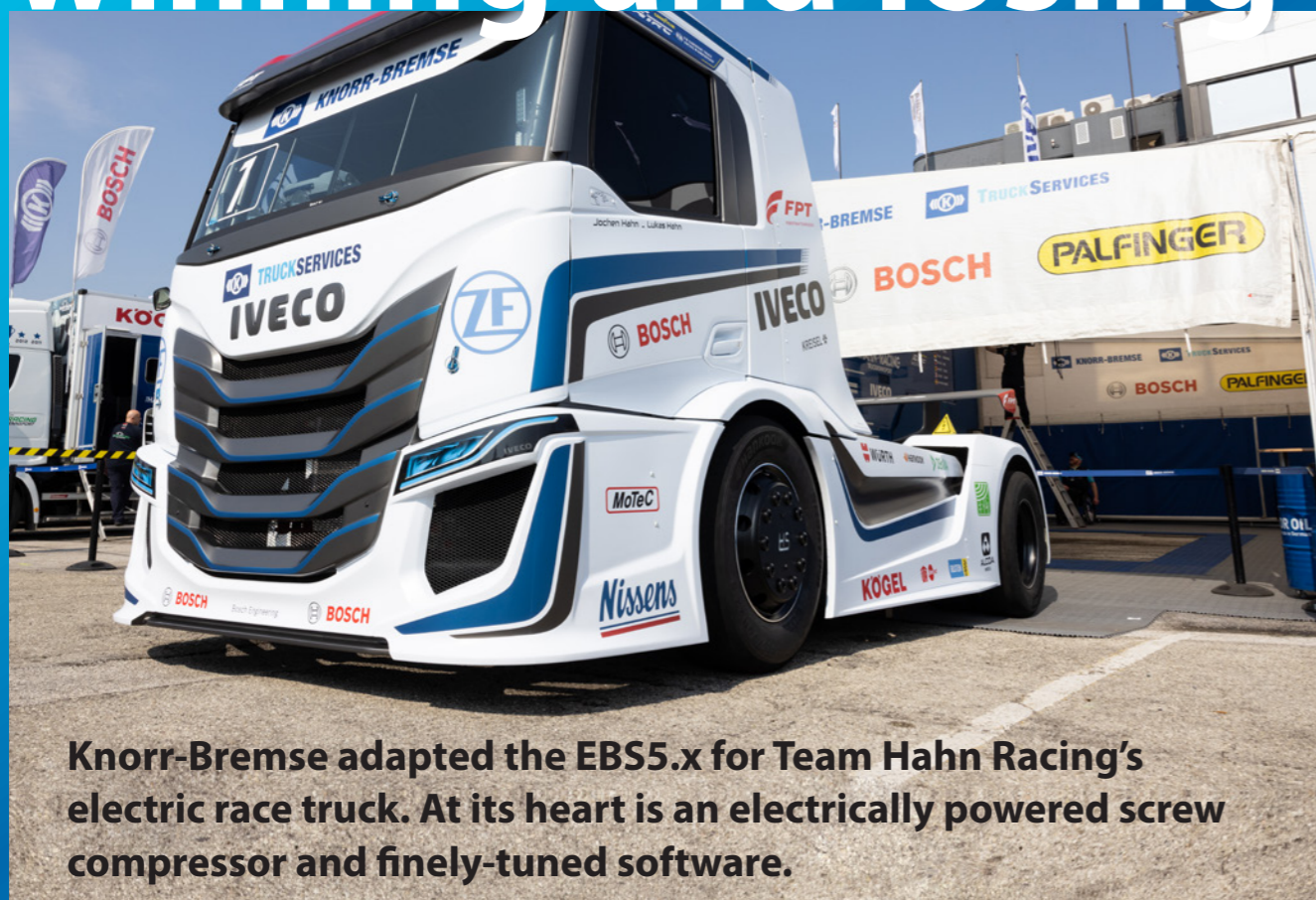
The Truck Grand Prix concludes the first half of this year's Goodyear FIA European Truck Racing Championship, with the teams now heading into the summer break. But when it returns in August, the races will come thick and fast, with four in just six weekends. The checkered flag will be waved for the final time on 1 October in Jarama, Spain.

Goodyear FIA European Truck Racing Championship

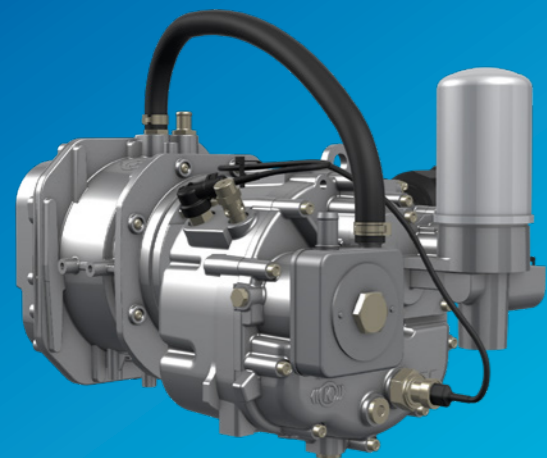
Top ten after four of eight rounds

- 1. Norbert Kiss, MAN: 209 points**
- 2. Jochen Hahn, Iveco: 155 points**
- 3. Sascha Lenz, MAN: 144 points**

Brakes are the difference between winning and losing



Knorr-Bremse adapted the EBS5.x for Team Hahn Racing's electric race truck. At its heart is an electrically powered screw compressor and finely-tuned software.



AT THE HEART OF THE MODIFIED Knorr-Bremse EBS5.x is an electrically powered screw compressor.

THE TEAM HAHN RACING IVECO ETruck

Engine power:	840 kW or 1,250 hp
Battery capacity:	252 kWh
Weight per battery pack:	408 kg (4 battery packs)
Max. charging capacity:	522 kW
Vehicle weight:	5.5 t

Brakes are the difference between winning and losing. Drivers generally overtake another vehicle while it is braking. Get the braking wrong and you soon find yourself at the back of the field. As a result, the brakes and electronic braking system (EBS) play a critical role in motorsport. And this also holds true for the all-electric race truck unveiled by Jochen Hahn at the Truck Grand Prix.

When, last year, FIA approved the use of electric race trucks in the European championship, truck racer Jochen Hahn's Team Hahn Racing and its partners got straight down to work. The result of their efforts is a prototype that was unveiled to the German public at the Nürburgring Truck Grand Prix, albeit without going through its paces on the track.

EBS and disc brake keep torque under control

The platform for the electric race truck is an electric Iveco S-Way semi-trailer tractor unit equipped with an e-axle. The EBS – the difference between winning and losing – is supplied by Knorr-Bremse. All electric vehicles, including Team Hahn Racing's electric race truck, are characterized by high power and extremely high torque that is fully available from a cold start. This must be controlled by an equally high-performance braking system.

This critical role is fulfilled by Knorr-Bremse's EBS5.x in conjunction with the same disc brake used in conventionally powered, volume-produced commercial vehicles. Surprising as it may seem, the hardware – including the footbrake and electropneumatic module, electronic control unit and different sensors – is largely the same as on volume-produced vehicles. "Obviously, the braking system must be able to cope with the high stresses and temperatures found in a racing environment, especially at the wheel end. Unlike drivers on public roads, when race drivers apply the brakes it is usually with full force. But a race only lasts about 45 minutes. That's nothing compared to the amount of braking in long-distance transportation", explains Péter Széll, Manager System Design and Application at Knorr-Bremse's R&D Center.

EBS5.x vehicle dynamics controls deactivated

Nevertheless, some modifications are necessary. Most of the key differences to standard applications are found in the software and operating parameters. "We developed the interface for the electric powertrain, optimized the brake feel and deactivated the vehicle dynamics controls such as ABS, automatic traction control and ESP. This allows the race truck driver to adjust the braking force distribution during the race so they can adapt it to the conditions and weather all the way around the track", explains Széll.

There is also a new screw compressor with modified temperature control and a special, intelligent Air Processing Unit (iAPU). This controls the e-compressor while also performing the standard APU functions such as air purification and the distribution of compressed air to the brake and auxiliary circuits.

Extensive know-how enables rapid progress

"A race truck's setup is different to that of a conventional truck. But we have extensive experience with electric drive systems, and the whole process, from system engineering to the first tests, only took a few weeks – it was a pretty routine job", he adds. There were no nasty surprises, but there were some pleasant ones. "The best thing about it was the excellent collaboration with Team Hahn Racing. As well as being highly competent, Jochen and his team are also very easy people to get on with. Working with them is like working with good friends", enthuses Széll.

Despite Knorr-Bremse's extensive know-how, insights from motorsport still benefit the development of components for volume electric trucks. "We learn how the EBS and brakes behave in extreme driving conditions with high temperatures and exceptionally strong vibrations. This supplements the information gathered from our test rigs and from driving the vehicles on public roads", says the systems engineer.

FIA regulations must be adapted for electric race trucks

The prototype electric race truck still requires further development. But that can only happen once the regulations for this new vehicle class have been established. Only then will it be possible to add an energy recovery system, for example, so that braking energy can be recovered to power the vehicle's drive system. These modifications will also benefit volume production, contributing to sustainable, zero-emission road freight.

E for emotion

Emotive and electric

Emotionally charged

E-motion



PARTNERS IN E-MOTION (LEFT TO RIGHT): The electric race truck was unveiled by Jochen and Diana Hahn and Team Hahn Racing together with ETRA Managing Director Georg Fuchs and Christian Sulser, Director Sales and Marketing at Iveco Magirus.

The 2023 Truck Grand Prix hosted a global premiere when Iveco and Team Hahn Racing unveiled the Iveco eTruck – the world’s first all-electric race truck. But the presentation of the zero-emission speedster wasn’t the only emotional moment for truck racer Jochen Hahn.

The European Truck Racing Championship features eight race weekends with a maximum of 60 points up for grabs each time. But the extravaganza at the Eifel race track is unquestionably the biggest event in the calendar. The Truck Grand Prix is the season’s highlight, especially for the German drivers, who are desperate to impress in front of the many fans and sponsors who turn up to their home race. But home advantage has its perils, as veteran truck racer Jochen Hahn knows only too well. He has experienced plenty of highs and lows over the 24 Truck Grand Prix that he has competed in. While there have been years when things didn’t go so well, there have been others, like 2016, when he delighted his fans by gaining the most points over his home race weekend.

“The Truck Grand Prix is the season’s most stressful event for me as a driver”, says Hahn. “You want to keep everyone happy, but there simply isn’t time anymore. This year I didn’t even make it to my own team’s marquee. I’m fortunate I can count on my team, and especially my wife, Diana, to take a lot of the pressure off me.”

Rapturous applause for the world’s first electric race truck

This year was another emotional rollercoaster for team boss and driver Hahn. Driving members of the public round the Eifel race track on race taxi rides is all in a day’s work for the truck racing veteran. But the same can’t be said of the unveiling of the world’s first all-electric race truck that Hahn has been developing with his team and industry partners since last fall. On the Thursday afternoon, the truck was presented to the assembled guests and members of the media who were also treated to an explanation of the key technical facts. Hahn and his crew received rapturous applause. “That was a special moment for me. At Team Hahn Racing, we’re proud that we could inspire our partners to take part in this ambitious, complex and costly project. Together, we’ve paved the way for a sustainable future for our sport. The many positive comments we received at the Ring were a resounding endorsement”, concludes Hahn. However, there’s still a way to go before the eTruck is ready for volume production. It will be necessary for other manufacturers to follow suit, while the relevant general conditions, such as changes to the regulations, will also need to be met.



A HOME RACE FOR HAHN: You always want to perform at your best in front of your fans, and that creates pressure.

Hahn junior’s presence ramps up the emotion

One thing that sets Hahn apart from many of his rivals is that, at some race weekends, his emotions as a family man come to the fore. And so it was at the Ring, where another Hahn family member lined up alongside him on the grid. At the Truck Grand Prix, Jochen’s son Lukas Hahn once again demonstrated the talent running through his veins. In the Promoter’s Cup for new talents, he came first in three races and second in the other. And Lukas currently lies tenth in the overall standings, despite only racing on two of the four weekends. If he were to compete in all this season’s races, a comfortable finish in the top half of the classification would be on the cards. So for his father and “racing instructor”, there were several moments in the 36th Truck Grand Prix that were about more than engine power, tenths of seconds and keeping appointments – moments that were all emotionally and sometimes also electrically charged.



The trailer: an economic miracle

If commercial vehicle fleets are to reduce their environmental and climate impact and at the same time withstand the pressure of rising costs, they need to become more efficient. In this context, trailers can make a special contribution, as they have a highly favorable price-performance ratio. A combination of lightweight, aerodynamic design and trailer EBS offers great opportunities.

"Low hanging fruit" is the term experts use to describe technical improvements that promise great success with little extra effort. In this respect, trailers, in particular, offer a wide range of opportunities. And to make the investment decision even easier for fleet operators, the German government has launched an "energy-reducing components" program that provides funding for trailers and equipment options that reduce a truck's energy requirements. The funding covers all the usual technologies - from lightweight design and aerodynamics to volume-optimized vehicles. So-called e-trailers, which are able to generate electrical energy for auxiliary consumers such as refrigeration machines, are also included.



»I only buy light! Payload-optimized vehicles are part of our business model and also offer greater sustainability.«

Georg Wittwer,
Managing Director Wittwer Spedition & Logistik GmbH



The most striking example is aerodynamically optimized trailers. The fewer corners and edges a semitrailer has, the less fuel the tractor vehicle consumes. On the highway, a standard semitrailer with a drag coefficient (Cw value) of 0.6 requires more than a third of the energy just to overcome the air resistance. Various air deflectors are available to improve the Cw value - from rear flaps to side panels and underbody panels. Field tests have shown that a fully optimized trailer can save an average of 6.5 percent fuel. But aerodynamic fairings are considered susceptible to damage, and Schmitz Cargobull is taking a different approach: With the EcoGeneration, the manufacturer has developed a trailer in which the rearmost part of the roof can be lowered hydro-pneumatically if the full loading height is not required. This results in a more aerodynamically favorable shape. Customers report that the Eco-Generation trailers can deliver a fuel advantage of five to ten percent in long-distance transportation.

The payload of the trailer also plays a major role in the CO2 footprint of any transport operation. The consumption improvement in this case depends on the nature of the route: In the case of a 40-tonne truck traveling from Stuttgart to Hamburg and back, a weight reduction of 800 kilograms theoretically results in fuel savings of around one percent. These are values that Georg Wittwer, managing director of the eponymous freight forwarding company, can testify to in practice. He exclusively procures lightweight curtainsiders of the Lightplus series from Kögel, either with Joloda rails for paper roll transports or as a Mega version.



THE LIGHT TRAILER BUSINESS MODEL: Lightweight construction either saves fuel or enables an increase in payload. Both can pay off financially.

In the basic version, these trailers have a tare weight of 5.2 and 5.4 tons, respectively, and thus achieve a payload advantage of around 700 kilograms over the standard versions. Wittwer enjoys economic benefits either through the extra payload that can be carried or the reduction in fuel consumption that is achieved. According to him, this compensates for the additional price of the lightweight trailers.

In addition, Wittwer predicts less tire wear on the trailer due to the lower load. And in his experience, the approximately extra 10,000 km of operating life represents another gain in sustainability. He also equips all his trailers with a Tire Pressure Refill System or TPRS, which warns the driver of pressure loss and automatically adds air while the truck is in motion if the tire pressure deviates from the set value. This not only protects against tire blowout, but also ensures optimum fuel consumption. A rule of thumb says that one bar of under-inflation increases consumption by one percent. Equally effective is the lower-cost Tire Pressure Management System, or TPMS, which checks the pressure

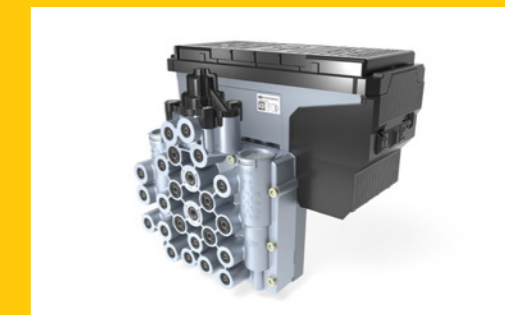


TIRE PRESSURE MONITORING AND INFLATION SYSTEMS ensure the ideal tire pressure and prevent unnecessary additional consumption.

and sounds an alarm in the event of deviations. However, this system requires the driver to top up the tire pressure him/herself when necessary.

Another factor impacting the energy requirements of a road train is the trailer chassis. This is demonstrated by the EU Vecto consumption simulation tool, amongst others. Any temperature increase in a tire, for example, reduces fuel consumption. This effect can be achieved by a lift axle: Lifting the first axle at partial load increases utilization of the tires on the second and third axles. Their temperature rises and rolling resistance decreases, so that 0.4 percent fuel can be saved in long-distance operations, according to Vecto. The lift axle also offers advantages when cornering, as raising it reduces the steering resistance of the

Funding for intelligent Trailer Technology



The "Energy-reducing components" subsidy program covers optional components and complete vehicles whose operation offers significant efficiency improvements and reduces the overall energy consumption of the truck-trailer combination. All vehicle operators who decide to purchase a new trailer between July 24, 2023, and March 31, 2024, will receive a refund of 15, 20 or 25 percent of the purchase price, depending on the size of the company, to a maximum of EUR 5,000 or EUR 10,000 for an e-trailer. If several such technologies are used in a trailer or semitrailer, the individual subsidies can also be aggregated. All information about the subsidy program can be found on the homepage of the Federal Office for Mobility and Logistics (BALM).

All Infos:

www.balm.bund.de/DE/Foerderprogramme/Gueterkraftverkehr/EMK/EMK_inhalt.html

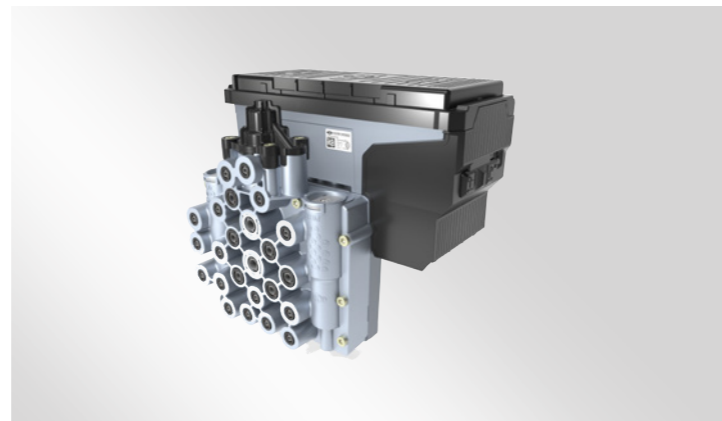




STEERING AXLES – AND ALSO LIFT AXLES – help lower cornering resistance and thus reduce fuel consumption, especially in local and regional transport.

rigid axle. Studies by the Research Association of Automotive Technology (FAT) have shown that a lift axle achieves a similarly positive effect during cornering as a steering axle and, in combination with the latter, can open up scope for even greater fuel-savings. However, the axle lift can only take effect when the vehicle is partially loaded or empty, whereas a steering axle is effective in all circumstances. The consumption simulation tool puts the fuel saving here at a total of 5.2 percent, with the greatest effect in urban traffic and, at 0.4 percent, lower on long-distance roads. A self-steering axle instead of a rigid axle leads to a reduction in lateral forces of around one third when cornering. As a result, a 40-ton semitrailer truck saves 4.5 percent diesel in urban driving and three percent in regional driving. On highways, the figure is 0.3 percent.

A modern trailer braking system also pays dividends in terms of efficiency and sustainability. iTEBS® X, the latest generation of trailer EBS from Knorr-Bremse, offers several functions that reduce CO2 emissions. For example, the iCorner dynamic wheelbase control system has an effect comparable to a steering axle. By relieving the



FUNCTIONS OF THE LATEST TRAILER EBS GENERATIONS, such as electronic wheelbase control, have the same fuel-saving effects as a lift axle.

load on the trailer's rear axle air bellows, the effective wheelbase is reduced. This not only prevents overloading of the semitrailer plate in the case of partial loads, but also optimizes the cornering of the semitrailer.

Telematics also have considerable potential for reducing the carbon footprint of transport operations. The specialist literature mentions savings of up to ten percent CO2. Such systems achieve this by networking the load, vehicle and driver and, with the help of analysis functions, increasing the degree of utilization of the cargo space and at the same time reducing the transportation distance by providing precise locational information.

In addition to digitalization, electrification is also set to bring significant efficiency advances in trailers in the future. For example, a generator axle can recover kinetic energy, store it in a battery and use it to power an auxiliary consumer such as a refrigeration unit. Schmitz Cargobull, for example, uses this to power the cooling of the S.KOe Cool. In addition to the S.CU ep85 cooling unit, the system includes a high-voltage battery with plug-in functionality and 32 kWh capacity, as well as an e-axle. As well as fuel savings, the vehicle offers other advantages such as quiet cooling operation and, in the future, access to zero-emission zones in conjunction with an e-tractor.

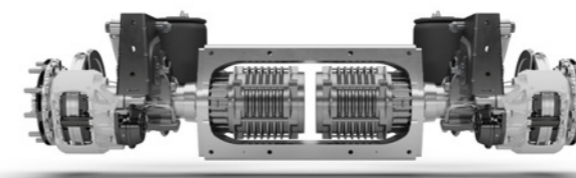
VECTO, the Vehicle Energy Consumption Calculation Tool, is an EU Commission software program accessible via the Internet, whose purpose is to determine realistic fleet consumption. It distinguishes between urban, regional and long-distance driving cycles and different payload classes, and assesses the effectiveness of various energy-saving measures.



A TELEMATICS SYSTEM increases the degree of utilization of cargo space and reduces the transport distance by providing precise location information.

For just under two years, the refrigerated freight forwarder STI Germany has been using an electrified trailer from Schmitz Cargobull in combination with a diesel-powered tractor unit. The tractor-trailer shuttles between two refrigerated warehouses over a distance of around 250 kilometers, delivering fresh, chilled and frozen goods. "The consumption advantage is up to five percent," says CEO Drazan Malesevic. "We are convinced that the future is electric!" he comments. According to him, the refrigeration unit has a power requirement of 7.5 kW on average, and 32 kWh of capacity is sufficient for 4.5 hours of refrigeration. From speeds of 60 km/h upwards and during braking, the generator axle recharges the battery. The net fuel saving of the road train in practical tests is at least 1.5 liters per operating hour, or almost five percent. Malesevic reckons that in hub-to-hub traffic, where the battery can be regularly preconditioned via a power cable, the application is ideal.

The results of theory and practice are rarely so clear: Both Vecto and the experience of fleet operators demonstrate that intelligent trailer technologies can achieve fuel or energy cost savings in the double-digit percentage range. Support programs now make the decision to pick the low-hanging fruit even easier.



E-TRAILERS HAVE AN AXLE THAT GENERATES ELECTRICITY capable of powering a refrigeration unit, for example. This can save up to 1.5 liters of diesel.

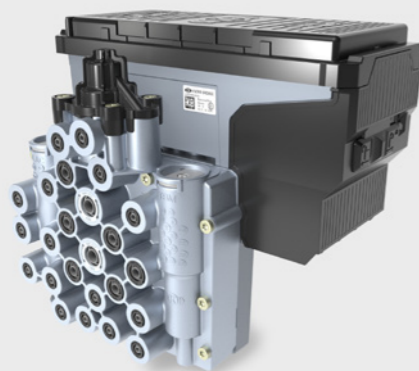


» We are convinced by the concept of the electric temperature-controlled trailer. For hub-to-hub operations it is ideal.«

Drazan Malesevic,
Managing Director STI Germany GmbH

The next generation Generation X Trailer intelligence Simple structure, highly intelligent

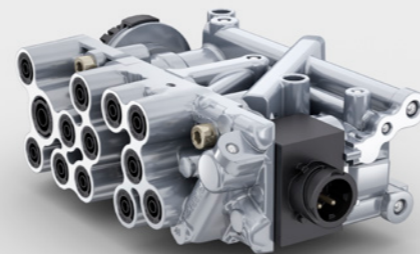
With iTEBS® X Knorr-Bremse is introducing the most advanced generation of the intelligent, electronic trailer braking system. A simplified and standardized piping layout offers advantages in terms of installation and service. And the range of applications and functions has been further expanded and refined.



SERVICE MADE SIMPLER: iTEBS® X, the new generation of trailer EBS, comes with a removable connector plate.

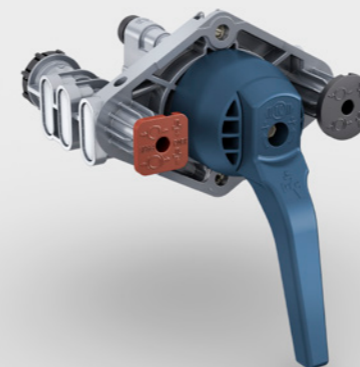
In the human brain, it is primarily the networking of certain areas that determines an individual's intelligence. In the case of trailers, that intelligence is found in the electronic braking system (TEBS) – which is why Knorr-Bremse calls its trailer EBS iTEBS® X, with the "i" standing for "intelligent". Here too, the networking of individual components plays an important role in the overall performance of the braking system. But the more complex and varied the piping of a TEBS is, and the more components it requires, the more time-consuming it is to install and subsequently service.

This is where the Knorr-Bremse experts stepped in. With the introduction of the iTEBS® X generation, which follows on from the G2.2 model, they have further refined the range of functions and simplified the networking of the individual braking system components, including the parking and maneuvering valve and air suspension. iTEBS® X combines the control unit, sensors and pneumatic brake control system, as well as braking functions such as ABS and load-dependent braking. This enables more precise control of the braking force and improved coordination between the tractor and trailer, reducing wear on the trailer brakes and therefore also cutting the overall operating costs.



THE CHASSIS SUSPENSION MODULE is available in two versions with identical connection layout.

Further optimizations include utilizing the widely-used HDSCS plug system which is freely available on the market. And in addition, iTEBS® X offers a modular connector concept, with functions that were previously controlled via a single connector now distributed across seven sockets. This gives the vehicle manufacturer even greater flexibility than before when it comes to selecting functionalities and assigning them precisely. A further fundamental design feature is the TEBS module's detachable connector plate – the compressed air manifold with the connections for the pneumatic supply lines. When it comes to servicing, a technician now no longer has to disconnect all the connections individually, but only one single compressed air manifold in order to rectify a problem either on the fittings or the modulator.



THE PARKING AND MANEUVERING VALVE offers the familiar two-button operation and also an integrated raising and lowering function.

iTEBS® X can be installed on all common types of trailer and semi-trailer and used for all conceivable applications. Despite this, it comes with a uniform and highly streamlined piping layout. In the new TEBS generation, Knorr-Bremse has routed electrical and pneumatic lines between the individual TEBS modules and trailer components along the shortest possible route. This saves considerable time during assembly, and also reduces the number of system components and amount of piping.

Since not every vehicle needs all possible functions, Knorr-Bremse offers the iTEBS® X module in three versions with different levels of functional integration. This enables an attractive price-performance ratio without customers having to compromise with regard to the intelligence or application possibilities of the TEBS. This is because the basic range of functions of the three iTEBS® X variants remains identical, with the models differing, for example, in the number of electrical inputs and outputs. While the iTEBS® X PLUS and iTEBS® X LAC models offer even more connections, the iTEBS® X ECO version is the most suitable solution for the cost-sensitive volume market. Vehicle manufacturers thus stand to benefit from an optimum price-performance ratio for their specific application.

iTEBS® X LAC (Lift Axle Control), on the other hand, has an integrated lift axle control and is therefore recommended for all trailers with at least one lift axle. In this case, only the air lines need to be routed to the lift axle, with no additional valve required. This also means that no additional installation space is required, and the chassis does not have to be drilled. The bridge between LAC and ECO is supplied by the iTEBS® X PLUS version, which offers, with the P28 connection, an additional controllable pneumatic connection, for example, for a lift axle valve or a steering axle lock.

Knorr-Bremse has also combined the lifting and lowering valve with the parking and shunting valve (POS) into a parking and maneuvering valve (POM) in order to save installation space. As part of this, the overflow valve has been moved to the TEBS modulator - which also helps to simplify the piping system. In addition to the proven two-button design, an HMI (Human Machine Interface) version is now available, which offers a lever for manually raising and lowering the vehicle body.

Knorr-Bremse is now also offering the new Chassis Suspension Module (CSM) in two versions, either as a conventional, purely pneumatic basic version or as an electro-pneumatically controlled iLvl version that offers additional smart functions. The latter is recommended for trailers that have to offer more than two driving heights: for example tippers in road finishing applications.

With the new generation iTEBS® X, Knorr-Bremse is thus once again demonstrating that networking is the basis of a TEBS's intelligence and functionality. At the same time, the simplification and harmonization of networking between the various TEBS components in no way compromises the system's functionalities.

Field testing experts: Practice-oriented Close to the customer Long-standing partnership Practical impressions count

Ensuring the smooth functioning of a trailer braking system is vital for manufacturers and fleet operators alike – which is why Knorr-Bremse always carries out rigorous field testing before introducing new systems or revising existing ones. The process makes an important contribution to the further development of systems – as well as maintaining a good relationship with customers.



ONCE A MONTH, Frank Heuer travels to the forwarding company in Rheda-Wiedenbrück to examine the stored data and talk to workshop manager Andreas Lohmann.





MANAGING DIRECTOR ASTRID WORTMANN, who also holds a truck driver's license, makes trailers from the company's fleet available for field testing.

For Frank Heuer, close contact with truck fleet operators is important. Not just because the 48-year-old trained design mechanic, mechanical engineer and business economist has grown close to the commercial vehicle industry and is always interested in the latest details. He needs contact above all because his job in Knorr-Bremse's "Technical Sales Trailer Controls" department requires him to research the impact of everyday stresses and strains on installed systems. Heuer's expertise is called on when braking systems need to be further developed or new ones are being prepared for series production.

Technical drawings already show standard pipework

The Knorr-Bremse engineer is currently working with freight forwarding company F. Lohmann from Rheda-Wiedenbrück on field testing the new iTEBS X® - the latest generation of the TEBS electronic trailer braking system that will shortly be launched on the market. His preparations involve sourcing the iTEBS X components from the Development Department, including the relevant mounting materials, and also preparing technical drawings to provide information on the subsequent

pipework requirements. In addition, he has to carry out brake calculations adapted to iTEBS X and prepare the appropriate datasets for the vehicles.

Heuer is always welcome at freight forwarders F. Lohmann. The main purpose of the field testing is to gain insights into the braking performance of the new TEBS under everyday conditions. The 48 tractor units and 70 trailers operated by Lohmann cover an average of 120,000 kilometers a year, and eight of the trailers are taking part in the one-year field testing program. It is no coincidence that this particular company is involved: F. Lohmann specializes in transporting cargo to Italy and also frequently serves customers in Switzerland. Refrigeration units are among the regular loads, as are furniture parts, machines and tiles.

Routes include extreme gradients and train rides

"The routes taken by the company's trucks involve long distances, extreme gradients, and even transportation by train, so they are perfectly suited for our field tests," explains Frank Heuer. "It is also important that not just new trailers are involved, but vehicles that are subject to regular and intense use." So Lohmann could hardly be more typical and customer-relevant for purposes of the field test. Today, two trailers are involved that have already been in use for 15 and 17 years respectively, but at first glance appear to be almost as good as new.

That may be because workshop manager Andreas Lohmann leaves nothing to chance. "There are real people driving our vehicles on the roads, so everything has to work perfectly," says the 55-year-old, who accompanies Frank Heuer during his visit. Lohmann is only too happy to take a look at the special equipment brought by Frank and have every step explained to him: "I also think it's great that we, as customers, are involved in the process of developing new systems. It gives you a good feeling and shows how important it is for Knorr-Bremse, as a manufacturer, to constantly work on improving existing and future systems.

Modern braking technology means taking responsibility

The close link with practice is what makes Spedition F. Lohmann stand out. "They are still really interested in the drivers' job and the technology used in their vehicles and trailers. F. Lohmann leaves nothing to chance," reports Heuer. "For us as a freight forwarder, our interest in sustainability and the latest braking technology also demonstrates our awareness of our trade's responsibilities towards others," adds Astrid Wortmann, who has just climbed into the cab of the tractor unit. As the company's managing director she, too, is an expert in the field and also holds a truck driver's license.

Once a month, Frank Heuer travels to the forwarding company in Rheda-Wiedenbrück to examine the stored data and update other information. Of course, other companies are also involved in the field tests that he oversees, but let us stay with Spedition F. Lohmann for a moment: "Over the years, a real partnership has grown up between us," Heuer explains. So it is certainly no coincidence that F. Lohmann has again invested in the same Knorr-Bremse braking system for the latest trailers it has ordered. Once the data has been collected during the test drive, it is reviewed at company headquarters in Munich, where it is incorporated into the analysis and further development of future programs and control units. In line with Frank Heuer's brief to ensure that ultimately all transport fleets benefit from the new iTEBS X®.

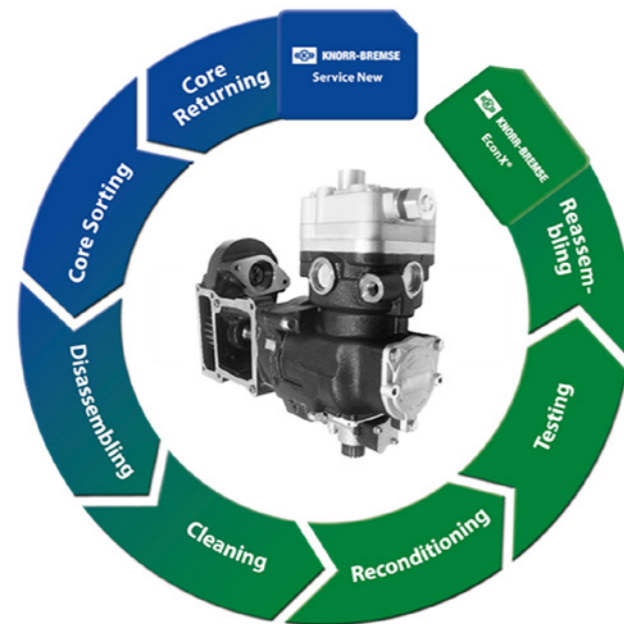


» There are real people driving our vehicles on the roads, so everything has to work perfectly. «

Andreas Lohmann,
Workshop Manager F. Lohmann

Inexpensive, functional, safe: EconX[®] clutch compressor for MAN

Knorr-Bremse adds MAN clutch compressors to its EconX[®] program, offering replacement parts in keeping with the current value of a vehicle.



Remanufactured EconX[®] components offer the same functionality and safety as a new service product. Vehicle operators do not have to compromise compared with the use of new products, thanks to a special industrial remanufacturing process that produces, assembles and tests replacement components to the same strict standards as OE products. In addition, remanufactured EconX[®] clutch compressors feature the latest high-torque clutch (HTC) technology to ensure maximum robustness and durability. The use of EconX[®] products is also particularly sustainable, as the industrial remanufacturing process generates significantly fewer CO2 emissions than the manufacture of an equivalent new product.

New brake pad quality: an environmentally friendly solution for the aftermarket


Knorr-Bremse TruckServices launches copper-free brake pads for the European aftermarket.



After more than 40 years of successfully developing and improving disc brakes, Knorr-Bremse's focus remains, as always, on safety, reliability and low life-cycle costs - but also on sustainability and environmental friendliness. Now the company has underlined its environmental credentials by developing a new copper-free brake pad for the European aftermarket that produces almost no copper particles during braking. This sends out a strong signal of Knorr-Bremse's commitment to sustainability - though still combined with a focus on outstanding braking performance and safety. In addition, the manufacturing process has been modified, enabling the Company to reduce its CO₂ footprint. The pads, of which other variants will follow, are ECE-R90 certified and meet Knorr-Bremse's top quality standards. To reduce time and effort for the customer, the brake pad set for the widely-used SN7 application will retain the familiar product number of K046771K50. The pads themselves will change to Knorr-Bremse OE quality - KB5400, but the application range and WVA reference number will remain as before.



Up2Date

- EconX[®] clutch compressor for MAN applications (Y490587) 
- Introduction of a new environmentally friendly Knorr-Bremse brake pad (Y508057) 
- A desiccant cartridge harmonized for most Daimler Truck applications (Y501210) 
- Electronic Parking Brake from Knorr-Bremse (Y418212) 
- Knorr-Bremse clutch compressors - overview of all clutch compressor variants (Y403245) 
- Tool component set to renew the most used components of the disc brake tool case K158880K50 (Y485362) 
- Product catalogue - Knorr-Bremse products for IVECO vehicles (Y497122) 

The documents can be downloaded at

<https://mytruckservices.knorr-bremse.com>



Happy birthday, EURO PART, and congratulations on your 75th anniversary.



A THREE-PRONGED CAMPAIGN
on the big issues: Max Hunt, Olaf Giesen and
Christina Scheib.

EUROPART has again made the Top 100 list of Germany's most innovative SMEs. Its consistent success is built on its digital strategy and its strong relationships with its customers. The parts dealer celebrates its 75th birthday in 2023, and can look back on a partnership with Knorr-Bremse that has endured for more than 30 years.

In the modern world, trends often prove to be short-lived, but EURO PART has shown more staying power. It has established itself as a permanent fixture in its industry, precisely because the independent parts dealer is committing to engaging with digitalization and innovation. This year marks its 75th birthday. When it was originally founded, in 1948, it was known as Westdeutsche Federnzentrale Wachenfeld und Co. (or WFZ, for short), and specialized in springs for carriages and motor vehicles. From 1960 onwards, the company began to expand its operations to cover the full range of spare parts, and today delivers more than 400,000 components every year, across Germany and internationally.



EUROPART makes sure that Max Hunt's workshop has everything he needs to service vehicles on the go.



» The partnership with Knorr-Bremse is based on reliability, trust, and the professionalism of the people involved.«

Olaf Giesen, CEO EUROPART



TODAY, EUROPART DELIVERS more than 400,000 components every year, in Germany and abroad.

It now operates more than 300 sales outlets in 28 countries, and employs more than 1,700 people. The project to re-baptize the firm as Europart began in 1995. The name was initially given to the export-only brand, Europart Premium Parts, but was soon adopted by the company as whole.

CEO Olaf Giesen feels that internationalization and the company's strong commitment to its core values are key factors in its success. "We have gone from a local spring specialist to Europe's market-leader for commercial vehicle parts and a driver of innovation. We are very proud of our expanding range, our world-class logistics network, our digital processes and our outstanding customer service - and it's all thanks to our fantastic team", he says. "We are passionately committed to maintaining close relationships with our customers, and will continue to apply that passion to driving innovation."

As he explains, innovation is crucial: "New ideas are the key to EUROPART's future success." One of the benefits of EUROPART's inno-

vation strategy is the range of products available to service specialists and fleets, which now includes solar panels suitable for use on trucks, vans and buses as well as spare parts, tools and workshop equipment. The solar panels are mounted on the roof of the vehicle, and generate green electricity to power the driver's coffee machine, refrigerator, television and other appliances, thus reducing the strain on the vehicle's battery.

Service specialists are continuing to benefit from the EWOS digital ordering and advice system, which can be used to identify individual parts quickly on the basis of the chassis number. EWOS allows service specialists to compare individual items and calculate prices, as well as to retrieve invoices and delivery notes. The system also incorporates maintenance instructions, guide times, maintenance schedules, inspection thresholds and details of individual settings.

Digital services like these are making life easier for EUROPART's own employees, too. For instance, the company has an app that allows staff

at 11 European sites to network, exchange messages and set up video conferences. The app also incorporates a corporate benefit program and EUROPART's Idea and Innovation Management system. The company is now looking to roll out a version of the app for its clients - the system is already in its pilot phase.

Over the course of this year, the firm is marking its anniversary with a Europe-wide roadshow, stopping at selected sites and dealerships to get customers, employees and suppliers involved in the celebrations. Those suppliers include Knorr-Bremse, which has been working with EUROPART for more than 30 years. EUROPART's Head of Category Management / Vehicle Parts, Oliver Hirtzmann, clearly appreciates the relationship: "Knorr-Bremse stands out thanks to its strong drive to innovate", he says. "Vehicle manufacturers benefit from that and, as a parts dealer, so do we. Knorr-Bremse provides products and repairs in the early part of the vehicle's life cycle, and it's very much a partnership of equals."

Haulier, adventurer and content creator Max Hunt is also taking part in the EUROPART birthday tour. Hunt is famous for his work with "The Real Way to Dakar", a historic recreation of the original Rallye Dakar. During the event, he works out of the world's smallest workshop to repair stricken vehicles. The mobile workshop is housed in a 20-foot container, built and equipped jointly by Hunt and EUROPART. It holds stocks of every EUROPART component Hunt might need to service and repair any given vehicle. Also among the party guests is the Women's Ambassador of Germany's BGL Haulage Association, Christina Scheib, who combines her ambassadorial role with driving her company's own trucks.

EUROPART marked its anniversary with the "Top 100" seal for innovation management, awarded by a panel of experts.

Useful websites

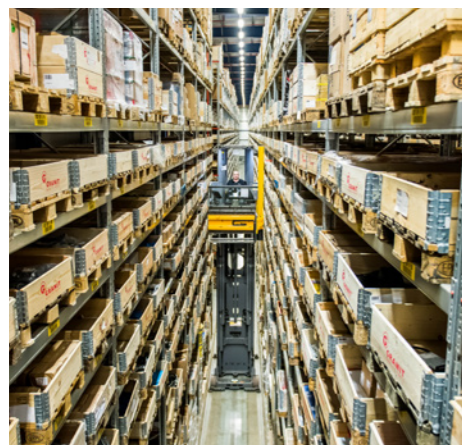
www.maxhunt.eu



www.youtube.com/@EUROPARTGroup

From village

FOUNDED IN 1923, the company is based in Heeslingen, Lower Saxony



WITH 67 LOCATIONS IN 26 COUNTRIES the Fricke Group is one of the leading spare parts wholesalers for the heavy-duty sector.

Dietrich Fricke originally laid the foundations for the heavy duty company back in 1923. In those days, the work involved was rather different to nowadays: shoeing horses and building farm wagons were tough jobs that had to be carried out without the help of machines. But even then, the company stood out for its commitment and passion. 100 years on, the Fricke Group has developed from a small village blacksmith's workshop into one of the leading companies in the agricultural and commercial vehicle sector, with six divisions, 67 sites in 26 countries and almost 3,500 employees.

One important area of business for the Group is vehicle parts. Historically, this goes back to the company's acquisition of the spare parts assets of former Hanover-based vehicle manufacturer Hanomag, which ceased production in 1972. Across-the-board expansion of the product range led to the foundation of "Granit Parts" in 1996. And today, Fricke is one of the leading spare parts wholesalers for the heavy duty sector.

At the 100th anniversary celebrations, however, the focus was not just on the history of the family business, but also on the future. Under the motto "100 years of growth", Philipp and Adrian Fricke, representing the fourth generation of the family business, shared their vision of the future

blacksmith to global company

The Fricke Group from Heeslingen in Lower Saxony has a passion for service and technology related to agricultural and industrial vehicles, gardening and municipal technology, construction machinery and spare parts. This year saw the company celebrate its 100th anniversary.

with invited guests. As the motto suggests, developments at Fricke have only ever known one direction: upwards.

The origins of this global growth strategy began as early as 1992 under the management duo Hans-Peter Fricke and Holger Wachholtz. At the time, the company was expanding to become a multinational trading and service company in the heavy duty vehicle sector – and doing so with considerable success. One important milestone came in 2001, when Fricke started to open up new sales markets, leading to the establishment of branches throughout Europe, together with sales companies and purchasing offices all over the world. At the same time, Knorr-Bremse's wide-ranging portfolio was also developing to serve countless markets around the globe. This impressive growth has always been characterized by the diversity and "enormously high quality" of its products, reports CEO Hans-Peter Fricke. In addition to his company's close collaboration with KB, he appreciates the innovative capability of the Munich-based brake specialist – which bodes well for many more decades of cooperation.

Fricke was in high spirits at the gala: "The 100th anniversary of the Fricke Group is a very personal milestone for me. Looking back at our beginnings and the huge development we have achieved fills me with great humility". He also looks with pride to the future of the family business, which will be shaped above all by his sons Philipp and Adrian Fricke.



»In the 100 years of FRICKE's life, partnerships with suppliers like Knorr-Bremse have contributed to our success«

Hans-Peter Fricke,
CEO Fricke Group

Personal touch

Automotive spare parts wholesaler HEIL Kfz-Teile offers customers as simple and rapid a delivery service as possible. To achieve this, it combines the commitment and flexibility of a family business with carefully designed ordering systems and personalized advice.



FROM WAREHOUSE TO CUSTOMERS: HEIL Kfz-Teile supplies its customers north of a line between the cities of Kassel and Halle – often on a same-day delivery basis.

More than 1.5 kilometers of conveyor technology transport around 130,000 different articles from the goods receiving area, over five levels, to the twelve-meter-high racking systems with some 300,000 storage locations, or to the 16,500 pallet storage locations.

Diverse customers need a diverse range of products. Hanover-based A.-W. Heil & Sohn GmbH & Co. KG, a medium-sized wholesaler for motor vehicle and commercial vehicle parts, has recognized this fact for the past 90 years. For this family-run company, responsiveness and proximity to the customer are key success

factors, whether they take the form of a user-friendly online search system or a helpful advisor at the other end of the phone.

CEO Velten Perlberg sees this as one of the company's great strengths: "As a family business we are able to think from one generation to the next. This means operating sustainably and working closely with our customers." And it is reflected in the broad range of products the company offers in both the passenger car and commercial vehicle sectors.

Logistics are clearly one of HEIL Kfz-Teile's particular strengths. Above all, the right parts for the needs of the region have to be readily available in the warehouse. In the commercial vehicle sector, this is quite a complex matter – which is why the company works so closely with its customers and suppliers. HEIL Kfz-Teile adapts the range held in its warehouse according to the particular focus of its customers, who

» Our ordering system and therefore also our customers benefit from the high quality of Knorr-Bremse's data.«

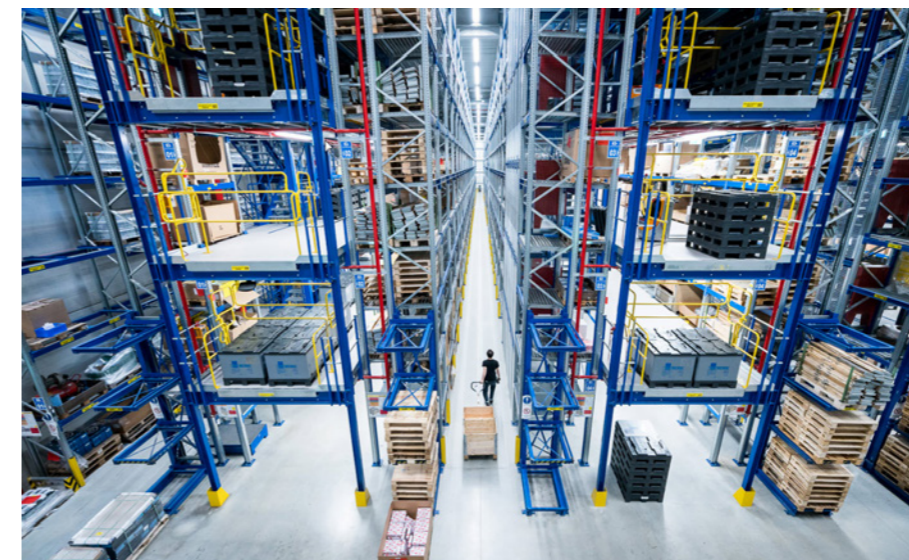
Velten Perlberg,
CEO HEIL Kfz-Teile

often specialize in specific vehicles and units. From 22 locations situated north of a line from Kassel to Halle, the company supplies its customers – often on a same-day delivery basis.

A top tool for customers is the NEXT Generation parts finder, which is based on the latest version of the Topmotive catalogs. In addition, the parts specialist is constantly updating its own data. But the HEIL portal also offers further special support to the commercial vehicle sector. The company works with customers across the board, and also offers an individualized catalog called "MeinLager", which contains its entire range, including commercial vehicles and specific areas such as caravans and trailers, and industrial, agricultural and construction vehicles, in addition to the TecDoc-maintained references.

When it comes to working with parts manufacturers, Velten Perlberg highlights the collaboration with Knorr-Bremse in particular: "Knorr-Bremse is usually first-to-market as an OEM partner, and therefore also first to the aftermarket, so they give us rapid access to components." In particular, he adds, the fact that Knorr-Bremse is also involved in the development of vehicles and delivers directly to manufacturers' production lines is evidence of the Munich-based supplier's expertise. An

important role is also played by KB's high-quality data and much-appreciated personal support at regional level. "At Knorr-Bremse, you can see the benefits of personal contacts," comments Perlberg. Which perfectly complements the individualized approach taken by HEIL Kfz-Teile.



CORE COMPETENCE LOGISTICS: In Sarstedt, 26,000 square meters are used to store automotive and commercial vehicle wear parts, consumables, workshop equipment, tires and much more.

The investment in the state-of-the-art logistics center is also an investment in the company's future.

DID YOU KNOW...



**... THAT ONE BRAKE FROM
US CAN HOLD ON UP TO
10 ADULT ELEPHANTS?**



EconX® Calipers from Knorr-Bremse withstand the greatest forces and bring older vehicles to a halt – as good as original.

More information:

truckservices.knorr-bremse.com/econxadb



TRUCKSERVICES