

LIEBHERR

Bauma Magazine 2019

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**Together.
Now
Tomorrow.**

&

Team & Work True Teamwork is Needed to Deliver Maximum Performance on Eight Axles | **p. 24**

Highlights & Innovation Everything you Need to Know About our Exhibition Appearance | **p. 30**

Trends & Vision Alternative Drive System Technologies – a Key Issue for the Future | **p. 47**





The family shareholders active in the Group (from left to right): Jan Liebherr, Stéfanie Wohlfarth, Sophie Albrecht, Philipp Liebherr, Patricia Ruef, Johanna Platt, Isolde Liebherr and Willi Liebherr

Dear guests,

We would like to warmly welcome you to the Liebherr booth at Bauma 2019. We are delighted to have the opportunity to meet you in Munich at the world's largest construction machinery trade fair. In order to shine the spotlight on this year's theme 'Together. Now & Tomorrow.', we would like to invite you to experience first-hand the outstanding technological highlights of today and the cutting-edge solutions of tomorrow.

At Liebherr, we believe that sharing information and ideas with customers, partners, machine operators and industry insiders plays a crucial role in helping us to shape the future together. We have approximately 100 exhibits on display at Bauma and would like to offer you a unique opportunity to find out more about the latest innovations in construction machinery, material handling, mining and components. What's more, you can gain fascinating insights into the various trends currently shaping the industry.

Where are we heading with alternative drive system technologies? In an in-depth interview about electric drive systems, we take a bold look at the future and the development team at Liebherr-Mischtechnik GmbH will shed light on their experiences whilst developing the first electric-powered truck mixer. We can also offer you a unique insight into how our latest product innovations come about. This includes the chance to learn about the eighth generation of our crawler excavator and our mobile cranes, which offer completely new levels of performance. You can also find out what happened when the wind decided to make an unwelcome appearance when a team of technicians erected our newest EC-B series tower crane. As we continue to look towards the future, there is one theme that is having a major impact on every product area: digitalisation. Discover how Liebherr's intelligent assistance systems have helped put safety first at a Munich transport depot, how components are learning to talk to us, how construction sites are becoming more digitised and how the INTUSI concept is ushering in a new era of machine communication.

We hope you enjoy the read and have an interesting and fruitful Bauma.

Dr. h.c. Dipl.-Kfm. Isolde Liebherr Dr. h.c. Dipl.-Ing. (ETH) Willi Liebherr
Presidial Committee of the Liebherr-International AG Administrative Board



Operating Everywhere 6
 In mines, on mountainsides and above the clouds – this impressive series of pictures shows Liebherr machines braving high altitudes, the elements and other adverse conditions.

In the Spotlight 24
 Given its colossal size and impressive performance, it's now wonder that all eyes are on the new eight-axle mobile crane in the run-up to its world première.

The Sky's the Limit 34
 Liebherr's new EC-B takes cranes to a whole new level. In Rotterdam, the new model is being used in the field for the first time.

Alternative Drive Systems 47
 Which drive concepts will be important in the future, and how is Liebherr preparing for this? An interview with engineer Klaus Graner.

Battery Powered 52
 After two years of high-precision development work, the first electric truck mixer has finally arrived. The new model can certainly hold its own against its traditional counterparts.

Product Areas 58
 Mining 59
 Tower Cranes 62
 Earthmoving 66
 Material Handling 74
 Deep Foundation Machines 76
 Mobile and Crawler Cranes 78
 Concrete Technology 83
 Components 86

A Vision of Safety 18
 Liebherr wheel loaders equipped with intelligent assistance systems provide maximum safety at a recycling company in Munich.

Information for Visitors 30
 Exhibitor floor plan, career opportunities, exhibits, live demonstrations and much more. Here you will find everything you need to know about the approximately 14,000 m² Liebherr booth.

A Bold Move 38
 The entire production facility in Colmar, France was redesigned for Liebherr's 8th generation crawler excavators.

Totally Digital 50
 Networking, data analysis, automation: the construction machines of the future are on the move in a digital world.

INTUSI? INTUSI! 54
 Liebherr has teamed up with the Technical University of Dresden to develop new control technology that combines a smart user interface with sophisticated machine intelligence.

The Liebherr Group 90
 Responsive Handling 92
 in Tough Conditions
 The World of Liebherr 94
 in Numbers
 Highlights 96

Like Father, Like Son 22
 Head of Construction Werner Haas works hand in hand with his son Julian at Bauma 2019 to build one of the largest exhibition booths in the world.

Status Update 42
 Liebherr's exhibition booth was built between November and April. During this time, Head of Construction Werner Haas provided regular updates via WhatsApp.

Operating Everywhere

In mines, on mountains, in valleys: Liebherr machines operate everywhere. No distance is too far for them, no mountain too high – and sometimes even the ‘big brother’ helps out.



At the Mine

Erzberg (Austria): Size takes on a whole new meaning at the largest and most cutting-edge open-pit iron ore mine in Central Europe. 80,000 tonnes of rock are blasted out of the mountain twice a day. Meanwhile, a powerful new workhorse has been assisting with material handling operations for the past year. Weighing in at 180 tonnes with a top performance of 1,200 hp, the Liebherr T 236 mining truck is driven by diesel-electric motors – ushering in a revolution at the Erzberg mine.



In the Forest

Mockfjärd (Sweden): The wood workers in the depths of Central Sweden are used to working in snow and frost. They don't stop, not even at -27°C. Neither does the L 580 LogHandler XPower®. Set against a wintry backdrop, this machine smoothly knocks down pine tree trunks and transports the long logs to the conveyor system as if they were giant pick-up sticks. Standstills are not an option.



On the Bridge

Würzburg (Germany): A large mobile crane helps out its smaller counterpart. During bridge demolition work in Würzburg, an LTM 1450-8.1 lifts an LTM 1250-5.1 from its position after it has completed its work. The 'big brother' then remains on site to finish off the job.



On Long and Winding road

Bischofshofen (Austria): A narrow road runs from Bischofshofen up to Mount Buchberg. It curves sinuously up the mountainside and is very steep in places – certainly a stretch of road to quicken the pulse of any motor racing fan. The fifth-generation Liebherr HTM 905 truck mixer safely and confidently negotiates the bends and gradients as it makes its way to the construction site to supply fresh cement.



Across the Pond

Los Angeles (USA): In the City of Angels, the LB 24 drilling rig digs through even the hardest ground layers with its powerful engine. The machine has built-in parallel kinematics and highly robust leaders to keep it stable and provide a large operational radius.



Above the Clouds

Saint Petersburg (Russia): The Lakhta Tower is the tallest building in Europe, standing at a height of 462 metres and rising above the cloud line. Four tower cranes played a part in its construction. A hydraulic unit enabled the cranes to scale the outside of the building and inside the tower. This allowed the cranes to stay one step ahead of the game at all times.

**Together.
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A Vision of Safety

There's no material-handling job too tough for Liebherr wheel loaders. At a recycling plant in Munich, smart assistance systems with cameras, innovative sensors and 'intelligent' headlights guarantee optimal safety around the depot.

'My team's safety is my number-one concern', says Thomas Breitsamer. Along with his brother Johann, the 48-year-old heads one of the largest recycling companies in the Munich area. To guarantee safety for everyone who sets foot daily on this very busy terrain to the north of Bavaria's state capital, the visionary entrepreneur relies on technology from Liebherr. He has equipped his L 566 XPower wheel loader with the SkyView assistance system which gives the driver a 360-degree view around the machine at all times. Four cameras from the Liebherr plant in Bischofshofen are installed on the wheel loader, providing the panoramic view that's displayed inside the vehicle's cabin. This is crucial for the driver, considering that up to 800 vehicles cross the six-hectare industrial terrain every day.

Developing products alongside the customer

From the moment you enter the terrain, it's clear that the Breitsamer company handles an enormous volume of material. Countless trucks arrive, carrying fully loaded containers with all types of waste, while the already unloaded vehicles queue up on the way back out of the terrain. The number-one concern on this traffic-heavy work site is the safety of everyone present. The boss is well aware of this, because he also works as the technical manager here, keeping a close eye on the machine park in particular. 'When it comes to safety, our philosophy has always been to go just a little further than what the law requires.'

That's why the SkyView system from

Liebherr is only the beginning. As a trained electrical mechanic specialised in heavy vehicles, Breitsamer works closely with Liebherr's product experts in Bischofshofen. 'Direct feedback from our customers is extremely important for product development', says Mark Walcher, product manager for large wheel loaders at Liebherr. He meets regularly with Thomas Breitsamer and has visited the site numerous times to watch the Liebherr machines in action. 'We don't just develop our machines for our customers, but also with them. That allows us to offer the best solutions possible', explains Walcher.



'When it comes to safety, our philosophy has always been to go just a little further than what the law requires.'

Thomas Breitsamer



As a trained electrical mechanic specialised in heavy vehicles, Breitsamer likes to get behind the wheel of his Liebherr machines himself whenever he finds the time

Lots of innovations at Bauma

For this year's Bauma, Liebherr is significantly expanding its portfolio of assistance systems. The SkyView and adaptive work lighting systems are both being updated. Adaptive work lighting is a special lighting system that adjusts the brightness of the headlights according to the job at hand. As an intelligent system, the various lighting components switch on fully automatically and only when needed. Just in time for Bauma, this system has been expanded and given an even more user-friendly design. Another innovation is the 'Remote Control with Coming Home/Leaving Home' functionality. Using a remote control, the driver can

switch the machine to work mode even before boarding it. The work headlights are activated to illuminate the hazardous zone surrounding the vehicle. 'This saves time and reduces the risk of accidents, especially when working at night', explains Mark Walcher. This is because boarding and disembarking the machines poses the highest risk of accidents.

Furthermore, Liebherr will introduce four all-new assistance systems designed to support machine operators during their day-to-day work. These include an original active rear-view human detection system developed in-house, a new joystick steering system, an improved

weighing device and an integrated tyre-pressure monitoring system. 'With this portfolio of systems, we are offering our customers even greater safety along with the utmost efficiency', says the product manager. The new joystick-controlled steering system gives the driver exact feedback about the position of the wheel loader, because the position of the joystick precisely replicates the ramp angle. The sensors of the newly developed rear monitoring system can distinguish between human beings and inanimate objects, warning the machine operator in time, in case anybody is in the hazardous zone behind the machine.



‘Direct feedback from our customers is extremely important for product development.’

Mark Walcher

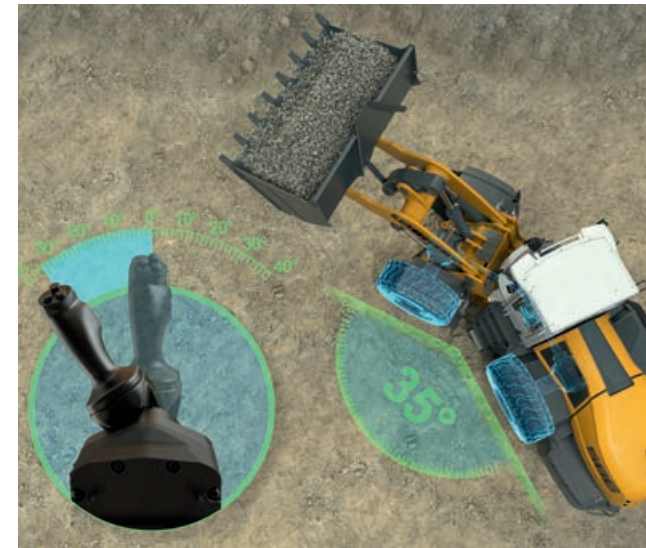
Think-tank for assistance systems

These solutions are all being developed at the Liebherr plant in Bischofshofen, Austria, where wheel loaders have been produced since 1960. ‘Bischofshofen coordinates the full development of driver-assistance systems within the Earthmoving division’, explains Mark Walcher, who has worked for Liebherr since 2009. They started out as beeper systems similar to the ones in passenger cars that warn drivers of obstacles. However, the shortage of specialised workers today has made more complex assistance systems indispensable. Above all, however, the markets (i.e. the customers) continue to optimise their supply chains, and this sets new requirements for vehicle development and construction.

Innovative by tradition

Listening to Thomas Breitsamer, you quickly get the impression that you are talking with someone who is running the family business with the deepest respect for his father’s life work, but who is also a visionary who takes a long-term view of the future. Along the way, the business has grown from a sanitation company to an ultra-modern recycling operation in which waste products are used to produce alternative fuels. ‘We see it as our duty as a waste management company to look at the bigger picture and think about what’s next for future generations. That’s why we produce over 30,000 tonnes of alternative fuels from the materials deposited here each year’, explains Thomas Breitsamer, whose company uses three compact L 507 Stereoloaders in addition to its three large wheel loaders. Another two telescopic handlers from the Liebherr plant in Telfs and two wheeled excavators from the Liebherr plant in Kirchdorf also perform without fail on the terrain. ‘Here in the Munich area, noise protection and emissions

are important factors that have to be considered’, says Breitsamer, who enjoys getting behind the wheel of his Liebherr machines himself whenever he finds the time. Breitsamer is impressed with the design of Liebherr’s machines. ‘They generate very little noise and are extremely fuel-efficient’, he says. Ever the pioneer in the field of waste management, Breitsamer already plans to take ownership of his next Liebherr machine at this year’s Bauma. The brand-new L 580 XPower wheel loader will be equipped with an extensive package of new assistance systems to continually meet the company’s needs. ‘Our drivers have a big job to do, so we want to make their lives easier with the right technologies.’



Liebherr presents a complete package of driver assistance systems at Bauma: the active rear-view human detection system, frontal area monitoring and the SkyView system ensure even greater safety on the construction site. The new joystick steering system, the tyre pressure monitoring system and Liebherr’s own weighing system with Truck Payload Assist increase the efficiency of the wheel loaders



Like Father, Like Son

Building one of the biggest trade fair booths in the world is an enormous challenge. A great deal of experience, organisational skill and craftsmanship go into ensuring that Liebherr leaves the best possible impression on visitors from all around the world at Bauma. Having nerves of steel helps too. Head of Construction Werner Haas has all of these traits, but this year he's also brought in some very special help – his son.

It's a tricky moment where everything has to fit with millimetre precision. Werner Haas directs the mobile crane with a circular wave of his hand. The cabin slowly descends and the men on the ground turn it until it is in position. Then things happen quickly. The cabin is mounted on the slewing platform in just a few steps. The young mechanic gets the presentation board out from inside. '1000 EC-H 50 Litronic', it reads. 'It's better if we leave the board down here', he says. 'When the crane is mounted, nobody will be able to read it 45 metres up.'

The man directing operations and the young mechanic obviously make a good team. And no wonder, since they are father and son. Werner Haas, 48, and his son Julian, 21, are both service mechanics at Liebherr-Werk Biberach GmbH. Werner Haas joined the company in 1991 and has been supervising the construction of one of the world's largest trade fair booths since 1998. His son Julian started an apprenticeship in mechatronic engineering at Liebherr in 2014 and is now a part of the construction team led by his father.

Both men like to roll up their sleeves. One is outside working with machine and crane assembly parts, whilst the other directs operations from his 'conductor's desk', a conference table in a small portacabin where Werner Haas has been orchestrating the various tasks since the beginning of November. This has included managing trade fair constructors, gas, water and electricians engineers, garden designers and

landscapers, graphic designers and, of course, the builders of Liebherr's more than 60 machine exhibits.

'We can only succeed if we work together, combining age and youth, experience and a fresh attitude towards innovation.'

Werner Haas

'Approximately 60 Liebherr colleagues and 80 of the staff from the trade fair organisation are responsible for achieving the maximum impact for us at Bauma', explains Werner Haas. 'I am the interface, the man at the centre of the storm.' That said, he's only as good as the team around him. 'We can only succeed if we work together, combining age and youth, experience and a fresh attitude towards innovation.'

And it isn't just talk – this is the tenth time Werner Haas has been responsible for the Liebherr booth at Bauma, and he is putting this combination of experience and youthful curiosity and energy to the test. His eldest son Julian was integrated into the team.

'It was inevitable', the father says with a mischievous grin. In the past, he would always bring his children models from the trade fairs. They loved playing with them, particularly the eldest. 'My fascination with cranes, construction machines and Bauma began at a young age', confirms Julian. Therefore, it was 'pretty much a given' that he would choose to do an apprenticeship in mechatronic engineering at the Liebherr plant in Biberach in 2014.

'My fascination with cranes, construction machines and Bauma began at a young age.'

Julian Haas

An amateur handballer in his free time, he has since teamed up with Liebherr to work as a service assembly mechanic, working mostly with tower cranes. His responsibilities range from training and instruction to repair and maintenance work. 'A crane is a wonder in every possible sense', he says admiringly. 'It's incredible how much steel is used.' If he has time, he likes to pore over the statistical calculations to get a deeper understanding of the laws of physics. 'Curiosity and a hunger for knowledge can't hurt', says the father.

The pair have already worked together for Liebherr at the trade fair in Paris. 'That allowed us to get attuned to each other in preparation for Munich and practice particular processes', explains Werner Haas. But there's no question of the Head of Construction giving his son any preferential treatment and that's the way both would have it. 'It's a fantastic opportunity to be part of this unique project and work in a really hands-on way', Julian Haas enthuses. 'It's a special job where there's plenty of scope for me to learn.'

However, work is far from over for the Liebherr team once construction work for the trade fair is done. 'During Bauma, we are constantly on the go doing demonstrations and maintenance', explains Julian Haas, full of anticipation. 'And when the doors of the trade fair close and everyone goes home happily, it's time for us to get stuck in again', adds Werner Haas with satisfaction. What takes half a year to assemble has to be dismantled and completely removed in five weeks. 'And then all the teams have the whole mountain to climb again.'

'People often ask how we can actually work together as father and son and if there isn't constant family strife and stress', explains Werner Haas. 'Of course, there are occasional



differences of opinion. That's completely normal. But in general, we get on just as well at work as we do at home', states Julian. In fact, it's got to a point where the women in their lives tick them off at the weekend. 'When we talk about work at mealtimes, my wife says that there must be something else to talk about besides Bauma', Werner Haas explains. 'And she's probably right. But the trade fair is a special event that only comes around once every three years, so it's only right that everything else revolves around it. Well, almost everything.'



Discover more:
www.liebherr-bauma.com



Following in Giant Footsteps

Eight axles, a 12-tonne axle load and 54- and 80-metre telescopic booms: at Bauma, Liebherr is showcasing its prototype LTM 1650-8.1, a new generation of powerful mobile crane. It took three and a half years of tinkering in Ehingen to develop the pioneering innovations that made this a reality.

Ehingen-made innovations are the source of constant amazement at Bauma, even if they have been an open secret for industry insiders for some time. 'Given their size, it's tough to keep new large crane models under wraps before they make their world premiere',

you'll notice as you approach the plant. A whole host of huge yellow and grey lattice and boom shapes can easily be seen stretching across the sky. They seem to beckon to onlookers, saying: 'Look here. This is the future of crane technology!'

sneak a glimpse from afar of the latest giant of a mobile crane from Liebherr. Those in the know have long suspected what Liebherr's engineering and development department was up to – namely, a new eight-axle mobile crane with an unprecedented amount of power.

At Bauma, the crane is now celebrating its official worldwide premiere: the LTM 1650-8.1 featuring two telescopic 54- and 80-metre booms. It is earmarked to succeed the LTM 1500-8.1 which has sold 600 units and is the best-selling large crane of all time. 'Those are giant boots to fill', says Bernd Boos, Head of Construction at Liebherr in Ehingen.

Three and a half years ago, the development and testing team of Bernd Boos, Josef Schick and other lead developers launched this ambitious project. 'Our goal was to achieve maximum

'Given their size, it's tough to keep new large crane models under wraps before they make their world premiere.'

Josef Schick

says Josef Schick, Head of Technical Testing at the Liebherr plant in Ehingen. If you visit the factory of the world's leading manufacturer of mobile and crawler cranes, this is the first thing

As Josef Schick recalls, the nosy parkers from the technology blogs did not need a second invitation. Since last year, they have repeatedly been spotted on the factory premises, trying to

performance on eight axles, with optimum flexibility and some notable increases in load-carrying performance compared to its predecessor', says Bernd Boos, summing up the size of the challenge facing the constructors. To achieve this as quickly, efficiently and reliably as possible, Liebherr employed 'simultaneous engineering' right from the start. This meant integrating everyone involved in the development process as comprehensively and early as possible. 'Everyone who needed to be involved in the project was there from the beginning', says Bernd Boos, 'from product management to purchasing, sales, construction, testing and quality control'. Depending on what stage the project was at, the size of the team would vary from five to 100 Liebherr experts.

'Every step in the project was exciting. Each one brought new challenges and called for genuinely innovative solutions', says Bernd Boos. 'In a project like this, theory and practice go hand in hand. As engineers, there were times when we had to don the blue overalls and work gloves to experience aspects of the construction work and any assembly hitches 'live' on the crane itself',

he says, before adding with a wink: 'And I'm sure I grew a few grey hairs in the process.'

Both this attention to detail, and the elegant streaks of grey have obviously paid off: the LTM 1650-8.1 will be made into a complete series with some pioneering new technology. The prototype constructed in Munich drives with a 12-tonne axle load including its telescopic boom and front outrigger. The rear support unit plus sliding outrigger posts can be attached using a throw and quick-release couplings. The whole process only takes 20 minutes.

For simpler tasks, according to Josef Schick, the crane's basic hardware can be set up in about an hour without the need for an auxiliary crane.

The LTM 1650-8.1 has a modular design. Customers can choose between 54-metre and 80-metre versions. If they need both sizes, it's a simple matter of swapping the telescopic part 3 and pulley head with the telescopic parts 3 and 5. This gives the crane more flexibility in terms of the tasks it can perform. In addition, the crane also boasts between 15 and 20% more load-carrying power – depending on whether or not



Both teams worked very closely with Bernd Boos (left) and Josef Schick (right) right from the start



the setup has an anchored telescopic boom.

The various lattice jibs showcase a high level of engineering expertise in crane construction. 'Our goal was maximum efficiency for a variety of different applications', explains Bernd Boos. Thus, the telescopic boom – regardless of whether the 54-metre or 80-metre version is being used – plus a fixed lattice jib ranging from 6 to 62 metres, can be extended quickly and easily. In addition, the luffing lattice jibs offer maximum height reach, load-bearing and performance over their length of 21 to 91 metres.

One of Bernd Boos' and Josef Schick's tasks was to constantly sound out the prototypes of the mobile crane on the factory premises. With 505 kW/687 HP and 3,160 Nm of torque, the eight-cylinder Liebherr diesel engine nonchalantly starts up the huge eight-axle vehicle. 'The engine meets Stage V emissions standards and can be adapted to meet the standards of countries outside Europe, e.g. Tier 4f in the USA or Stage IIIA for Low-Regulated Countries', says Josef Schick.

ZF's 'Traxon Torque' 12-gear transmission provides agile handling and outstanding manoeuvrability, as does the fact that all eight axles can be steered. 'The torque converter allows the vehicle to taxi and approach adeptly', explains Josef Schick before doing a couple of extra loops. The mechanically steered axles 1-4 and electro-hydraulically

'Our goal was to achieve maximum performance on eight axles, with optimum flexibility and some notable increases in load-carrying performance compared to its predecessor.'

Bernd Boos

steered axles 5-8 enable five different steering modes to be used. The 'All-Wheel Drive' mode allows the crane to achieve the tightest turns whilst the 'Crab Steering' mode even allows it to move sideways. 'Maximum driving performance and mobility is a must on the construction site', says Josef Schick. Drive settings now include an ECO

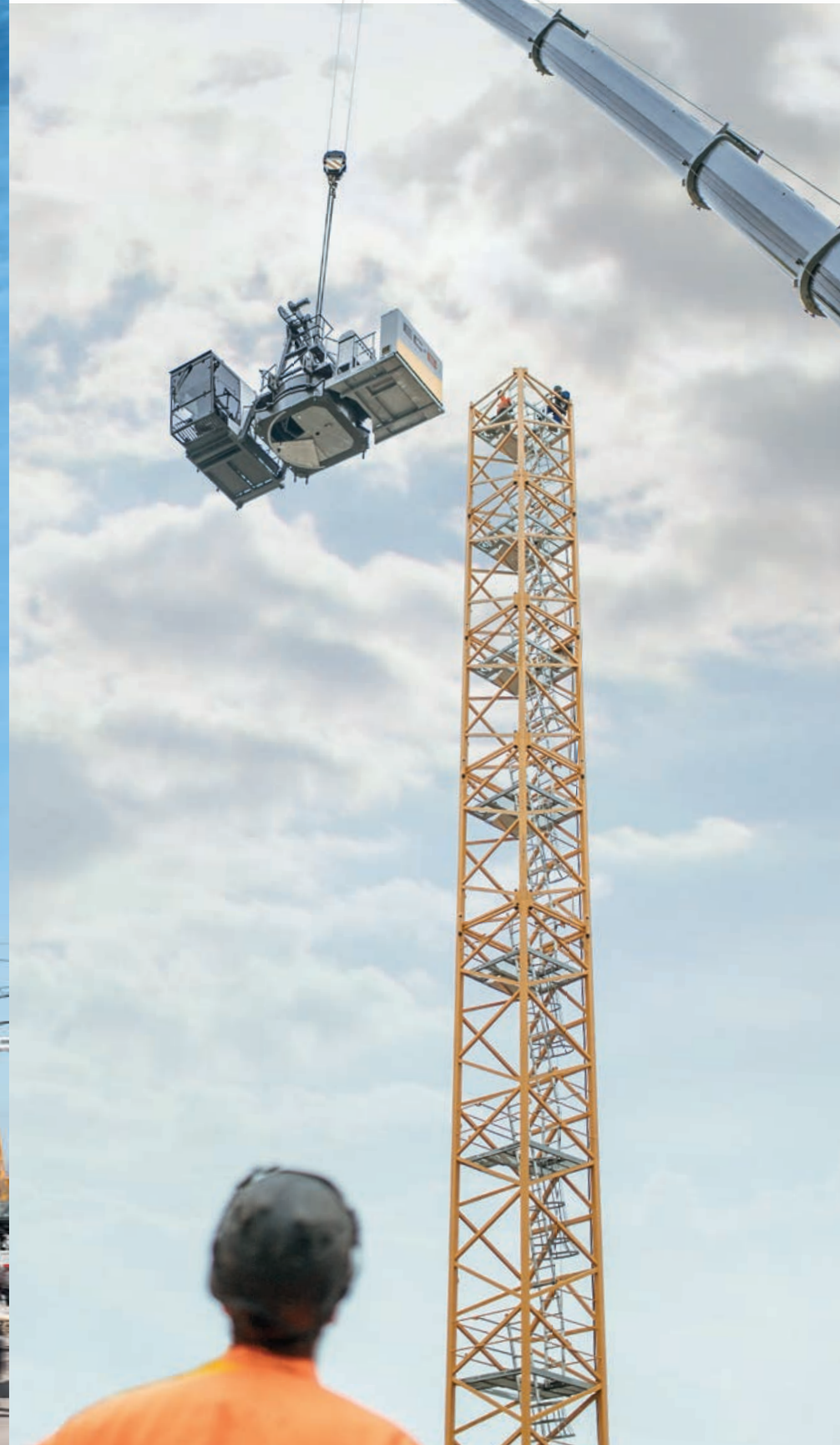
mode alongside the existing 'Power mode'. This saves fuel by reducing engine revs whilst also minimising noise.

Bernd Boos and Josef Schick park the mobile crane back in the testing hall and contemplate their 'handiwork'. One thing they can definitely agree on: 'The excellent collaboration with other Liebherr divisions has contributed greatly to this achievement. We are in a position to make better products because we can adapt our components to meet the requirements of the crane perfectly, rather than buying all of them off the peg', says Bernd Boos.

Nevertheless, after its worldwide premiere at Bauma the Liebherr developers will not be resting on their laurels. 'Now it's full steam ahead as we've got a whole series to test', says Josef Schick, full of anticipation. In fact, there's always another mobile crane in the pipeline. 'We've got some really exciting ideas for our 100-tonne class', Bernd Boos confides. 'There's never a dull moment here.' We're sure the nosy parkers from the blogs will be glad to hear it.



Discover more:
www.liebherr-bauma.com



The Sky's the Limit

The world premiere of the new EC-B series of Liebherr tower cranes marks the arrival of a brand-new generation. These impressive cranes were tried in the field for the first time at a hospital building site near Rotterdam. It was such a special occasion that even the wind made an appearance.

You'd be forgiven for thinking that Poortugaal is spelt incorrectly. But, in fact, we are not referring to the country on the Iberian Peninsula, but a place in the Netherlands approximately 15 kilometres south of Rotterdam. Roel Reinders and Arno Heger would definitely prefer to be in the 'real' Portugal on this January morning, which is not just cold but also very stormy. Today the four-strong team of technicians from the Dutch crane specialists Van der Spek are going to rig a crane on a hospital construction site. And not just any old crane – this is the world premiere of the 340 EC-B from the new Liebherr flat-top series.

'This is just really, really cool and not any kind of routine job. We have to inspect everything even more carefully than usual and make sure we check every handle,' says Roel Reinders, who is very eager to start the task that lies ahead. Roel Reinders and his team do

Now.
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Liebherr at Bauma 2019

Welcome to Liebherr at Bauma 2019. From 8-14 April, visitors can experience one of the largest exhibition booths in the world. Here is an overview of what you can look forward to.

Training. Passion & Opportunities., THINK BIG!, ICM Foyer, Booth 308

'At the education booth at the ICM we are putting on some exciting events about starting a career at Liebherr. An interactive careers advisor will suggest personalised traineeship options and younger students can explore the wonder of our products by trying their hand in one of our miniature diggers.'

Marcel Steinhauser, Trainee Construction Mechanics



Components. Move & Improve., Hall A4, Booth 326



Components. Move & Improve., Hall A4, Booth 326

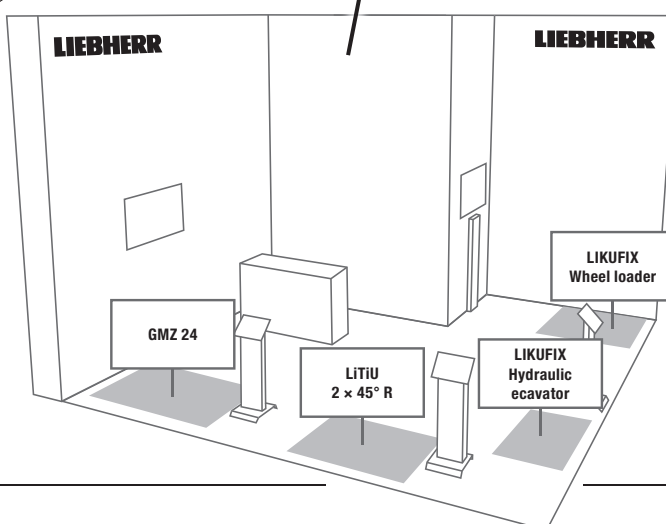
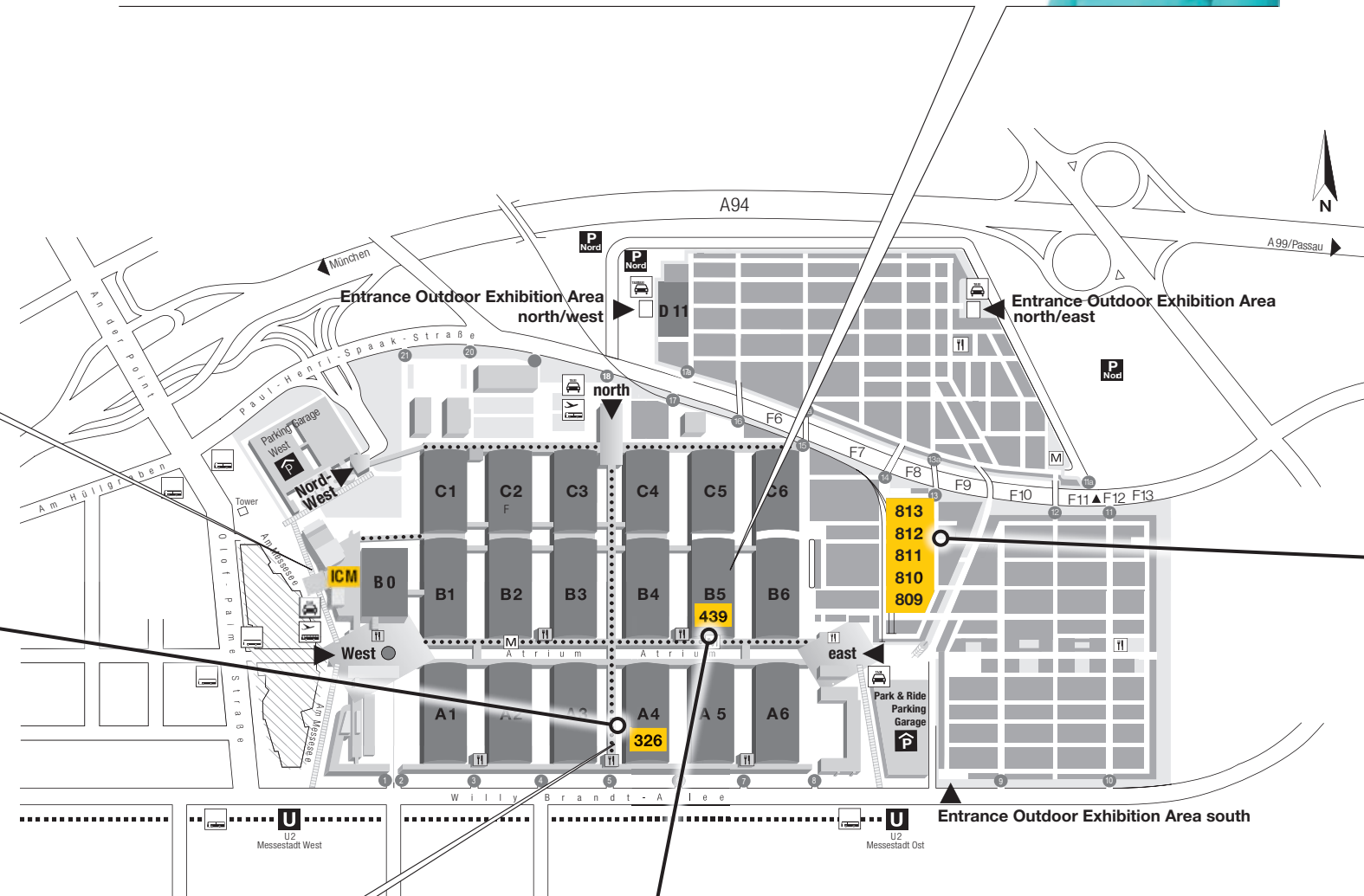
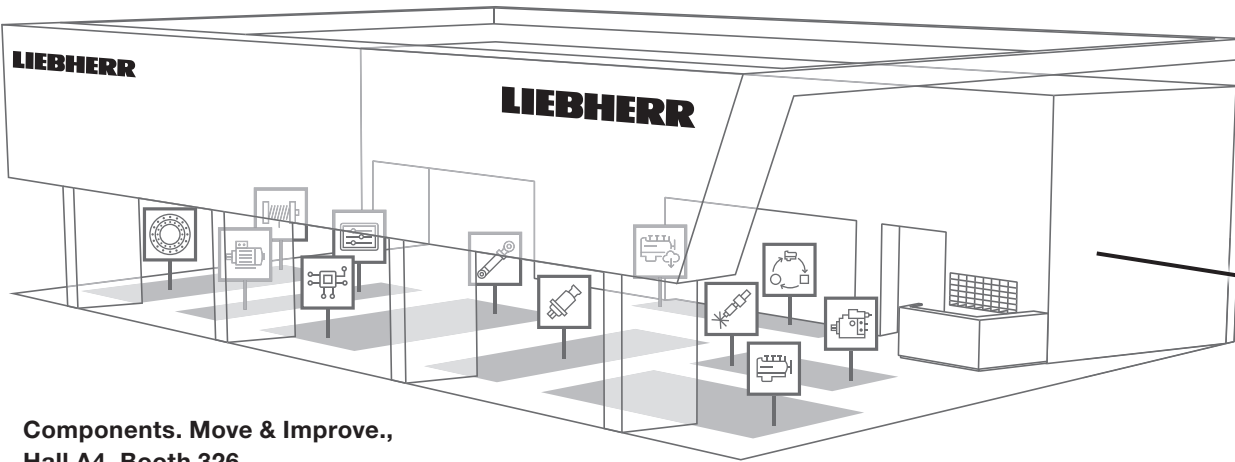
'Condition monitoring is the central theme at the components booth at this year's Bauma. Acting as a developer partner for machinery manufacturers, Liebherr provides standardised data using a standard interface. You can use an app to explore these technological features for all Liebherr components – from diesel engines to energy storage, hydraulics, gearboxes and slewing bearing. The app enables machinery manufacturers to keep their clients' fleet managers, service technicians and machine operators up to date about the condition of their components.'

Stefan Wallmüller, Head of Department Controls

Tools. Attach & Work., Hall B5, Booth 439

'Liebherr develops and manufactures innovative accessory tools and rapid top-of-the-range exchange systems. Did you know that these can be used both with our machines and comparable models from other manufacturers? Call in at hall B5 to see the quality of our new generation of clamshell buckets and test the Liebherr LIKUFIX rapid exchange system on one of our models.'

Manuela Gischel, Sales

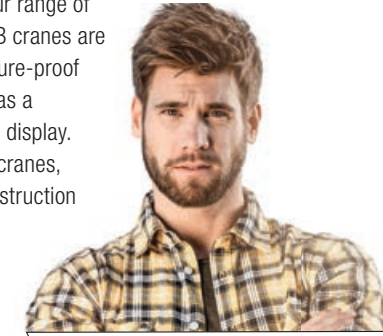


Tools. Attach & Work., Hall B5, Booth 439

Tower Cranes, Outdoor Booth 809 - 813

'Power-lifters are not just down at the gym. You can also find them in our range of tower cranes. The new EC-B cranes are especially powerful, and future-proof with modern features such as a fibre rope and a multi-touch display. The new rapid-deployment cranes, axle system and mobile construction cranes are also looking in excellent shape.'

Jan M., Strong Guy



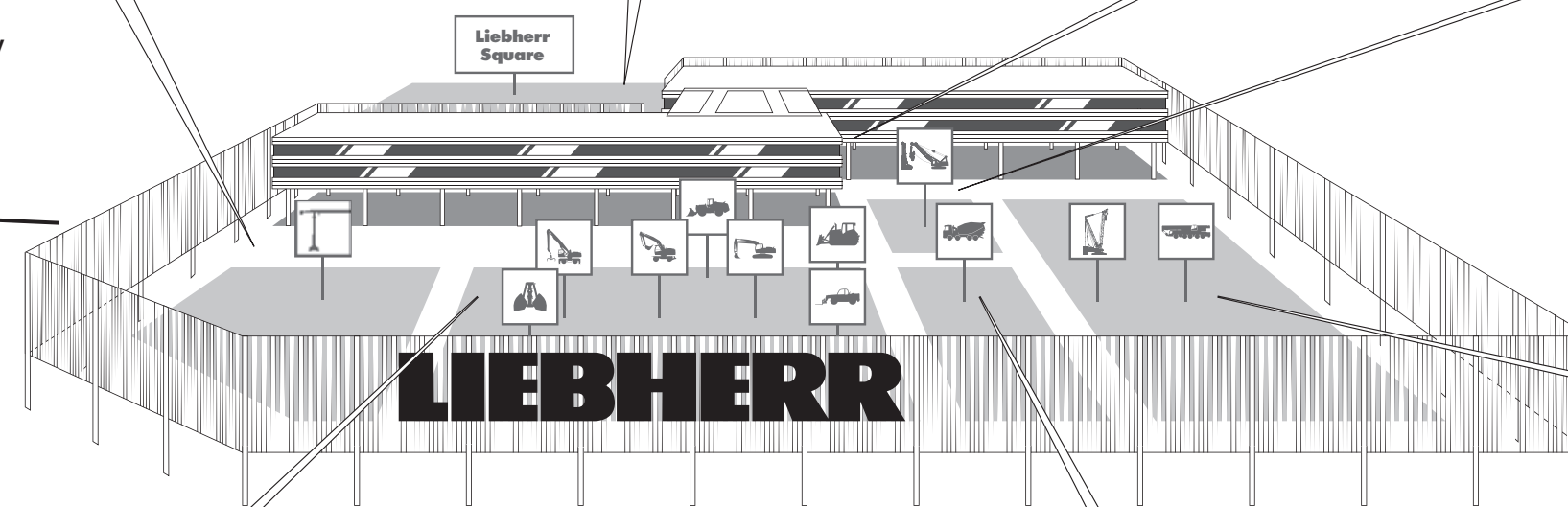
Mining, Outdoor Booth 809 - 813

'Liebherr-Mining goes electric! We are proud to present two solutions which will reduce our environmental footprint and noise pollution: the R 9200 electric excavator and the T 236 diesel-electric truck. We will hold three demonstrations every day which promise to be a truly unique experience for visitors. This includes the chance to turn on a switch which unleashes 6,000 volts and starts up a 210-tonne electric mining excavator.'

Grégory Schuh, Marketing



Construction Machinery and Mining, Outdoor Booth 809 - 813



Innovation. Machines & Show., Outdoor Booth 809 - 813

'Take a bold look into the future with us. An impressive display of machinery will be shown four times a day (10:30 am, 12:30 pm, 2:30 pm, 4:30 pm). We will also be presenting innovative approaches and real-world solutions for the Construction Site 4.0 and the Harbour 4.0. You can look forward to a fun and fascinating presentation.'

Alexander Katrycz, Marketing



Innovation. Share & Explore. Outdoor Booth 809 - 813

'Would you like to find out more about specific technologies and discuss these with the experts? Would you also like your feedback to become an important part of our future development process? If so, come and visit us in the Innovation. Share & Explore. area, and find out how to get involved.'

Florian Mang, Development Engineer



Deep Foundation, Outdoor Booth 809 - 813

'The LB 16 unplugged is the world's first battery-powered large-diameter drill. The electro-hydraulic power unit of the LB offers 'Local Zero Emissions' whilst providing exactly the same level of performance in the field as the conventional device. At our booth, you will be blown away by the new technology. You can also have fun trying to charge the battery up yourself.'

Michael Rajek, Product Manager



Mobile Cranes, Outdoor Booth 809 - 813

'Visitors can marvel at the four mobile cranes making their debut at the trade fair. We will be presenting the LTM 1650-8.1, a new 8-axle model designed for maximum performance and which will be replacing the LTM 1500-8.1, the most successful large crane of all time. The LTM 1110-5.1 is a second world premiere for us, whilst the LTM 1230-5.1 and the LR 1800-1.0 crawler crane have already been showcased during the 2018 customer days. We will be presenting 13 different types of crane, plus some exciting technologies and service products for mobile and crawler cranes.'

Lei Shen, Project Leader Homologation



Concrete Technology, Outdoor Booth 809 - 813

'There are a few innovations in concrete technology. One particular highlight is the new 42 M5 XXT truck-mounted concrete pump. This medium-tier device has a totally new motor called the 'Powerbloc' for its pump system. To better demonstrate its key features, we are showing you the pump unit whilst disassembled. In our next-door technology showroom, you can see video animations that explain the new pump unit and how it works with the new semi-closed oil system (HCC).'

Tobias Waitzinger, Product Manager



not appear to be fazed by the mud, rain and icy cold wind. The team are all smiles, outshining anything the weather can throw at them.

It was still dark when the low loaders arrived at 7.30 am, carrying the crane components and the mobile crane. 'The first special feature was noticeable even when the crane was still on the truck', explains Arno Heger. 'Instead of the usual two, there are now three jib sections that fit on one truck bed.' Liebherr has redesigned many details on the top of the crane for easy transportation and assembly. The EC-B's compact head, jib and trolley are now even lighter than their predecessors. Furthermore, as the jib is narrower, three jib sections now fit on one truck bed. This means that even the shortest jib can be transported with one fewer transport truck. When the jib is fully extended, at least two fewer trucks are required to transport the crane. The team at Van der Spek greatly appreciate this fact as it saves them both time and money.

Another detail arouses the interest of the assembly team. The new cranes have also been designed with optimised quick-assembly connections for jibs and counter-jibs which makes assembly even easier and, above all else, safer. However, it is still important that the weather cooperates when assembling tower cranes. Even the best systems will not tolerate too much wind and the jib sections start to sway intermittently when they are lifted from the low loader by the mobile crane. 'It doesn't look like we will be able to complete the assembly process quickly today', Roel Reinders surmises. This means there is more time to focus on the new crane.

The EC-B series includes a wide range of cranes from small city cranes to large material-handling cranes. The maximum lifting capacities range from 6 tonnes to 16 tonnes and the maximum jib head load capacities range from 1.6 tonnes to 2.8 tonnes when working at maximum radius. The largest cranes



The wind is a force to be reckoned with while assembling the jibs

in the new series – the 340 EC-B and the 370 EC-B Fibre – each have a maximum radius of 78 metres.

Back on the construction site in Poortugaal, the wind has started to die down. But will it be enough to enable the jib to be assembled safely? Meanwhile, the assembly team have expertly constructed the substructure and the tower in no time at all. The slewing platform is also already in position. 'I have been assembling cranes since I was 18 years old. I am now 36 and I never fail to be impressed by the latest innovations from Liebherr. It is fascinating to see how easy it is to construct the EC-B using

the new plug connections', Roel Reinders tells crane operator Niels Molendijk. 'You're going to love it', he shouts as Niels Molendijk climbs into his new workspace, a warm and spacious cab which allows in plenty of natural light.

'Wow, I've never seen anything like it', 34-year-old Niels enthuses. It is more luxurious, there is more room and a greater field of vision. These are the main standout features on seeing the LiCAB in the new top-slewing crane for the first time. The cab is over two square metres in size and offers more space than previous EC-B cabins. The large wind-screen provides Niels Molendijk with a



Crane operator Niels Molendijk's new workplace

large field of vision from his seat. Not only can he see the whole construction site beneath him, he also gets a perfect view of the tributary of the Meuse River and far into the distance along the North Sea coastline of South Holland.

In addition to the ergonomically positioned operating controls, Niels Molendijk likes the range of storage areas and surfaces. There are even several 230V sockets. 'What a luxury!', Niels Molendijk enthuses. 'I can make myself a cup of coffee and charge my walkie-talkie.' There are even USB ports for charging smartphones and a Bluetooth system to make hands-free telephone calls and play music from a mobile phone. Niels Molendijk is amazed. 'This cabin is an enjoyable place to be. I'm totally blown away.'

The technicians below glance anxiously at the sky. Even though the wind has dropped, the clouds scudding across the sky suggest that the storm is not ready to blow over quite yet. 'It's worth a try', suggests Roel Reinders. The mobile crane lifts the counter jibs. The assembly team swiftly attach the connection above. But will the crane be fully assembled by the end of the day? Unfortunately, the wind picks up again, which makes the last strut element on



The Van der Spek technicians (f.l.t.r.) Miloud Tak, Arno Heger, Roel Reinders, Danny Van Der Eijnden and mobile crane driver Andre De Rijk

the mobile crane hooks sway precariously. Roel Reinders shouts 'Abort!' into the walkie-talkie. 'The jibs need to be fully assembled or not at all.' The sections that have already been assembled are brought down again. 'The weather forecast for tomorrow is good. We can finish then without the wind and the rain.' The world premiere of the first 340 EC-B is postponed until the following day. The case is clear for Roel Reinders and his team. 'Safety is paramount.' In Poortugaal and everywhere else in the world.



Fibre rope soLITE

The new EC-B models also feature innovative 'fibre' rope technology. Some of the new EC-B models are also available with the soLITE high-tensile fibre rope instead of the customary steel rope. For ten years, Liebherr has been working in partnership with the Austrian rope manufacturer Teufelberger to bring this new type of rope to market.

This innovative rope solution offers considerable benefits, which could even be regarded as ground-breaking. Compared with cranes which use steel rope, fibre cranes can achieve a 20% higher jib head load capacity, and the fibre rope lasts four times longer than steel rope with the equivalent amount of usage. As fibre rope is around a fifth of the weight of steel rope, reeving the hoist rope is also significantly easier. In addition, maintenance is much more straightforward as the fibre rope doesn't need to be lubricated. The fact that different layers of the rope's outer cover wear down at different rates is also a major plus point when it comes to operational safety. The crane operator knows that it is time to replace the rope when the red layer underneath the cover becomes visible.

Discover more:
www.liebherr-bauma.com

Liebherr Shop

Visit us in the Liebherr shop at Bauma or online at: www.liebherr.com/liebherrshop



1 | Liebherr LTM 1090-4.2. True to the original model of the 4-axle mobile crane with 90 t max. load capacity. 1:50 scale. Die-cast zinc model by WSI. Length: approx. 30 cm. **Item no.:** 12229275 **Price:** €167

2 | Liebherr metal keyring. Solid metal keyring made of solid cast iron material. With O-ring and metal logo plate. Packaged individually. Size: approx. 56 x 11 mm. **Item no.:** 12217250 **Price:** €4.90

3 | Liebherr R 938 Litronic crawler excavator. Model of the versatile crawler excavator, scale 1:50. Die-cast zinc model by Conrad. Length: approx. 18 cm. **Item no.:** 12238776 **Price:** €92.50

4 | Softshell jacket. Black softshell jacket with a sporty yet elegant look made of breathable and water-repellent functional material. Perfect fit making it easy to move around. Adjustable cuffs. Various inside and outside zip pockets. Material: 96% polyester, 4% spandex. Sizes: S-3XL. **Size / item no.:** S/12765411 M/12765412 L/12765413 XL/12765414 XXL/12765415 3XL/12765416 **Price:** €87.50

5 | Griptool. Versatile multi-tool from Richartz. Compact, solid and always ready for use. Matt blasted stainless steel handles with plastic inserts. With 12 functions. Including black belt strap. Dimensions: approx. 10 x 4 x 2 cm. **Item no.:** 12765432 **Price:** €16.90



All Things New

After five years of development, Liebherr-France is ushering in a new era for crawler excavators. The 8th generation of this heavy-duty machine is a technological revolution both in terms of the machinery and the production process.

The wedding cake, wedding bells and the festive music may be conspicuous by their absence, but the wedding is still a very special one. On a Thursday afternoon in February in Colmar, the undercarriage and uppercarriage of an R 922 will form a lifelong union, and the 60,000th crawler excavator made by this historic Liebherr production plant in France will be almost ready to roll off the line.

However, all those present will be concentrating far too hard, and will be too tense to even contemplate popping a champagne cork. Today is not just the celebration of a special model. It is also the birthday of the new assembly line for the 8th generation of crawler excavators. A lot of the processes and hand movements are still unfamiliar and demand total concentration from their operators. In any case, a cameraman is on hand to record this doubly historic moment.



Thomas Haas, Head of Product Management

'We wanted to take a big step forward and really modernise Liebherr's crawler excavators.'

Thomas Haas

Liebherr-France SAS has invested five million euros in the new production equipment, with three assembly lines running alongside each other here in halls 5 and 6. You can see straight away which line belongs to the older model celebrating its anniversary today.

'It's all brand-new', says Florent Arjoux, Head of Engineering Process Management. 'The assembly stands, the pneumatically controlled transport rails, material procurement and logistics and digital process management.' And you can't miss it: the generous space and well-designed, ergonomic workstations stand out a mile. It's abundantly clear that a new kind of production philosophy is at work here.

'We wanted to take a big step forward and really modernise Liebherr's crawler excavators', says Thomas Haas, Head of Product Management at Liebherr-France SAS, confirming our first impressions. The 8th generation is a totally new type of crawler excavator designed for earthmoving and for quarry work. Since it is built around a platform base with a range of modular options, we needed an equally flexible and dynamic assembly process.

Whilst the 60,000th crawler excavator enjoys a quiet celebration, it's all about the new 8th generation. The developers have promised more power, greater productivity and increased safety, as well as maximum comfort for the operator and maintenance staff.

During its introduction phase, the 8th generation will consist of seven models ranging from 22 to 44 tonnes. The R 922 and R 924 have engines that comply with Stage V emissions and have been developed for countries with strict emissions regulations. The other five models, the R 926, R 930, R 934, R 938 and R 945, have a range of engines that suit countries with both strict and less stringent regulations. 'It's always about customer focus for us. We can significantly increase the models' profitability with more powerful engines for shorter load cycles, heavier ballast weights for higher bucket capacities and reduced fuel consumption', says Thomas Haas.

'Our philosophy is market to market', explains Thomas Haas, with regard to Liebherr's development ethos. During the five-year development process, product management, development, production and sales were in constant dialogue with one

another. There was also plenty of exchange happening within the departments themselves – particularly the Components division. 'In fact, by working together with colleagues from Biberach, Lindau and Bulle, we were able to adapt the new components to match our requirements very precisely', says Florent Arjaux. With 'off-the-peg' components, that would not have been possible. 'As a result, we have been able to create different modular platforms really quickly and efficiently, and this has enabled us to have uniform structures in production and a package of components for the various models.'

The close collaboration has also helped us massively increase the machinery's digging power, the undercarriage's traction, and the swing torque of the uppercarriage, as well as ensure that they complement each other perfectly', explains Thomas Haas. 'This helps us achieve a much higher level of performance on the construction site'. Another example is the 8th generation's new control block, which can be rearranged in sandwich construction to suit all emissions stages, and which can therefore be custom-fitted for all markets. 'At the heart of the control block are the innovative electronics that control the hydraulics. Besides performance, another important consideration when developing this innovation was to lay the foundation for the continuing

digitisation of all our machines. Liebherr is well prepared for the construction site 4.0.

'At the heart of the control block are the innovative electronics that control the hydraulics.'

Thomas Haas

However, the 8th generation looks very handy on a 'conventional' construction site as well. We redesigned and enlarged access to the uppercarriage and platform to increase safety during maintenance. 'You can now climb onto it from the side', says Thomas Haas. The new service concept for the new crawler excavator is particularly user-friendly as all maintenance stations can be accessed from ground level. For optimal control, the machine monitors its engine oil, hydraulic oil, and fuel and carbamide levels, which are also displayed in the driver's cabin.



A special union: the undercarriage and uppercarriage of the 60,000th crawler excavator are mounted



A real team effort: product management, development, production, procurement and sales have been in constant dialogue with each other

When the vehicle is operating, the standard rear and side-view cameras and the optional SkyView 360° camera system provide the driver with optimal panoramic views. The halogen headlights have been completely replaced with LED technology, providing better lighting over longer periods and reducing energy consumption. In addition, assistance systems help the driver recognise obstacles and people, providing a warning if needed and helping to prevent collisions.

However, there's still some way to go before the R 922 can travel from its celebratory launch in Colmar to work on a construction site. In fact, Liebherr has special plans for the royal blue crawler excavator. 'It will be part of a roadshow in 2019', says Thomas Haas. 'And then it can show customers throughout Europe what the 8th generation is made of.'

Discover more:
www.liebherr-bauma.com

Status Updates from Werner Haas

During the six months leading up to Bauma, Werner Haas leaves his life in Upper Swabia behind and moves to Munich where he has been responsible for managing the construction of Liebherr's exhibition booth since 1998. He undertakes this monumental task with enthusiasm and intelligence, supported by his on-site team of 60 colleagues. He keeps everyone back at home informed with regular updates via WhatsApp. Werner Haas uses this platform to inform everyone about the latest news, successes, challenges and unusual events. Here is a brief insight into his activities:

November

We're ready, the machines are ready – let's get going!



Things are already coming together. The Liebherr booth is starting to take shape.



December

It's starting to get colder. It's a good thing the windows are being installed!



Merry Christmas! The building shell is complete!



January

Topping out ceremony! Three cheers for the team. Still a few more weeks to go.



Time to press on... interior construction in progress.



February

The first machines have just arrived at the booth. There are more to follow.



March

The filters have been attached. The booth is gradually taking shape.



April

Job done! We can now look forward to a successful Bauma 2019!



Further Development of the MyLiebherr Online Portal

Customers, service partners and Liebherr employees can access an extensive range of online services provided by the Liebherr Group via the MyLiebherr platform. Various additions and new features are also in the pipeline.

Wouldn't it be great if you could find a replacement part with a simple click of the mouse or quickly download a machine manual you need to your device? With MyLiebherr you can. The platform was developed to give Liebherr customers 24/7 access to information and services relating to products they have purchased, whether construction machinery, mining equipment, mobile and crawler cranes, material handling technology or maritime cranes. The developers' prime focus was to ensure that the platform provided a wide range of user-friendly features and an uncluttered and flexible user interface.

Register and get started

The full functionality of the platform can be used once the registration process has been completed and the business relationship with a Liebherr service partner has been confirmed. Once the user has logged on to the system using the Single-Sign-On process, a wide range of online features can be accessed. These features already include a comprehensive replacement parts catalogue and a quick and convenient way to contact your respective Liebherr service partner. In this way, customers can coordinate the maintenance and size of their machinery fleet wherever they happen to be in the world. Depending on whether the feature is supported by your service partner, the system is also able to tell you if the part you require is available and when you can expect to have it delivered.

More of everything

Liebherr is continuously developing its online portal in order to provide an optimum user experience. A Replacement Parts Shop interface is in the pipeline, which will provide an order processing system that will be almost entirely automated. This is particularly relevant for users who would like to save money when purchasing essential materials such as Liebherr replacement parts and operating supplies and accessories, whilst also guaranteeing supply. In the crane section, online configuration tools allow quick selection of the right crane for a specific application.

A one-stop shop

Liebherr intends to gradually integrate existing applications into MyLiebherr so that the system can develop into a centralised personal portal for the whole Liebherr Group. This will include the data transfer and tracking system LiDAT, which enables customers to manage and monitor their machinery and vehicle fleets. LiDAT also provides localisation information relating to machine operation. This includes information such as machine position, operating and usage times, fuel consumption and service interval information. Instead of having to switch between the MyLiebherr portal and the LiDAT platform, there will be just one convenient access point, which can be accessed from anywhere.

The advantages of MyLiebherr at a glance:

- Individual management of machines
- Simple contact with your Liebherr service partner irrespective of opening times
- Online access to the constantly updated spare part documentation of your machine
- Direct and convenient order option with the Liebherr service partner
- Display of price and availability by your service partner

MyLiebherr – A portal for your online services



MyLiebherr combines the following product areas in one portal:

- Construction machines
 - Earthmoving
 - Deep foundation
 - Tower cranes
 - Concrete technology
- Mining
- Mobile and crawler cranes
- Material handling technology
- Maritime cranes



Tomorrow. Trends Vision. &

Alternative Drive Systems – Quo Vadis?

Where are we heading in terms of drive system technologies? Can electric engines knock diesel off its perch? Or are there other energy sources that are in contention? And how prepared is Liebherr for this? We look at the evidence with Dipl.-Ing (TU) Klaus Graner, Managing Director and Head of Drive System Technology at Liebherr-Components Biberach GmbH.

Mr Graner, how long has Liebherr been involved with alternative drive concepts and which of them have been used in real-life applications?

K. Graner: Essentially, Liebherr has been heavily involved in developing alternative drive concepts since the company was founded. With the invention of the tower crane in 1949, the firm's founder, Dr E.h. Hans Liebherr came to the conclusion that it was better to produce certain parts of the drive technology in-house, as he was dissatisfied with what was available on the market. Thus, Liebherr has been developing and building electric machines and control boxes for its tower cranes in Biberach since the 1950s. As such, we have gained experience, particularly in electrical drive concepts, throughout the course of our history. Just as it did in the past, this helps us develop new drive concepts like diesel-electric systems for mining trucks. Liebherr has been producing complete mining trucks with this drivetrain for approximately ten years.

What applications and machines are the drive concepts best suited for?

K. Graner: This is not just a question about technology but more of an economic calculation, which is why diesel engines and hydraulic systems dominate the construction machine category. They benefit from high power density and being low on weight and on costs. When a business looks at investing in a construction machine, there are two key performance criteria: how many tonnes the machine can shift per hour and the costs per tonne. This allows it to calculate when the return on investment (ROI) will be reached and the machine starts making money.



'We have gained experience, particularly in electrical drive concepts, throughout the course of our history.'

Dipl.-Ing. (TU) Klaus Graner

What does this mean for electric drivetrains?

K. Graner: An electric drivetrain is more efficient than hydraulic solutions – with 90% and 70% efficiency respectively – and also achieves significant savings in energy consumption. However, it is much more expensive to procure. For example, compared with a diesel-hydraulic system, it takes many operating hours to recoup the additional costs of using a diesel-electric system, due to the reduced fuel consumption. With construction machines, which operate up to 2,000 (but often only about 1,000) hours per year, this process obviously takes significantly longer than with machines such as mining vehicles, which operate for 5,000 hours or more.

When it comes to shifting heavy and super-heavy loads, the diesel engine has ruled the category since the beginning of mobility. What level do you think alternative drive systems are currently at?

K. Graner: First things first: diesel is, and will continue to be, the standard for mobile construction machines for a long time. The fuel has an extremely high energy density, meaning that mobile machines can operate for up to 24 hours on a reasonably-sized tank of fuel. In addition, modern exhaust systems complying with increasingly strict EURO norms mean that emissions of pollution have continually fallen. Construction machine operators know exactly how important this can be. It

remains to be seen whether hydrogen or synthetic fuels can replace diesel and take combustion technology to the next level in terms of CO₂ neutrality. Because of their heavy weight, large volume and the high cost of batteries, I think purely electric transmissions are some way off being able to replace diesel completely.

'It would be naive to think that governments would only hold the car industry accountable for protecting the environment and forget all about construction machines.'

Dipl.-Ing. (TU) Klaus Graner

What do you think about diesel-electric engines? Can they exploit the advantages in both technologies?

K. Graner: The benefits of diesel-electric transmissions are most obvious when it comes to high power applications and when dealing with very long operating times. Electrical power conversion has a 90% efficiency ratio – 20% higher than mechanical-hydraulic solutions. This affects energy consumption which in turn impacts CO₂ emissions. Our analysis suggests that in the current circumstances it only makes economical sense to use diesel-electric engines starting at around 5,000 operating hours per year, as is the case predominantly in the mining segment. In the case of smaller machines, it could be interesting in the future if, like in the car industry, there are legal targets and restrictions relating to CO₂ emissions for individual machines, or for whole fleets or motor parks.

How real a possibility do you think it is that legislators will create rules of this kind?

K. Graner: It would be naive to think that governments would only hold the car industry accountable for protecting

the environment and forget all about construction machines. Nevertheless, nobody knows whether these types of regulations are coming, and if so, when. We are therefore continuously developing alternative drive technologies so that we will be well prepared when it does happen, and can offer our customers immediate solutions.

How close are we to emission-free construction sites?

K. Graner: Because fossil fuels still account for a large portion of overall energy consumption today, discussions about emission-free construction sites tend to be restricted to 'local zero' emissions. To achieve truly CO₂ neutral construction sites on a global level, they would obviously need to be powered by renewable energy; in other words, it would take an energy revolution. We are developing suitable technologies and components for fully electrical construction machine drivetrains. However, it will be up to policy-makers, not developers or financially driven machine operators, to decide whether we can at least achieve local zero emissions on construction sites in inner-urban areas. The additional costs entailed will only be paid when local zero emissions are enforced by law or regulations. Then, it will depend on the nature of the project whether to use batteries for energy storage or to physically 'plug in' machines. In the case of lengthier, more difficult applications, we would hit physical limits pretty quickly.

Can you give us an example?

K. Graner: Take, for example, a purely electric 50 kW wheel loader, designed to work continuously for four hours in the morning on an inner-urban construction site, and which is then recharged during the midday break so it can work for another four hours in the afternoon. The average power consumption at the drive shaft of an electric engine doing lighter work like this is about 12 kW. Over a four-hour period, this is equal to 50 kWh of energy. A battery with this effective energy content would weigh about 500 kilos, have a volume of 250 litres and cost around 30,000 euros. For jobs that are significantly more intensive and time-consuming than the one I have just described (for example, on large-scale earthmoving construction sites or in the mining industry), it seems more realistic and efficient to use combustion engines powered by hydrogen or synthetic fuels, both of which would ideally be produced in a climate-neutral way in the future.

What kind of battery innovation do you think has the greatest potential?

K. Graner: The experts assume that the prevailing lithium-ion technology will continue to dominate the next 15 years. During that time, energy density may improve somewhat, but it is pretty unlikely that there will be a quantum leap forwards.

Time is of the essence when it comes to climate change and the consequences for the environment, the economy and society. Are there any quick solutions? How long do you estimate it will take to develop alternative engines from the inception of the idea to being ready for mass production?

K. Graner: Technologically, we have already made a lot of progress on the electric drivetrain. Now it's a matter of making it more compact with higher-rpm electrical machines, so that these drivetrains can be fitted on construction machines with sufficient ease. We estimate



that it will take from three to five years to reach batch production. However, solutions involving battery-powered or plug-in construction machines will only help prevent climate change if the power is generated from renewable sources.

How do you do that?

K. Graner: We are in close communication with customers inside and outside the Group throughout the development process. They know their work sectors and available budgets better than anyone else. When we execute ideas, we combine the experience and expectations of our customers with the know-how and testing and checking infrastructure of the Liebherr Components division. When creating innovations, it is helpful that we can sometimes adopt solutions from other projects and adapt them to fit our needs. This saves on time and costs.

How are the efficiency and performance of alternative engines affected by being in challenging environments such as quarries and mines?

K. Graner: For some years, we have gained important experience from the fact that our diesel-electric engines are used in mining vehicles. As a result, it has become clear that we can achieve greater efficiency on upward slopes with more electrification. In some mines, these ramps stretch over more than five kilometres and span a height differential of up to 500 metres at a 10% incline. For current diesel-electric mining vehicles, this means driving for around 25 minutes at full power. This accounts for about 90% of total fuel consumption.

Since we have already had cases where machines operate for very long periods over exactly the same routes, we are already working with customers (for example, in Austria and Panama) to electrify the routes completely by using overhead lines and current collectors on our diesel-electric mining trucks.

Although this is possible in a mining setting, it would be far more difficult on temporary construction sites where the machines are constantly working in different areas. How mobile do you think electrification will be?

K. Graner: It is conceivable that there will be construction machines that drive to their work location using combustible fuel and then do their work there without requiring the mobility of a wheel loader, for example. This would enable them to be supplied with energy using a power outlet. One example of this would be a crawler excavator digging a hole with only a small deployment radius. This already happens with tunnel excavators, to prevent tunnel tubes from being filled with exhaust fumes. It would also be conceivable to use a cable connection to the power grid on a construction site, for example, for mobile cranes, concrete pumps or concrete mixers. As I mentioned before, for lower power requirements, electrical machines with a suitable battery would be just as mobile as conventional machines on construction sites.

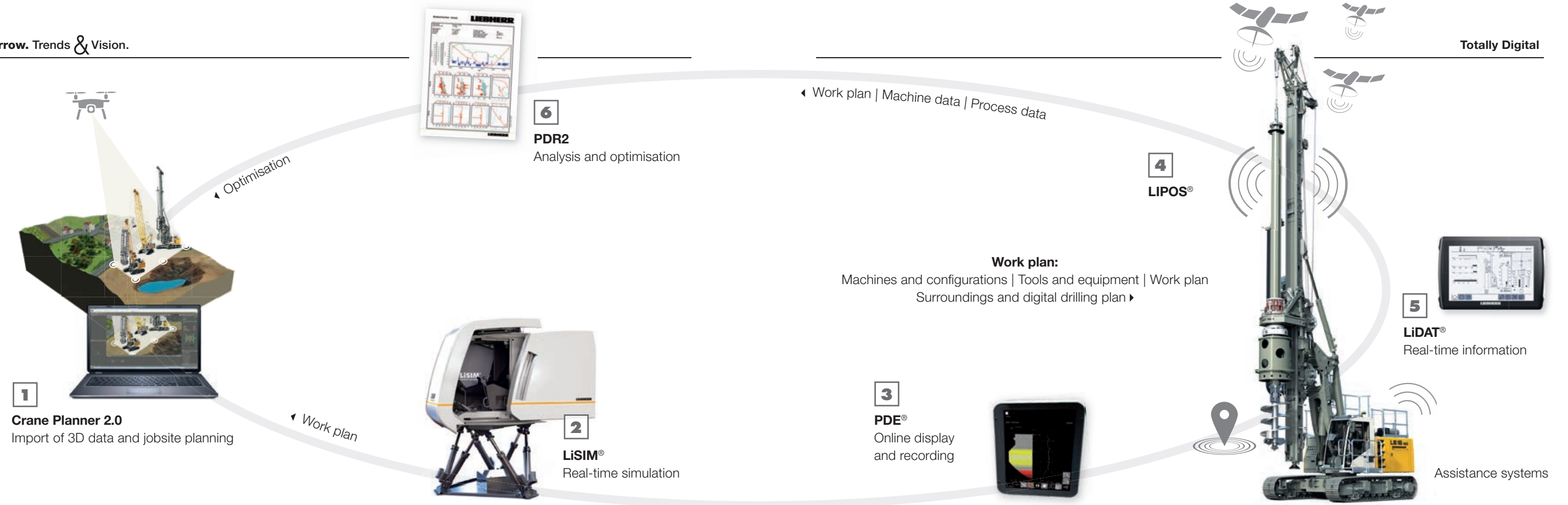
Let's think ahead: what drive concepts will be important in the future, and what are you doing today in order to make them a reality?

K. Graner: There is a lot of potential in an electronic drivetrain for a stepless power transmission. For intensive mobile heavy-duty applications, the same goes for using diesel engines built to the latest EURO norms as the vehicle's primary energy source, and, further into the future, for combustion engines powered by hydrogen or synthetic fuels. If we are able to successfully derive these alternative fuels from renewable energies so they are produced in a CO₂-neutral way, it will be a big step forwards in terms of sustainability.

When will that happen?

K. Graner: It is difficult to predict, but it will definitely take more than 20 years before we reach the final step. But I am convinced that humanity will, and indeed must succeed in this regard. That much we owe to the generations to come. In any case, Liebherr is ready to contribute to a better future with its technologies and innovations. Of that, I am totally sure.

Discover more: www.liebherr.com/stories



Totally Digital

Networking, data analysis, visualisation and automation. The construction machines of the future move in a digitised world.

Future-orientated technologies such as Augmented Reality (AR) and Virtual Reality (VR) are gaining ground in Industry 4.0. The use of AR and VR solutions has the potential to change the way we work.

With the help of extended realities we project digital images and data onto real objects. Required data is put directly into context and we are able to process information more easily and use it without barriers.

One world is not enough

Future-orientated technologies such as Augmented Reality (AR) and Virtual Reality (VR) are gaining ground in Industry 4.0. The use of AR and VR solutions has the potential to change the way we work.

With the help of extended realities we project digital images and data onto real objects. Required data is put directly into context and we are able to process information more easily and use it without barriers.

VR: The latest example is the Crane Planner 2.0, an intelligent software for planning demanding lifting assignments. All working steps from lifting to setting down the load can be simulated in virtual 3D space using VR glasses. Thus, a completely new spatial understanding of the jobsite and the

technical interdependencies can be achieved. The feasibility of the complete project is checked in advance, directly during the planning stage. The advantages are obvious. In addition to saving time and costs, safety standards are redefined.

AR: Augmented Reality can also be experienced live at the Liebherr booth at Bauma 2019. AR means the expansion of reality, i.e. a real world is enriched with additional digital information. Everybody knows preliminary stages from everyday life, such as rear-view cameras. In principle, complex tasks should be simplified or additional information should be available in real time. People will understand more quickly and, above all, more easily.

Big data

Today the construction industry is subject to enormous requirements. Increasingly complex building projects have to be completed in ever shorter times. Construction machines, as an integral part of every construction site, must keep pace with this development, and Liebherr construction machinery aims to do just that. Real-time data from the machine on the construction site is of central importance for all parties involved.

The **machine operator** always has everything under control. In the case of complex applications, for example in deep foundation work, any critical situation can be responded to at an early stage. Longer downtimes are a thing of the past.

The **service engineer** can plan assignments perfectly. Automatic notifications of service intervals leave no room for contingencies.

The **fleet manager** never loses track of the big picture. With the help of real-time data the answers are always available to questions such as: on which jobsite are the various machines located? Are there any additional requirements on a jobsite? Is fuel consumption or operating time on average?

For the **construction company** the process data as well as the machine data are essential. The depth of the borehole, quality and quantity of the concrete filling or perhaps the ground pressure, to name but a few examples, must be accurately measured. This allows for 100% jobsite documentation and rules out liability risks.

Liebherr IT-Tools are instruments for quality control. Furthermore, they significantly contribute to the improvement of safety and in the end decisively optimise the processes on the jobsite.

Experience the technology live @ Bauma 2019

1. Visit our **Augmented Reality pavilion** in the Liebherr outdoor area and let worlds merge.
2. Applications and numerous digital solutions can be experienced in the area, **Innovation. Share & Explore.** on the ground floor of the main Liebherr building.

'E' Makes all the Difference

For two years, the engineers and developers at Liebherr-Mischtechnik GmbH have been tinkering around to help create the emission-free construction site of the future. At Bauma, they will not only be showcasing the first electrically-powered truck mixer that is comparable in performance to a diesel one, but will also present solutions that had previously been regarded as impossible.

The central console in the driver's cabin is in a jumble. There are cables all over the place, tiny lights flashing and jacks waiting to be connected to laptops and other mobile computing devices. The whole thing is more reminiscent of a server room than the workspace in a truck mixer.

At the Liebherr-Mischtechnik GmbH test hall in Bad Schus-senried, there is a high demand for complex electronic measurement technology – all the more so when it comes to designing innovative construction machinery for use in high-emission city centres and giving it emission-free status. The innovation in question? The electric truck mixer.

For more than two years, a team of developers lead by Gerhard Zenne, the Head of Engineering and Development at Liebherr-Mischtechnik GmbH, has been refining the new ETM production series. 'It certainly wasn't easy', recalls Gerhard Zenne. 'Unlike the car industry, applying electronic technology in construction site vehicles is completely uncharted waters – our work really is pioneering.'



Gerhard Zenne, Head of Construction and Development of mixer and truck mixer technology at Liebherr-Mischtechnik GmbH

At this point, it's worth thinking back to how we got here. Gerhard Zenne's team was given the task of combining the advantages of two driving technologies – and to work out how to fit them into the same amount of space, with the same axle load distribution. 'These types of products aren't already out there, waiting to be used', says Alexander Pifko, the e-mobility project leader in Gerhard Zenne's team. 'And what's more, many devices that function in an indoor industrial setting cannot cope with tough outdoor working conditions, where the power electronics are constantly exposed to adverse temperatures and weather.' Given the challenging outdoor requirements, some e-pioneers were hesitant when it came to collaborating on a project like this.

Eventually, the engine technology and chassis construction experts from ZF Friedrichshafen came on board for this demanding project, despite all its unknowns. 'It was actually a stroke of luck for both parties', says Gerhard Zenne. Their joint objective was to build a plug-in hybrid with an electric drum motor, generator and battery – with the right power conversion technology and hot and cold temperature management for the battery. Furthermore, it was only possible to add approximately 750 kilograms of extra weight, so that the whole vehicle including its lightweight drum would have a total weight of 4.1 tonnes.

'During the development process we learned a lot from each other in a relatively short amount of time, both individually and as a team. And now we are ready to present our ETM as a production-ready model at Bauma', says Gerhard Zenne, proudly. One particular challenge was to make the battery the right size. 'We needed special temperature management. To deliver power immediately, at any time, for example in the depths of winter, the battery has to be at its operating temperature, which can only be done if it is kept at a constant temperature. We even found a solution for that', explains Andreas Scherzinger, a mobile electronics developer at Liebherr.

To keep the truck mixer agile and manoeuvrable on the roads with suitably short wheelbases, the constructors managed to integrate the battery behind the rear drum support unit. This also provided the 32-tonne vehicle with an optimal axle load.

There are lots of benefits to having an electric motor when using the truck mixer. 'Noise pollution and harmful emissions



are significantly reduced. And unlike hydraulic systems, an electric motor can achieve a minimal rate of rotations which reduces wear on the components.' Apparently, it can even transport and mix stiff category F1 and F2 concretes without any trouble.

As a plug-in hybrid, the battery can be charged either by the diesel-powered generator or by plugging it in to an electrical outlet. 'During a typical 30-minute drive to a construction site, the diesel-powered generator charges the battery. When the drum is being filled at the concrete factory, power is supplied by plugging it into an electrical outlet, either at 22 kW or a supercharged 50 kW', explains the project leader Alexander Pifko. Thus, with an average of six journeys from the mixing factory to the construction site and back, there are a total of 12 charging cycles. 'That's an optimal charging system, which supplies permanent power'. And since Liebherr has already agreed a system voltage of 650V/DC with the vehicle manufacturers, it is already future-proof.

For fleet managers, operating costs are just as important a consideration. 'Despite a slight increase in diesel consumption by the generator, the e-truck mixer boasts overall fuel savings of about 30%', calculates Gerhard Zenne. After all, there is no longer a need for a diesel motor to rotate the mixing drum at the mixing unit or the construction site, as the energy is supplied entirely by the battery. 'It's a fantastic base to build on for the future.'



Tinkering in the test hall: Alexander Pifko (left), e-mobility project leader, and Andreas Scherzinger (right), mobile electronics developer

Discover more:
www.liebherr-bauma.com

Come and Join the Revolution!

'Making the complex simple' is the mantra guiding the work of the researchers and developers from Liebherr and the scientists from the Technical University (TU) of Dresden. And this ethos has produced INTUSI, a new piece of control technology that combines an intelligent user interface with sophisticated machine intelligence. It marks a revolution in machine communication for construction and material handling machines.

There's something a little Matrix-like about the room when Florian Mang unbolts the hall door and a narrow strip of light pierces the darkness. At the back of the room, the light falls on a control panel with an anthracite-coloured driver's seat and control levers covered with rings of LEDs. Is it sci-fi? Florian Mang dismisses that idea with a wave of the hand. 'Then again, perhaps it is', he adds. 'This is the construction machine of the future.'

Werner Seifried, Director of Technology at Liebherr-Hydraulikbagger GmbH, looks happy to see the young scientists. For two years, he and his team have been working closely together with the chairs and faculties at TU Dresden to realise INTUSI's ambitious aims. As well as the technical design faculty, the Endowed Chair of Construction Machines and the Gesellschaft für Technische Visualistik, a data visualisation company spun out of the computer science

'The project is being driven by digitalisation and the increasing importance of the Internet of Things', says Werner Seifried. 'Change will inevitably come to the construction site. Thanks to the INTUSI project, we will be well prepared for it and the challenges it entails', says Werner Seifried, well aware that it's completely uncharted waters for the construction site. 'At the moment, paperwork is usually dealt with on site in quite a chaotic way. There's not much in the way of digital networking. Quite the contrary is true; a lot is still done on an ad hoc basis so that it's possible to react to constantly changing circumstances on the ground, such as when the subsoil turns out to be different than initially assumed.'

'This is the construction machine of the future.'

Florian Mang

Florian Mang is a development engineer at Liebherr-Hydraulikbagger GmbH in Kirchdorf an der Iller. Here, in hall 18 at the development and exhibition centre of the excavator and earthmoving manufacturer, the final preparations are underway to unveil a prototype with the potential to usher in a technological revolution – the innovative, adaptive INTUSI concept. Liebherr is giving this intuitive user interface its worldwide premiere at this year's Bauma trade fair. This technology stands to completely revolutionise communication with construction machines and inter-machine communication.

It's only a few weeks until the trade fair kicks off in Munich, which is why today a group of scientists has again travelled in with Jens Krzywinski, Professor for Technical Design at TU Dresden. 'We're putting the finishing touches on our prototype', explains Florian Mang. They obviously know each other well, judging by the warm way they greet each other.

faculty, have also been involved in the interdisciplinary project.

'The goal of the new technology was to create a pioneering interface for machine operators that would be just as easy to use and well organised as

'The project is being driven by digitisation and the increasing importance of the internet of things.'

Werner Seifried

Liebherr's existing products', Werner Seifried explains the purpose behind the research. And as if this wasn't enough of a challenge, the idea was that the new technology would function across all Liebherr's earthmoving and material handling machines in the future.

A construction site, explains Werner Seifried, is one of the most challenging environments for man and machine. 'That's why it's such an interesting and pioneering venture to create digital control systems that can make a difference.' INTUSI is a trailblazer in this respect.

'In our research projects with Liebherr, we have analysed and reimagined communications between man and machines, and inter-machine communication', explains Professor Krzywinski. To achieve this, Liebherr engineers from Kirchdorf have developed a huge

range of ideas and concepts alongside software specialists, system architects, media designers, UX specialists and industrial designers.

'We intentionally didn't bring in any professional users for the initial brainstorming phase. They only came later', Florian Mang stresses. It was important not to let the objection, 'But we've never done anything like this before', get in the way of a genuinely free and innovative process. Werner Seifried believes that out-of-the-box thinking is key when it comes to creating real innovation. 'The young digital natives at Dresden University should be able to think up, down, sideways and back to front. Nothing is off limits', explains Werner Seifried. 'In our project, disruption wasn't just allowed, we actively encouraged it in our researchers and developers.'

And the result is INTUSI. The interface creates a completely new interface between the digital and analogue worlds. 'The fact that different types of machine need different user interfaces should now be a thing of the past', says Florian Mang. 'INTUSI works everywhere, using the same patterns and principles.'

The developers have created an intuitive system for machine operators that collates all the necessary information for the tasks at hand to make day-to-day work that bit simpler and easier.

'The smaller machines like wheel loaders, excavators and crawler tractors often have a variety of different tasks to perform during the day', says Florian Mang, highlighting the scale of the

'We intentionally didn't bring in any professional users for the initial brainstorming phase. They only came later.'

Florian Mang

challenge. He explains how in the past there has been a proliferation of assistance systems bringing more and more operating systems and displays into the cabin area. 'At some point, nobody will be able to tell what's what', he explains. With INTUSI, Liebherr have come up with a modular solution that allows any number of additional functions or tools for a range of different mobile or load-bearing applications to be added to the interface. 'It's a real one-size-fits-all kind of machine', says Florian Mang in summary.

He mentions another benefit that should be music to the ears of cost-conscious machine operators: 'INTUSI allows you to stay up to date at all times without investing in additional hardware. The machine can be constantly upgraded

simply by updating the software', Werner Seifried adds. 'Even new assistance systems that become available to the market in a few years can be integrated into the new interface.'


No doubt they will be bringing a bit of that science fiction factor from hall 18 with them to Bauma. 'It's going to be really exciting at our Innovation. Share & Explore. space', enthuses Florian Mang. 'We will record and evaluate our clients' first impressions and thoughts, which will directly inform our product specifications. First, we will create a range of models. Then the revolution can begin.'

Discover INTUSI live @ Bauma 2019

1. A machine show will be held **four times each day**, where you will get the chance to see how the INTUSI concept is being used to deliver **Construction Site 4.0**.
2. You can experience INTUSI and a number of other innovative solutions in the **Innovation. Share & Explore**. area located on the ground floor of Liebherr's main building.



Jan Wojdziak (left) and Esther Lapczynya (middle), research assistants from the Chair of Media Design at the Institute for Software and Multimedia Technology (Technical University of Dresden), regularly exchange information and ideas with Florian Mang (right), development engineer at Liebherr-Hydraulikbagger GmbH

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Products. Brand New. &



Mining

Tough Test for the R 9400

The R 9400 with a backhoe attachment and a bucket of 9.5-m³ has been tested at a cement plant in Héming in the Northeast of France since April 2018. The 350-t hydraulic excavator has worked around 350 hours in July/August. It was the first large hydraulic excavator equipped with a Liebherr engine. The Liebherr D9812 engine has been specially designed for mining applications and is, therefore, built to withstand the tough conditions of global mining. With outstanding performance in all applications, it can be adapted to comply with a range of emission standards such as Tier 2 or even US EPA Tier 4f. The V12 engine reaches a power output of up to 1,500 kW for hydraulic excavators and can reach up to 2,013 kW for mining applications. The engine architecture and high system integration with all key components developed by Liebherr allow the D9812 to achieve very high efficiency.

First R 9400 with Tier 4f engine delivered

In February 2018, Liebherr delivered an R 9400 mining excavator with backhoe attachment to Trapper Mining Inc., Colorado (USA). The R 9400 commissioned at the mine is the first Liebherr excavator in the US powered by a diesel engine that complies with the US EPA Tier 4f exhaust gas regulation. The 345-tonne excavator has a rated output of 1,250 kW (1,675 HP). At Trapper mine, the new R 9400 excavator will be equipped with a specifically designed 28.5-m³ bucket to maximise the productivity on-site. The bucket shape ensures maximum crowd and breakout forces. The R 9400's upper structure is accessible via a powered 45° stairway fitted with handrails, while the service drop-down flap provides easy access to the main servicing components.

Ten at a Stroke

The delivery of the first Liebherr mining truck T 264 to the Chernigovets open-pit mine, part SDS-Ugol (the coal mining division of the Siberian Business Union holding company) in Russia was timed to coincide with the opening of Liebherr's repair and storage warehouse in Belovo, Kemerovo region, built specifically to better serve this customer. The SDS-Ugol

holding company ordered ten Liebherr mining trucks T 264: five were delivered to the Chernigovets open-pit mine and another five to the Pervomaiskiy open-pit mine.

Equipped with the Arctic package, the Liebherr mining trucks are productive in temperatures as low as -40°C.



New Hydraulic Excavators R 9100 B and R 9150 B

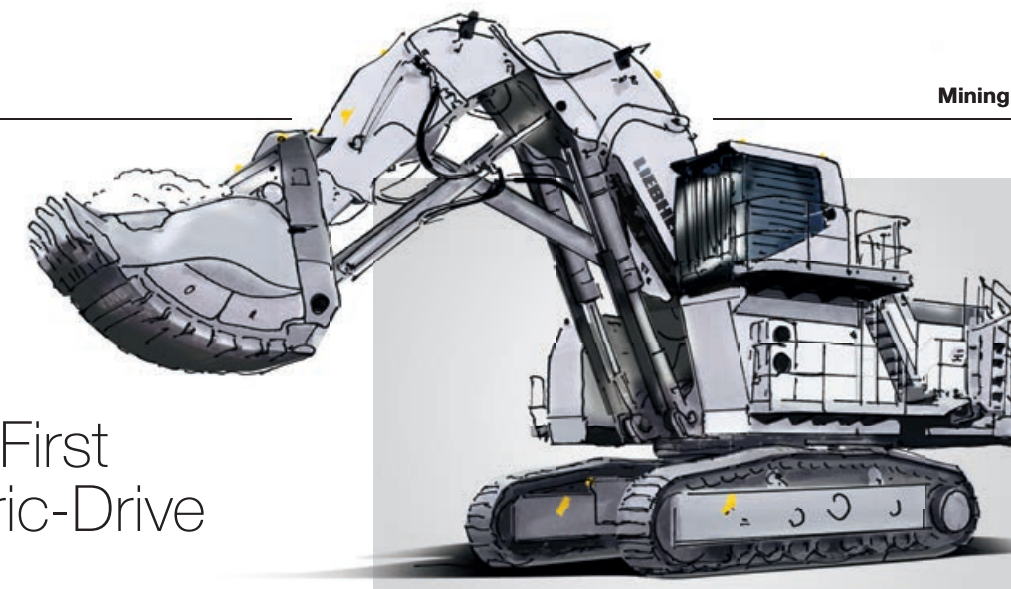
In January, 2019 Liebherr launched its B-versions of the R 9100 and R 9150 hydraulic excavator. With the newest upgrades, these machines take a step forward and clearly exceed the performance and reliability while lowering the cost per ton. The R 9100 B and R 9150 B are equipped with the durable Liebherr V12 diesel engine (SMU target of 15,000 hours) and engine management system specifically designed to withstand extreme conditions. There is even an electric drive available for the R 9150 B. Furthermore, the new B-versions come with the exclusive EVO Bucket solution with pat-

ented Liebherr design to maximise the loading capacity and ensure optimal penetration efficiency. The EVO Bucket backhoe bucket now has a capacity* of 7.5 m³ (9.8 yd³) for the R 9100 B and 8.8 m³ - 9.6 m³ (11.5 - 12.6 yd³) for the R 9150 B. The connectivity kit lets the machines collect operating parameters, error codes and machine faults. Last but not least: the R 9100 B's and R 9150 B's uppercarriage are accessible via a robust fixed ladder or 45° access stairs are optionally accessible and contain one large central platform equipped with slip-resistant surfaces.

FQM Relies on Liebherr Mining Excavators

Liebherr Zambia Ltd. was founded in 2014 and first provided First Quantum Minerals (FQM) with mining excavators and in-country support in Zambia. Two T 284 mining trucks were sent to Zambia for a twelve-month testing period, during which time the customer was able to evaluate Liebherr, the trucks and the customer support in the country. The first mining truck was commissioned in May 2016, the second truck followed soon after, in June.

In the autumn of 2016, FQM allowed Liebherr to begin developing, testing, verifying and fine-tuning the trolley assist system. It was due to the success of this trial phase that FQM proceeded to order six more Liebherr T 284 mining trucks for the Zambia mine site, followed by an entire fleet of 30 T 284s for Cobre Panamá, all fitted with fully functional trolley assist systems.



R 9200 E: Germany's First 200-t Electric-Drive Excavator

Liebherr delivered an electric-drive R 9200 E mining excavator with face shovel attachment to Lausitzer Grauwacke (Germany), part of the Eurovia Group. The 210-tonne excavator has a rated output of 850 kW (1,675 HP). This Liebherr R 9200 E balances performance with environmental consciousness: no exposure of people and the environment to diesel emissions and noise. Furthermore, the electric motor is equipped with an air-to-air heat exchanger. This integrated and easy system reduces maintenance by up to 25% and cuts down on machine downtime. The R 9200 is the only 200-t-class mining excavator using a closed-loop swing

circuit: the kinematic energy can be saved when the swing motion is used during deceleration in order to drive the main and auxiliary pumps, which also enables other motions to be performed faster. Further, with an electric-drive excavator, the hydraulic power can briefly be higher than the nominal power during the load cycle, which results in better reactivity and shorter cycle times (the fastest measured at less than 20 seconds), thus achieving productivity gains. Fitted with a 12.5-m³ (16.4 y³) HDV bucket and patented Liebherr GET to load material with a loose density of 1.65 t/m³ (2.8 lb/yd³), the R 9200 E efficiently loads 65-t mining trucks in three passes.

Upgrades for Ultra-Class Mining Truck

Investing in the latest product upgrade for the T 264 mining truck results in a higher payload capacity of 240 tonnes/265 short tons. To maintain performance and increase productivity, the T 264 offers multiple engine options with power ratings of up to 2,013 kW/2,700 hp. The new front-wheel design and upgraded braking system offer quicker reaction times to increase safety for operators. The upgraded wheel motors and rear gear ratio boost torque and acceleration to provide similar cycle times with 10% increased payload. Furthermore, existing T 282 C and T 284 mining trucks can be retrofitted for increased payload (375 t/413 tons) and production capacity. In addition to this, Liebherr provides customers with a choice of engine options. Tier 4 solutions are already available on the T 264 and will become available on the T 284 within the next twelve months. Liebherr Mining Data (LMD) now comes standard with all new ultra-class mining trucks, and the hardware kit is available as a retrofit for the T 282 C generation mining trucks. The portal offers real-time insights and data regarding mining truck performance and availability.





Tower Cranes

The new MK 88-4.1: More than just an Upgrade

Future-proofed products are created when innovative concepts are combined with tried-and-tested solutions. Liebherr is showcasing the MK 88-4.1, the latest version of the MK 88 mobile construction crane, at the Bauma trade fair. New axle load configurations make this powerful crane particularly agile. It will be available from the beginning of 2020.

When updating the MK 88, Liebherr placed a great deal of emphasis on retaining the special benefits of this popular mobile construction crane whilst enhancing it with new features. The MK 88-4.1 provides a maximum load capacity of 8,000 kg, a maximum jib working radius of 45 metres and a maximum lifting capacity at maximum hoist height of 2,200 kg. The powerful trolley travel gear combined with the

load-plus function means that with a luffed jib position of 45° this crane can lift up to 50% more than its predecessor.

Various axle load configurations

The ballast concept has also been re-evaluated. The three different axle load configurations enable the MK 88-4.1 to be used in many more applications. The axle load totals just

under 13 tonnes with additional ballast, under 12 tonnes with standard ballast and an impressive 10 tonnes without any ballast. Bridges with axle load weight restrictions are therefore no longer an obstacle. In addition, an updated lifting capacity curve means that even the 10 tonne version of the crane delivers a powerful performance. For jobs where there is limited space available, the crane can also be held firmly on the ground using one-sided support. The standard support width is 7.0 metres but can be reduced to 5.75 metres if necessary.

Clean and quiet operation round the clock

Liebherr mobile construction cranes are often used in urban areas. However, very quiet electric engines enable the machines to be operated during the night without any problems and also protect air quality. The MK 88-4.1 also includes a 32 amp connection alongside the standard 63 amp version. An intelligent energy management system ensures that the maximum amount of power is always available to operate the crane. This means that the MK 88-4.1 can be operated even when the mains supply is limited.

Learning from big brother

The larger MK 140 Liebherr mobile construction cranes served as the archetype for many of the features of its 'little brother', the MK 88-4.1. In addition to the one-sided support, users are likely to be familiar with the elevating operator's cab. Among other things, the cab is steplessly height-adjustable. Larger windows provide the crane operator with a good view. To further extend the field of vision, crab and slewing platform cameras are also available as optional extras. The modern driver's cab has been ergonomically designed and provides maximum comfort for the driver. These features represent a significant upgrade and indicate that further excellent enhancements can definitely be anticipated in the future.

20 years and still going strong

That's certainly the case for one particular MK 40 Liebherr mobile construction crane which has reliably done its job for all these years a team of Liebherr technicians has fully refurbished the crane to ensure it is fit to perform numerous tasks well into the future.

When cranes have been operated for a number of years, it is quite reasonable for them to show certain signs of age. For example, the MK 40 owned by a company based in Nuremberg began emitting noises from the slewing drives. During the winter months, the team at the Liebherr plant in Biberach completely dismantled the superstructure as they carried out an extensive range of diagnostic tests. The superstructure was partially sandblasted and received a full technical overhaul. This process revealed, among other things, that the slewing platform had been bent out of shape which was possibly the result of an accident. This was not visible when ballast was added. In order to (literally) rectify this, the repair crew of ten technicians partially heated the part in question and returned it to its original shape.

The technicians called upon the expertise of the repair hall manager when they worked on adjusting the outriggers. Peter Vollmer knows the MK 40, which he helped to build in the 1990s, like the back of his hand. A database is being set up that contains information relating to this kind of retrofitting work in order to ensure information is always available on older tower crane models.

The crane was completely repainted and repairs were made to the welded joints. The MK 40 has now been handed over to the customer who can look forward to another 20 years of faithful service!



Shining in new glory: the 20-year-old MK 40

The Largest Fast-Erecting Crane in its Class

With a maximum hook height of 65.5 metres and a radius of 55 metres, the Liebherr 125 K is currently the largest fast-erecting crane on the market. Despite its size, its 3.2-metre slewing radius enables it to fit into the smallest spaces and Liebherr's new LiTRAX axle system now allows the crane to be transported without a semi-trailer.

With a 55-metre radius and a load capacity of between 1,300 and 8,000 kilograms, the 125 K is the ideal choice for civil engineering projects, such as road traffic bridges and industrial buildings. The standard model comes with a 29.5-metre hook height. However, five tower sections can be added to achieve a total hook height of 41.5 metres. The 30° luffed jib position enables the crane to reach an impressive 65.5 metres.

The new LiTRAX transport solution

Despite its size, the 125 K can also be towed as a trailer by a conventional truck as well as being transported on a semi-trailer. This has been

made possible by the new LiTRAX axle system. The modular 80 km/h high-speed axle consists of three units which can be assembled using a combination of single or tandem axles depending on the type of crane. The axle system is equipped with state-of-the-art safety technology, such as the responsive electronic brake-assist system, which ensures shorter braking times, and the electronic stability control system which anticipates tilting and stabilises the axle using targeted brake intervention. The high steering angle also provides a small radius which allows the crane to be manoeuvred in tight spaces.



The New L1-32 – Lightweight but Strong

The L1-32 hydraulic fast-erecting crane is a new addition to the L1 family. It features a flexible ballast concept and its efficient transport logistic system provides maximum mobility. Its powerful capabilities make it the perfect tool on building sites where family homes of various sizes are under construction.

The L1-32 has a maximum load capacity of 4 tonnes and can lift larger prefabricated components such as concrete staircases. Its standard hook height is 21.3 metres and it can lift 1,050 kg at the jib head when it is extended to its maximum radius of 30 metres. The L1-32 is also equipped with state-of-the-art drive and control technology. All loads can be lifted at top speed using Liebherr's Speed2Lift two-line operation system, which means no re-reeving is necessary. The Micromove fine positioning mode also enables heavy precast concrete components to be safely and precisely lifted into position. Additional safety features include the ABB work area restriction system, the oscillation damping and wind force movement control.

An efficient transport system

Liebherr focused especially on developing an efficient transport logistic system for the L1 series in order to help save customers time and money. The crane can be delivered to site on a conventional trailer and initially assembled with 15 tonnes of ballast. The crane is immediately fully operational, albeit with marginally reduced load capacity values. The remaining two tonnes of ballast can be delivered at a later time to provide higher lifting capacities. The crane can then operate at full capacity. Liebherr's clever technology enables the L1-32 to be transported in one trip and then assembled so it is immediately ready for use.

Experience Liebherr Tower Cranes Virtually

Liebherr Tower Cranes is offering visitors to its booth at Bauma in Munich a unique opportunity to get a close-up view of a tower crane using virtual reality technology. Visitors will get the chance to explore a brand-new 370 EC-B 12 Fibre crane on a virtual building site in the centre of Munich.

Seeing the world through a pair of virtual reality glasses provides a completely different way to see the sights of Munich as you travel from the exhibition booth directly into a beer garden, past the Allianz Arena, over the Frauenkirche cathedral and straight into a Munich construction site. You can use the controllers to explore this 3D environment at your own pace and examine the newly designed 370 EC-B 12 Fibre crane at close quarters. It is a great way to take a close look at the new LiCAB with its multi-touch display or to fly over the streets of Munich. This virtual reality technology enables trade fair visitors to experience the crane in a completely different way, in different weather conditions and at varying



times of the night and day. Liebherr has come up with another special virtual experience for customers to enjoy: you can also view the 370 EC-B 12 Fibre crane in your company's corporate colours with your logo displayed on the advertising panels. This is a great way to see what your prospective crane could look like.

LiTRAX Mobilises Liebherr's Fast-Erecting Cranes

The new LiTRAX axle system enables all Liebherr fast-erecting cranes to be transported on a semi-trailer or a single basic trailer. State-of-the-art driver safety features include the 80 km/h high-speed axle which helps the driver to handle difficult manoeuvres.

It was previously only possible to transport large fast-erecting cranes on a semi-trailer, but Liebherr is now providing a simple solution: the modular LiTRAX axle system. This system enables fast-erecting cranes to be safely and easily transported either on a trailer attached to a conventional truck or on a semi-trailer.

One system for any size of crane

The 80 km/h high-speed axle consists of three units – one front axle, one rigid rear axle and one steerable rear axle – which can be assembled using a combination of single or tandem axles. This enables each Liebherr fast-erecting crane to be optimally configured for maximum compactness and manoeuvrability on the construction site. The front axle has a steering angle of 180° and the steered rear axle angle is 27.5°, which allow the cranes to be manoeuvred into the tightest spaces.

Integrated driver safety systems

The axle system includes an electronic brake-assist system which helps the driver to quickly slow down heavy and long vehicles. An electronic stability control system also anticipates tilting, stabilises the axle using targeted brake intervention and ensures that the cranes can be transported considerably more safely.





Earthmoving

Telescopic Handlers from Tyrol – Suitable for any Application

Liebherr-Werk Telfs GmbH was founded in 1976 to provide a production site for hydrostatically driven crawler tractors. Over time, the product range has expanded to include crawler loaders, pipe layers and most recently telescopic handlers. Martin Längle, Managing Director of Liebherr-Werk Telfs GmbH, gives us an insight into the development of the site and the new series of telescopic handlers.

Mr Längle, last year you introduced the latest generation of telescopic handlers. What is so special about this product range?

M. Längle: We offer eight basic models of machines with lift heights of six, seven, nine or ten metres, covering a wide range of areas of application. Depending on the intended use, customers can choose between machines delivering

maximum performance or simple, cost-optimised machines. The two ranges of models are the product of close collaboration with our customers during development. The eventual users were involved at every stage, beginning with defining the requirements specification and continuing right through to the deployment of prototypes and pre-production machines.

How do the machines differ from one another?

M. Längle: The S-model range has been designed for tough applications and high capacity utilization. This range is equipped with a particularly powerful working hydraulic system and super-sensitive controls for manoeuvrability, and combines comfort with maximum performance. The value models, on the other hand, come in a slimmed-down and cost-optimised design. They are ideally suited for simple stacking and lifting applications.

‘We are convinced that this machine concept will also find a market in the wider world.’

Martin Längle

And what advantages do they have in common?

M. Längle: We offer different machine hitches for all new-generation models. In addition to the Liebherr quick coupler, for example, we also offer quick couplers for other manufacturers. This means that customers can also use their existing attachments on Liebherr telescopic handlers. Good all-round visibility, a clearly arranged workplace and ease of use for the operator (thanks to the ergonomically designed and intuitively operable controls) are a further plus. As with all Liebherr products, we also focused on fuel efficiency when developing the telescopic handlers. And lastly, we don't want to just put the machines on the market. Liebherr is totally committed to customer service. We have an excellent network of sales and service offices with qualified and dedicated staff.

Let's take a look inside: what changes have the new products meant for the Telfs site?

M. Längle: For one thing, we have expanded significantly in terms of personnel – initially in the development team but also in the areas of purchasing and procurement. All installed components also have to meet our high quality standards, so we have a correspondingly large quality management department. Last but not least, we have also significantly increased staffing levels in production. Positive trends in turnover and unit sales have prompted us to make numerous infrastructure investments at the site in the last few years.

Examples include a new assembly line for the telescopic handlers and our flagship crawler tractor, the PR 776. In addition, we have invested in a new workshop for technical testing, a distribution and logistics centre and a state-of-the-art training centre for our sales partners' service employees. Our new administration building is needed because the number of employees at the Telfs site has risen in the last few years from 450 to its current level of over 750. Space is needed to accommodate them.

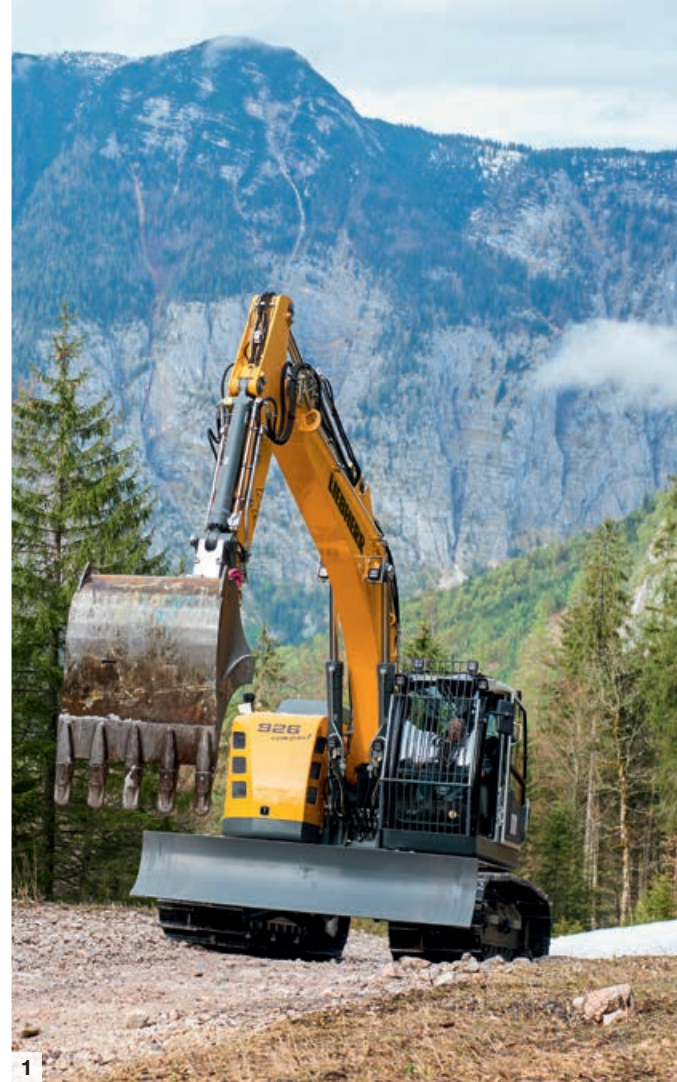


How do you see the development of telescopic handlers progressing in future?

M. Längle: In industrialised countries, the market for most product lines in the construction machinery sector is already largely saturated. Growth is very limited, except during boom periods like the current one. The market for telescopic handlers is an exception, as it has been recording significant growth rates for years. In addition, the telescopic handler is a product which currently still enjoys success mainly in industrialised countries and highly developed economies such as those in Europe and North America. However, we are convinced that this machine concept will also find a market in the wider world. In other words, I think the telescopic handler has the potential to continue its very positive upward trend.

Traversing the Dachstein Glacier

The 2,996-metre Dachstein is the second highest summit in the Northern Alps. Traversing the Dachstein is unofficially known as 'Austria's National Ski Tour'. The tour's starting point is in Obertraun am Hallstättersee. This was also the starting point for a Liebherr crawler excavator which made its way up to the Dachstein Glacier to start work on various construction projects. This is not just a challenging tour for experienced skiers; the R 926 Compact Litronic also had to demonstrate its capabilities across extreme terrain consisting of steep, snow-covered tracks in temperatures as low as -30°C . The crawler excavator finally reached its destination at the Hunerkogel mountain station at 2,700 metres above sea level after a 15-hour climb. The ski lift operator, Planai-Hochwurzen-Bahnen GmbH, has been using the machine since then to carry out terrain correction work, to develop trails and to work on other new construction projects on the Dachsteinwarte. The crawler excavator is also moving ski lift supports which have lifted due to glacier movement and is placing them into the right position. A huge number of tasks need to be undertaken which the R 926 is well-equipped to perform with its wide range of features including various buckets, a rock cutter, a crane hook with crane extension and a rope winch that can be extended to nine metres. The Dachstein Glacier is a conservation area, so the crawler excavator is only ever operated with Liebherr's biodegradable hydraulic oil 'Liebherr Hydraulik Plus Arctic'.



1. An early start for the R 926. 2. The crawler excavator winds its way to the top up the steep ski routes. 3. This Liebherr excavator has to travel 18 kilometres. 4. The crawler tracks are fitted with special crampons and cross bars, which ensure the vehicle does not slide on the slippery frozen surface. 5. Sunrise in the bitter cold. 6. The crawler excavator makes its way to its unusual place of work. 7. Arrival at the Hunerkogel mountain station located 2,700 metres above sea level.



Designed for Individual Markets

In service all over the world, Liebherr's earthmoving machines are also specially tailored to suit the requirements of individual markets. One example of this is emissions standards. For markets with less stringent regulations, Liebherr has developed a bespoke product line that profits from the know-how and high-quality standards across the whole Liebherr Group to deliver outstanding productivity, fuel efficiency, reliability and comfort.

With the R 926, R 930, R 934, R 938 and R 945 crawler excavators, Liebherr has produced five new models that are specially adapted for these markets. These machines are based on the new 8th generation excavator range and meet the requirements of unregulated or lightly regulated markets. The development team at Liebherr-France SAS has completely overhauled the range's fundamental design to increase comfort, safety and performance and to achieve a more ergonomic user interface.

The R 934, which was presented at the InMotion. Test & Drive. show ground, complies with Stage IIIA vehicle emission standards and, like the R 938, it is based on a custom platform designed by Liebherr-France SAS. The R 934 and R 938 excavator models have an operating weight of 35 and 38 tonnes, and a top performance of 200 kW/272 hp and 220 kW/299 hp respectively. Bucket capacities vary from 1 m³ and 2.5 m³ in the R 934 and from 1 m³ and 3 m³ in the R 938.

With a large range of options in terms of equipment and tools, the R 934 and R 938 crawler excavators can be used for multiple applications when earthmoving, levelling, digging, loading and even lifting.

In terms of wheel loaders, Liebherr will continue to offer its five tried and tested models for more lightly regulated markets. The L 524, L 538, L 550, L 566 and L 580 models provide a range of different options with tipping loads from 7.5 to 18 tonnes. These wheel loaders come equipped for a huge range of applications and can be enhanced with plenty of useful upgrades.

These can increase machine reliability in dust-intensive applications like coal moving. For example, the oil bath filter upgrade is fitted at the wheel loader's rear end and removes fine coal dust from air passing through the radiator. This prevents dust particles from getting into the engine and increases the machine's reliability. Another upgrade is a reversible fan motor which prevents the build-up of dirt inside the radiator by reversing its direction at predetermined intervals and blowing dust out of the cooling unit. A sealed dynamo with a protective housing guarantees a continuous power supply by preventing dust from getting in.

The automatic central lubrication system provides additional benefits. Liebherr fits this upgrade on all available wheel loaders. When the wheel loader is being used in a dust-intensive environment, the machine operator has to maintain its lubrication service points at regular intervals. Liebherr's central lubrication system does this automatically, keeping every lubrication point on the machine oiled with precisely calculated doses of grease whilst it is being used. Automatic maintenance allows the stored grease to be distributed evenly which reduces wear, and keeps downtime to a minimum.



Agile Powerhouses: The New Stereoloader Generation

For over two decades, Liebherr Stereoloaders have built up a reputation as reliable and agile all-rounders. With a host of innovations such as the optimised Z-bar linkage or the spacious operator's cab, the new models in these series give businesses real added value.

Whether it's horticulture or roadbuilding, local authority or industrial applications, the feasibility of many projects depends on how manoeuvrable the machines are. That's why Liebherr developed stereo steering – a combination of articulated steering and rear-axle steering – back in 1994. This gives the vehicle a tight turning circle and reduces the articulation angle to 30°, which in turn provides enhanced stability as the centre of gravity remains largely at the centre of the machine even when moving heavy loads. The Stereoloader's powerful hydrostatic transmission allows it to accelerate smoothly. Liebherr also offers a 'Speeder' model for when the vehicle needs to travel over longer distances. This wheel loader model can reach a top speed of up to 40 km/h.

The Stereoloader's Z-bar linkage is the embodiment of technical expertise. The powerful lift arm combines high break-out power in the lower segment with enormous holding power in the upper segment. When operating the fork, the Z-bar linkage provides optimised load conveyance over its entire lifting range. The vehicle has also received a comfort upgrade. The compact bonnet gives the driver a better view of the engine, whilst even the smaller models have been retrofitted with the spacious cabin of the L 518 Stereoloader. Large glass panels offer improved views on all sides. Operating and driving controls are highly intuitive, even for new drivers. Above all, this improves safety when different operators are using the wheel loaders.

Powerful and Safe: The R 950 Demolition Litronic

The R 950 Demolition Litronic was designed for working at heights of up to 29 metres. The machine can use tools with weights of up to 3.5 tonnes and has a reach of up to 16 metres, providing maximum power during demolition work. Its stable rotary platform with end-to-end box girders forms the sturdy backbone for this Litronic, ensuring optimal transmission of the power flow. This has two major advantages for the steel construction of the equipment and uppercarriage: high operational safety and long lifespan. The demolition cabin can tilt up to 30°, guaranteeing an optimal view of the work area.

The Litronic is also equipped with the Liebherr Demolition Control (LDC) system. This provides the operator with information about the exact position of the demolition tools, ensuring the stability of the Litronic. As such, it minimises the chances of human errors which might impact the stability of the machine. Furthermore, it informs the operator in real time of which movements are allowed. Liebherr is currently the only manufacturer to offer this system. The R 950 is making an appearance on the Nagel Group booth at Bauma 2019, which can be found in the outdoor exhibition space at FM. 811 A-D.



A Compact All-Rounder

Liebherr is launching the prototype for the new A 913 Compact Litronic at Bauma 2019. The wheel excavator is an excellent all-rounder when it comes to classic excavation tasks on space-restricted construction sites. The vehicle also meets Stage V emissions standards. The standout feature of this machine is its flexible undercarriage with all-wheel and crab steering which deliver both superb manoeuvrability and high load capacities.

The A 913 Compact Litronic has an operational weight of between 13,800 and 15,500 kg. All-wheel steering enables the front and rear axle to move in opposite directions, resulting in a small turning circle. In crab steering mode, both axles steer at the same angle so the wheel excavator can move sideways without turning its uppercarriage. Given its small rear turning radius of 1.70 m and reduced front turning radius, it can work well on cramped building sites.

Power and comfort

Liebherr-Power-Efficiency offers high performance and low fuel consumption at the same time. The 95 kW/129 HP engine can operate at full power even at low rotational speeds,

which helps prevent wear on components and improves longevity. The A 913 Compact Litronic meets Stage V emissions standards with a diesel oxidation catalyst, particle filter and an SCR system working in tandem. Maintenance can be done comfortably at ground level thanks to the engine hood, which stretches along the entire right flank of the vehicle. The vehicle also comes with an optional 360° camera system with SkyView for increased safety.



Material Handling

New Material Handlers for Harbours

The two material handlers that Liebherr is showcasing at Bauma 2019 are designed to move both bulk and packaged cargo quickly and efficiently. The weight of the equipment has been specially optimised for handling these cargo types and give the machines enormous load bearing capacity. Liebherr also offers a variety of different types of equipment for each machine so that they can take on as many tasks as possible. The patented energy recovery system (ERS-System) increases system performance whilst reducing fuel consumption by up to 30%.

LH 40 M Port for cargo handling

With an operating weight of 41 to 45 tonnes and a D 934 diesel engine that delivers 155 kW/211 HP of power, the new LH 40 M Port also meets Stage V emissions standards. Thanks to the standard ERS-System, the machine can deliver 233 kW of total system power. This allows the LH 40 M Port to handle up to 400 tonnes of materials per hour, over a distance of 12 to 19 metres (depending on how it is equipped). Due to an optimal weight distribution between the uppercarriage, undercarriage and its equipment, the LH 40 M Port offers enormous stability and therefore precise handling.

LH 110 C Port with an electric engine

The LH 110 C Port material handler offers excellent performance and sets new standards in terms of efficiency. The 300 kW electric engine works in tandem with the ERS-System

to deliver a total system power of 478 kW. Add fast and dynamic rotary motion into the equation and the machine can handle up to 1,000 tonnes of material per hour over a distance of 18 to 28 metres. The electric engine is low-maintenance, quiet, environmentally-friendly and free from emissions regulations.

Undercarriage with multiple applications

The new Gantry portal undercarriage allows trucks and wagons passing through to be loaded quickly and efficiently. Its new construction sets new standards in terms of stability and boasts unique new step access. Liebherr's modular design offers between 4.5 and 9.0 metres of horizontal clearance and 5.0 to 6.5 metres of vertical clearance. The new undercarriage is available with both diesel and electric transmissions. The electric version offers customers a range of connection options to choose from – such as a tow cable or a winding system – which allow the machine sufficient mobility.

When using a diesel motor, there is an option to have an extra diesel tank installed on the portal undercarriage: this increases the machine's efficiency as it can go longer without refuelling.

Powerful Recycling Performance

Introducing the LH 18 M Industry and LH 26 M Industry – two new machines that are particularly well-suited for recycling applications such as materials handling and unloading, or sorting used paper, wood and waste products. And, with a new regenerative power system, the machines are designed for maximum uptime.

The LH 18 M has an operational weight of 17 to 18 tonnes and an engine that delivers 105 kW/143 HP of power (Stage V emissions standards). For flexibility to move between locations, a version is also available that is certified for road use. The LH 18 M provides excellent responsiveness thanks to optimal calibration between the engine, distributor valve and proportional control. In addition, the machine's service-friendly design allows for short maintenance periods and therefore reduces wasteful downtime. All daily maintenance points can be accessed quickly, comfortably and safely from ground level.

The Liebherr LH 26 M electric material handler has a superior design with a high attention to detail. Driven by an innovative 90 kW Liebherr electric engine, it provides powerful and dynamic working motion whilst also keeping maintenance costs and noise to a minimum. In addition, it comes with an extra electric engine for auxiliary users that guarantees correct energy distribution and maximum efficiency. Meanwhile, the LH 26 M's advanced frequency converter technology ensures dynamic and responsive working motion. Another

great benefit is that it can be used with every conventional mains supply in the world using a simple converter.

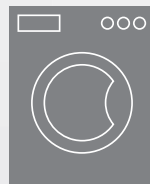
Log Handler Premiere at Bauma

The Liebherr LRS Log Handler reach stacker will be showcased to the public for the first time at Bauma. The Log Handler is used primarily to transport timber within factory yards and wood handling terminals, with an emphasis on speed, manoeuvrability and – above all – mobility. The Log Handler is a robust and powerful machine that can be deployed by wood-processing businesses such as saw, paper or pulp mills or work as a material handler at harbours. It combines all the benefits of the popular LRS series with a whole host of modifications for wood handling. Like all Liebherr reach stackers, it comes equipped with a smooth hydrostatic transmission that boasts low fuel consumption and excellent handling. The Log Handler also comes with a standard Pactronic® hybrid engine as standard, offering a temporary performance boost without increased fuel consumption or CO₂ emissions. In addition, the vehicle has a purpose-built timber grab and a solid protective structure for the driver cabin.

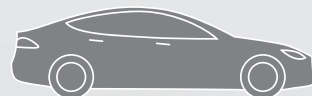
A battery-powered innovation with an appropriate name:

the LB 16 unplugged deep foundation mining device can run off a single charge for an entire 10-hour working day without any power loss. If you installed it in other battery-powered devices, you could:

do **900** washes at 60° in a washing machine



drive for over **3,000 km** in a electric car **without a recharge**



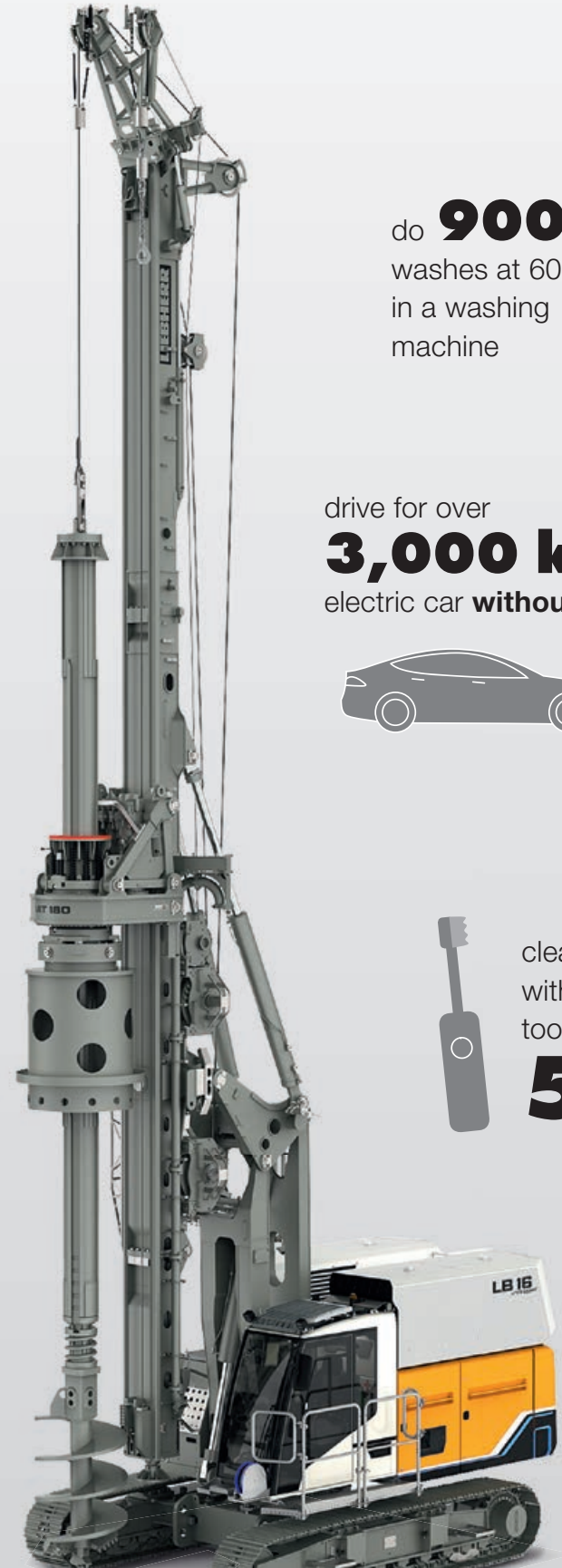
use an smartphone for **53,333.333** hours straight **without a recharge**



brew **50,400** cups of tea



clean your teeth with an electric toothbrush for **55** years



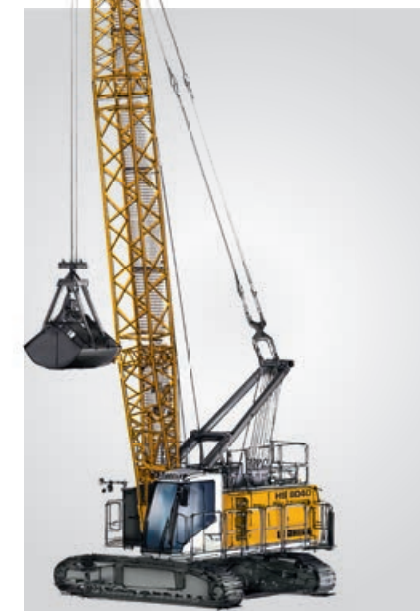
Deep Foundation Machines

The Smallest of the HS Series

The standard version of the agile HS 8040 HD provides an impressive 3.5 metre turning radius. Meanwhile, the version with a longer uppercarriage can bear significantly heavier loads, which can be very useful especially when using a dragline. The vehicle has almost unlimited applications: the HS series works seamlessly with slurry wall grabs and boring machines, whilst it can also be used as a service crane for lifting tasks. The duty cycle crawler crane is equipped with a powerful 230 kW Liebherr diesel engine, two free fall winches with 120 kN of cable torque each and a main jib of up to 40 metres in length.

Ready for rapid deployment

With a transport weight of under 40 tonnes including ballast, the HS 8040 HD is highly flexible and can easily be redeployed between construction sites. Moreover, an improved A-Bock system has reduced its length during transport and made it easier to raise or lower the jib. A modern climate control system, improved field of vision, noise-reducing design and ergonomic driver's seat with integrated heating and cooling offer increased driver comfort.



The New LB 45 Drilling Rig

The LB 45 is named after its 450 kNm of nominal torque, offering about 10% more torque than the powerful LB 36. Both the leaders and the ballast weights have a modular build, which enables them to be assembled quickly and easily. The boom of the leaders is designed for a variety of drill axes and can therefore be used for any kind of application. The LB 45's drill axle has been extended by 500 mm, so the rig can be used to achieve a drilling diameter of up to 3.3 metres. The LB 45 can also achieve a greater drilling depth of up to 100 metres using the Kelly method and a 5-part Kelly rod. Powerful winches offer top performance with a maximum traction of 42 tonnes.

Safety features and user-friendly construction

The earth pressure of the machine is measured in real time whilst being compared to the predetermined safety values for any construction site. This allows the operator to see whenever he or she is entering the critical range. The LB 45's Kelly display allows the telescopic sections of the Kelly rod to be easily locked. The real-time display shows the operator the actual distance to the next locking case. The LB 45 is also equipped with a new type of cabin where driver comfort is paramount. This is achieved with a modern climate control system, an optimised field of vision, a noise-reducing design and an ergonomic driver's seat.



The New LSC 8-18 Slurry Wall Cutter

The new LSC 8-18 accessory works seamlessly with the Liebherr HS 8130.1 cable cutter for fast and precise slurry wall excavations. The cutter can be turned hydraulically so that it can work continuously on the trench whilst the cutting direction is corrected by twelve independent steering flaps. The sturdy base body is available in a 'compact' version or

as a 'large' version that is 4 metres longer. With a combined length of 12 metres, heavy weight and low centre of gravity, the vehicle offers exceptional steering. This is especially useful for larger slurry walls.



Mobile and Crawler Cranes

Digital Mobile Crane Operator's Licence: New E-learning in Action

Shortage of skilled labour, flexibility, increasingly complex technologies and stricter standards for safety and accident prevention: these are only a few of the reasons why it's become so important to create new training opportunities and methods for mobile crane operators. To address these needs, the training centre at the Liebherr plant in Ehingen has teamed with the e-learning production company Krassmann Produktion GmbH and legal expert Dr Rudolf Saller to develop the digital mobile crane operator's licence. This joint project aims to increase safety when working with mobile cranes on construction sites around the world. Since training crane operators is primarily the responsibility of the crane companies themselves, the idea was to provide a tool to support training activities and transfer knowledge in condensed form. Created in June 2018, this e-learning programme can be used as an interactive self-learning system for refresher training, instruction or as a training tool for on-boarding. The Austrian company Felbermayr Transport-

und Hebetchnik GmbH & Co KG is one of the companies that has adopted Liebherr's e-learning programme. Here is a look at how that company is putting it into practice.

What are the challenges you face when training and certifying crane operators?

The biggest challenge by far is finding time for the crane operators to be available for training. That's why training sessions are usually postponed until the off-peak season. But, in general, we would like to be in a position to offer training at any time and with greater flexibility. The same goes for the training content itself. For example, we want to train our experienced crane operators differently than we train those who are just beginning their careers. Our experienced operators do not require comprehensive training from the ground up, but just need individual modules for refreshing or updating the knowledge they already have. Thus, there was a need for greater flexibility in that regard.

How does the new 'Digital Mobile Crane Operator's Licence' tool support your training activities?

The tool is very useful for training new crane operators who have little to no knowledge of theory. So, the programme serves as a complement to their practical training on the work site. But we also like to use the individual modules as a refresher for crane operators who have already been trained.

What are the advantages of offering a digital tool for training crane operators?

Above all, it's the flexibility to provide ongoing training any time, any place. It's an online programme, so it's available worldwide. The mobile crane operators have personal access to the training modules they need, so they can work through them at their own pace, and complete them or repeat them if they need to.

Are there any disadvantages?

Obviously with e-learning, we cannot really monitor whether everything has actually been done correctly. For example, we cannot see if the crane operator took the online test themselves and without help from anyone else. Thus, it's important for us to trust in our employees and for the employees themselves to be intrinsically motivated. The same goes for comprehension questions that arise during the training. We have to be able to trust in our trainees to ask questions when they need to.

How do you rate the content and structure of the programme?

The structure works well, and we are very pleased with it. We consider it a plus that each individual module can be completed quite quickly. There are various elements like graphics, images or even videos incorporated, which adds lots of variety to the entire experience. So far, we haven't heard any negative feedback from our crane operators, which tells us that our employees are able to use the programme properly and intuitively.

It must be said that our transport and hoisting systems involve state-of-the-art technologies and require a high level of technical knowledge. Our employees are experts at defying gravity. That doesn't just happen by chance. Training and education are critical to the success of our projects. The 'Digital Mobile Crane Operator's Licence' e-learning programme has proven to be an efficient training tool.

The content at a glance:

- legal principles
- crane technologies
- crane physics
- load capacity tables
- crane position selection
- safety equipment
- set-up
- operating conditions
- load fastening
- crane inspection
- troubleshooting
- and much more



Talk with the management board of Felbermayr Holding GmbH and Felbermayr Transport and lifting technology GmbH & Co: (from left to right) Peter Linimayr, Wolfgang Schellerer, Ing. Peter Stöttinger, Horst Felbermayr Senior, Horst Felbermayr

About Felbermayr

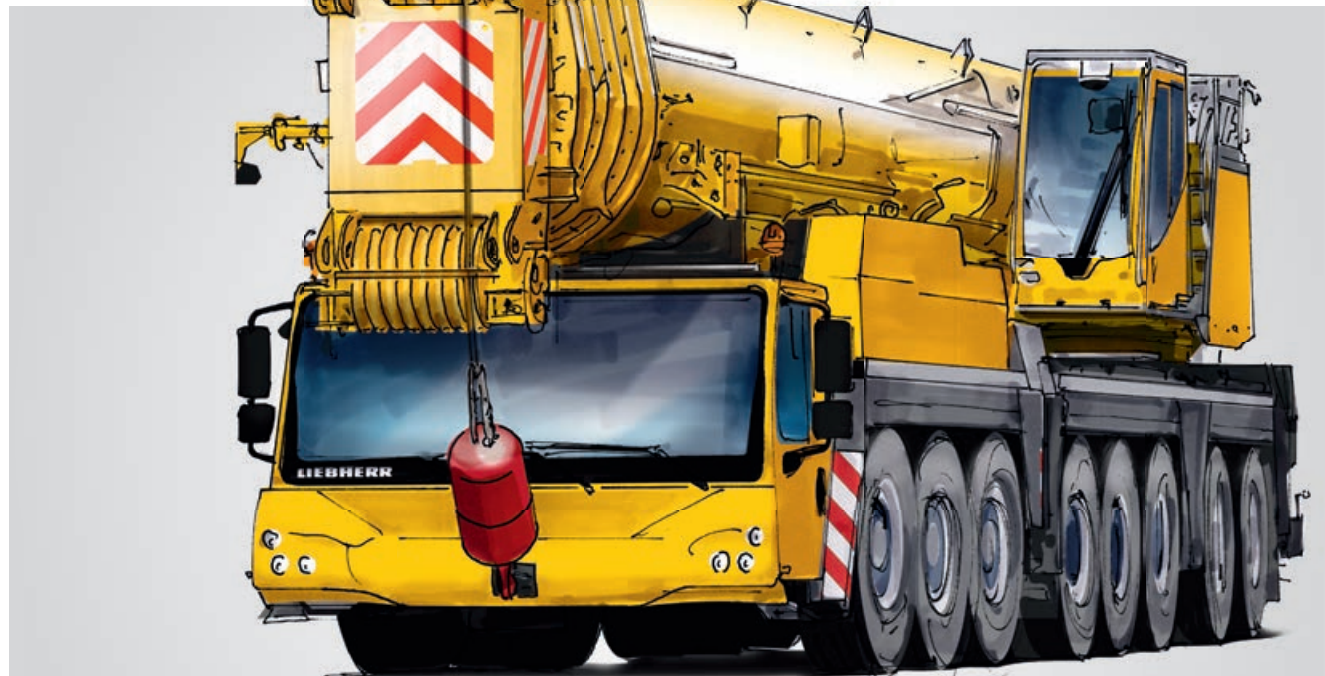
Felbermayr is a family company with a diverse yet cohesive business portfolio and a strong customer focus. Its activities range from transport and hoisting technologies to construction. Felbermayr has successfully established itself on the market as a full-service provider in these fields for years. It offers a full spectrum of transport-sector services, extending from rail and motorways to waterways. Further services include extensive storage facilities and industrial harbours for handling the heaviest materials.

Want to learn more? The German-language version of the Digital Mobile Crane Operator's Licence e-learning tool is available at:

www.betriebinbestform.de

For more information, visit:

www.liebherr.com/mobile-crane-operator



The LTM 1450-8.1: 85 Metres Long, Yet Extremely Mobile

This 450-tonne, 8-axle mobile crane features a powerful 85-metre long telescopic boom. It is quick and easy to set-up on site and has been designed to deliver cost-effective mobility for customers across the globe. It is capable of travelling on public roads with a 12-tonne axle load along with the entire outrigger system.

The new Liebherr 'single-engine concept' is also used on the LTM 1450-8.1 which enables the superstructure to be powered via a mechanical shaft installed in the engine located in the undercarriage. The ECOmode programme mode ensures the mobile crane can be operated with high efficiency.

A Compact and Flexible Powerhouse

The LTC 1050-3.1 offers the kind of mobility usually found in traditional all-terrain cranes and its compact design also makes it an ideal hoisting unit for use in very confined working spaces. This innovative mobile crane has a lifting capacity of 50 tonnes and has secured an excellent position on the market. The VarioBase® variable supporting base system is one of the standout features of this compact crane which has been designed to be used in industrial buildings and on sites with space restrictions. Other striking features, such as the heavy-duty jib, hook traverse and the cabin, which can be optionally mounted on a telescopic arm, all ensure this little powerhouse performs extremely reliably.



Into the Wild: The LRT 1100-2.1 Rough-Terrain Crane

As well as excellent performance, the LRT 1100-2.1 was also designed with safety in mind with its ease of use and outstanding off-road capabilities. This crane offers superb manoeuvrability using all-wheel and crab steering. The extra-wide crane cabin provides greater comfort for the crane operator. Clear and intuitive controls also make the crane very easy to handle. Liebherr's own VarioBase® variable supporting base system provides even greater safety benefits, and comes fitted as standard in this 100-tonne class crane. VarioBase® enables each crane support to be extended to the desired length.



The LTF 1060-4.1 Truck Mounted Tele- scopic Crane: Mobile, Versatile, Cost Effective

The LTF 1060-4.1 is a cost-effective taxi crane solution. It can travel on public roads on a four-axle chassis with its complete ballast of 10.2 tonnes on board, making it ready to operate as soon as it arrives on site. This crane has a high lifting capacity and a 35-metre telescopic boom.

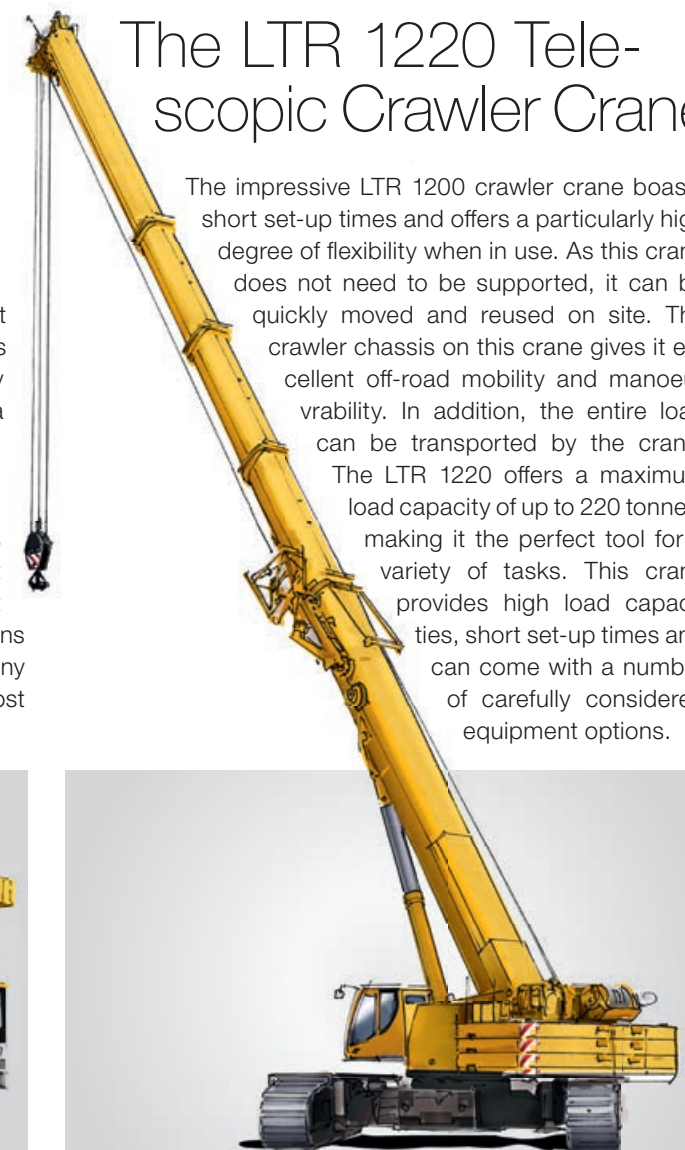
Road licences for cranes with low axle weights have been simplified in Germany, so this type of crane is a major plus point, particularly when customers require cranes at short notice. 'LTF cranes with a part ballast can be licensed just like a normal truck. This is a major advantage for us', explains a representative from the family-run crane hire company Würzburger Kranverleih whose fleet consists almost entirely of Liebherr cranes.



The LTR 1220 Tele- scopic Crawler Crane

The impressive LTR 1200 crawler crane boasts short set-up times and offers a particularly high degree of flexibility when in use. As this crane does not need to be supported, it can be quickly moved and reused on site. The crawler chassis on this crane gives it excellent off-road mobility and manoeuvrability. In addition, the entire load can be transported by the crane.

The LTR 1220 offers a maximum load capacity of up to 220 tonnes, making it the perfect tool for a variety of tasks. This crane provides high load capacities, short set-up times and can come with a number of carefully considered equipment options.



Simply Powerful: LR 1800-1.0

The new Liebherr 800-tonne crawler crane boasts outstanding lifting power and cost-effective mobility for customers across the globe. This particularly powerful industrial crane has been designed to operate with a luffing jib and derrick system, making it ideal for power plant construction and the petrochemical industry. The new LR 1800-1.0 is currently the most powerful crawler crane on the market and features a base machine, which is just 3 metres wide.

The boom system is completely new: three lattice sections can now be telescoped into each other, which reduces the number of units that need to be transported. Another feature, which reduces transport costs, is the base machine, which has a 3-metre transport width and a maximum transport weight of 46 tonnes.

Improved Safety, More User-friendly – The LR 1300.1 SX Crawler Crane

The new generation of the LR 1300.1 SX crawler crane is fitted with innovative assistance systems for increased safety and greater ease of handling. It can easily lift weights up to 300 tonnes, and can be equipped with a derrick boom with additional ballast for heavy-duty lifting. The LR 1300.1 SX no longer has a fixed ballast radius, but rather a new floating ballast moved using simple hydraulics.

Supporting the boom's up-and-down motion

The crane comes with several assistance systems to aid the operator: the 'Boom Up-and-Down Aid' senses if the crane is close to its tipping point when lifting or offloading, and automatically stops in the event of danger. Wind sensors in the main and luffing jibs calculate the allowable wind speed whilst taking into account the crane's current setup. Another assistance system monitors the earth pressure of the LR 1300.1 SX in real time, triggering an alert if it reaches the critical range. When in 'Safe Mode', Liebherr's Litronic crane steering system also regulates driving speed once the load has been attached to the hook, whilst automatically adapting maximum load weights to the barge tilt when being used on a barge.

Safe lifting of personnel

Another special feature of the LR 1300.1 SX is that it is permitted to lift personnel. Since the crane already has the EC-type examination certificate, operators require no additional permission from local authorities. Liebherr provides the legally required emergency generator and emergency steering system for lifting personnel as a simple plug-and-play solution.



Concrete Technology

Thomas Simon (left), Liebherr Production and Logistics Planning Project Engineer and Martin Dobberstein (right), Foreman at the concrete pumps plant worked closely together to develop the new production facility

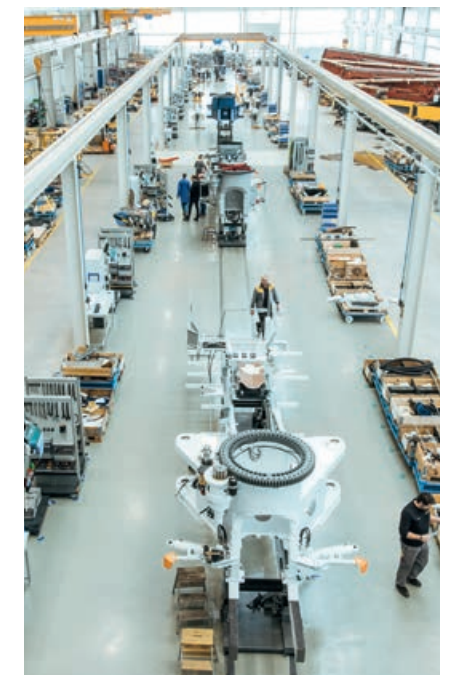
Watching Innovation Unfold

For decades, Liebherr-Mischtechnik has played a decisive role in shaping the fields of concrete mixing plants and truck mixers around the world. The concrete experts based in Bad Schussenried are setting new standards both with the new 42 M5 XXT truck-mounted concrete pump and the factory's modern manufacturing processes.

All products manufactured by Liebherr-Mischtechnik are rigorously tested in the factory's 1,000 square metre test centre. In addition to testing truck mixers, mixing plants and concrete pumps, mixing tests are also carried out here. The test centre offers plenty of space for technicians and engineers to easily connect multiple large machines to the testing equipment simultaneously. However, things suddenly get crowded – much too crowded. Foreman Martin Dobberstein focuses his gaze on the hydraulic connector on the 5-piece multi-folding mast attached to the brand new 42 M5 XXT truck-mounted concrete pump. Martin needs to use a particularly delicate touch as he extends the mast using the remote control. It's not easy to extend the 42-metre long mast even in this generously proportioned space. With a little manoeuvring, Martin manages to skilfully position all the hydraulic parts so they are easily within reach.

Dobberstein has only worked in the test centre for a short time. He previously spent 18 years working at the Liebherr concrete pump plant 60 kilometres away in Neu-Ulm. Production capacity there was no longer sufficient to meet demand, so Liebherr moved operations to Bad Schussenried in 2018, where the company has been manufacturing products for the concrete industry for 65 years. 'We're adopting completely new manufacturing methods', explains Thomas Simon, Liebherr Production and Logistics Planning Project Engineer, who was responsible for conceptualising the new production line. 'The 42 M5 XXT truck-mounted concrete pump paves the way for a whole host of new possibilities in terms of both the quality of the product and manufacturing methods', he says.

This is also plain to see. The new pump production facility measures 120 metres by 32 metres, offering an impressive 4,000 square metres of floor



space. 'The production line has been designed to conform with the latest industry standards. The components are pre-assembled in parallel according to

the fish bone principle, the one-piece-flow concept and final assembly', explains Thomas who worked closely with Martin Dobberstein during the entire development and implementation process. An additional covered space measuring roughly 2,000 square metres connects the new production areas and provides further options for the logistics function.

Modern industrial production as exemplified at Bad Schussenried would not be possible today without sophisticated logistics solutions. The new logistics centre takes up a further 5,000 square metres of space and supplies the pump production, truck mixer and plant engineering facilities with materials, whilst providing maximum flexibility and agility on the production lines.

'This takes machinery production to a whole new level', Martin enthuses. 'Clearly structured, clean, safe and incredibly efficient – this is a perfect fit for us and our new leading-edge product.' Martin, his team and the developers are eagerly anticipating Bauma Munich where the 42 M5 XXT truck-mounted concrete pump will go on sale and be presented to the general public for the first time. 'This modern all-rounder



A stand-out feature of the new 42 M5 XXT truck-mounted concrete pump: the new drive unit for the pump system

with the popular 5-piece multi-folding mast complements Liebherr's medium-range product class', explains Klaus Eckert, Head of Marketing at Liebherr-Mischtechnik GmbH. 'It is compact on the road, with a wide reach on the construction site, while its low unfolding height, outstanding slip characteristics and great manoeuvrability also make working inside buildings even easier.'

'Every single component was worked on during its development', adds Klaus Eckert, going on to explain how this level of detail ensured that the total weight of this agile and compact machine fell

below the 32-tonne limit applicable for four-axle vehicles. This was achieved without having to forgo any of the usual hallmarks of Liebherr products, such as a quiet and powerful motor.

The developers are particularly proud of the new drive unit for the pump system. 'It's a genuine highlight', says Klaus enthusiastically. This is the first time it has been possible to integrate all hydraulic switching and measuring elements into the drive unit. This removes the need for numerous hydraulic hoses and many other components. Another new feature is Liebherr's highly efficient, semi-closed oil circuit which powerfully and reliably supplies all the drives with hydraulic energy.

Liebherr's indestructible XXT support is another practical feature. Even on construction sites where there is little room to manoeuvre, the 42 M5 XXT can be safely set up in a stable position. Liebherr's XXA monitoring system actively assists the operator during this process, ensuring that the multi-folding mast can be easily extended and unfolded with a high degree of precision to allow the concrete to flow perfectly.



Rethinking Mixing Technology

To meet the demand for mixing solutions for increasingly complex tasks, Liebherr-Mischtechnik has developed two new laboratory mixers. The new series places special emphasis on transferability from the lab to real world applications. The mixers allow for high quality results to be reproduced and can easily be adapted for a variety of different tasks.

Ring-pan and twin-shaft mixers Liebherr-Mischtechnik's ring-pan mixer and twin-shaft mixer are two different mixing systems that can accomplish a wide range of mixing tasks. Ring-pan mixers have optimised rotary swivels that can achieve a perfect mixture for mixing materials that tend to agglomerate. This makes them especially good for finely grained, self-compacting



high-performance cement and specialised cements. Because they move mixing materials in three dimensions, twin-shaft mixers can achieve a high-quality mixture in a short time.

Future-focused: The ETM Truck Mixer Series

With this series, Liebherr guarantees optimal performance whilst significantly reducing noise and cutting out emissions entirely. The electrically-powered drum even handles extremely stiff concrete such as F1 or F2 adeptly, performing equally well in challenging winter conditions. Battery reserves last for the entire working day under normal operating conditions. The battery is recharged by a generator whilst the vehicle is driving or by using an industry standard Type 2 connector.

70 E – The Next Step on the Way to the 'Green Construction Site'

The electrically-powered 70 E has benefits for users and residents alike: such as zero emissions, less noise and low service costs.

It is becoming more difficult to run diesel-powered stationary concrete pumps at inner city construction sites. Liebherr's 70 E electric stationary concrete pump offers a powerful alternative for producing concrete at ground level or high up in an emissions-free way. The pump works without producing emissions and emits significantly less noise. Furthermore, the robust concrete pump is low maintenance and offers flexible positioning.





Components

On Close Terms with the Machine

Maximum performance and optimum cost-efficiency – a great deal is expected of construction machines and off-road machinery. Liebherr is now adding ‘intelligent components’ to this list of requirements. New sensors, analytical capabilities and transmission technology are adding a whole new dimension to condition monitoring along with machine and fleet management.

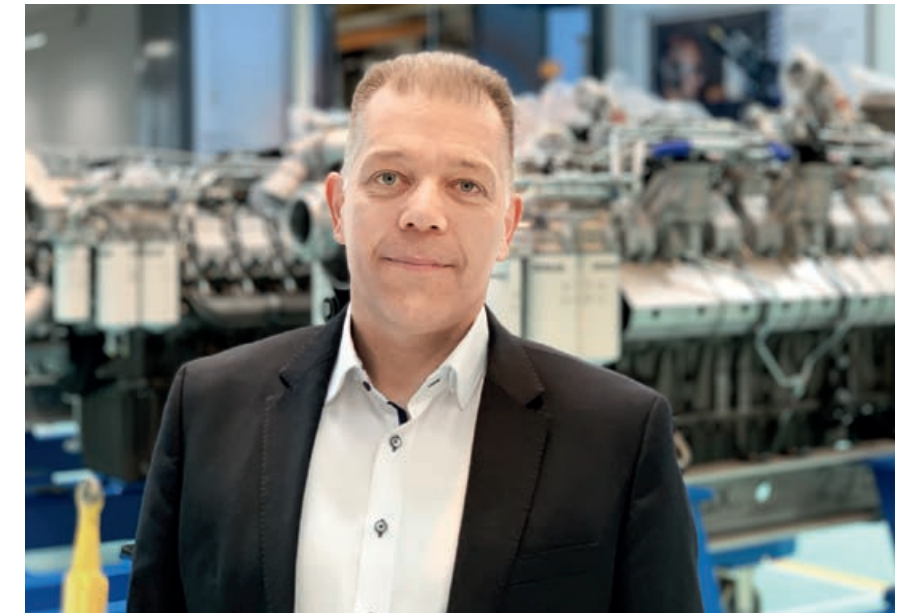
‘Hello, how are you today? Are you feeling fit?’ When you have to make big things happen each and every day, it’s not just polite but also totally reasonable, and indeed necessary, to enquire about your co-worker’s current state of health and ability to work. But what if your co-worker is a machine? In this case, it is necessary to call upon

sophisticated high-tech tools. Digital condition monitoring relies on effective communication between human and machine. ‘Constant improvements in performance and functionality levels give rise to special requirements, especially in terms of reliability and the timeframe from when a fault is detected until the machine is recommissioned,’

explains Rüdiger Heim, Deputy Director of the Fraunhofer Institute for Structural Durability and System Reliability (LBF). Rüdiger emphasises how in many cases preventative maintenance and scheduled service intervals ensure that an acceptable degree of reliability can be achieved.

And this is precisely what the experts at Liebherr’s Components division have been relentlessly working on for many years. ‘Liebherr has been implementing condition monitoring on combustion engines since the end of the 1990s. We are now focusing on applying this intelligence to other components,’ explains Stefan Wallmüller, Head of Controls at the Liebherr works in Bulle, Switzerland. ‘This paves the way for a new approach to machine and fleet management.’

At this year’s Bauma, Liebherr is showcasing for the first time a demo version of its new app which provides new condition monitoring functionality for many Liebherr components, including diesel engines, energy storage devices, hydraulic systems, transmission systems and large-diameter slewing bearings. ‘The app and the related software and hardware reflect the know-how of the many Liebherr experts from the various component factories. This demonstrates the way we work with our customers to continually expand and develop in order to meet their needs,’ Stefan Wallmüller explains. In the future, this will enable machine manufacturers, fleet managers, service teams and machine operators to provide customers with accurate information about the status of the components. And this



Stefan Wallmüller, Head of Controls at the Bulle site (Switzerland)

the amount of data available.’ He continues to describe how a powerful telematics unit ensures that data is transferred securely, even under challenging environmental conditions. ‘Data security is a top priority for us,’ Stefan Wallmüller emphasises. ‘This is why we comply with the most stringent encryption, authentication and cybersecurity standards. The data flows from the components in one direction and is not sent to the internet via open ports.’ This process eliminates the fraudulent use of data.

‘Maintenance work and unscheduled maintenance can be promptly anticipated, and machine downtimes can be reduced and prevented,’ says Stefan Wallmüller. ‘This cuts down on costs and improves efficiency, providing genuine added value which will pay real dividends!’ Stefan Wallmüller explains how an original equipment manufacturer (OEM) could also use the newly available data to optimise fuel consumption and machine performance.

‘The door is now wide open for us to exploit previously untapped machinery capacity.’ For example, Stefan Wallmüller envisages that the next phase could see data networks connecting machine components with each other, which would enable users to receive specific recommendations via one standard interface. This would help them to operate the machines flexibly and to maximum advantage. The machine’s response to the question, ‘How are you today?’ would then ideally be provided without any hesitation: ‘In top form, of course!’

‘The door is now wide open for us to exploit previously untapped machinery capacity.’

Stefan Wallmüller

can be achieved in real time, anywhere in the world, using a single interface and a uniform data format.

These developments are underpinned by increasingly innovative sensor and software technologies. As Stefan Wallmüller explains, ‘These technologies are steadily and significantly increasing

Stefan Wallmüller goes on to explain that the Liebherr Components division is not supposed to serve as an IT service provider but as a development partner for machine manufacturers. Its task is to generate functional data and condition monitoring data on the different components and to make the data available to customers who can use it to

Liebherr is Turning to New Materials

To meet precise customer requirements for lightweight construction materials, Liebherr Components is increasingly looking at alternative materials and has, therefore, added carbon fibre reinforced plastic (CFRP) into its product range.

Liebherr has always taken the approach of making components in-house so that the required know-how is always on hand. The company remained true to this approach whilst developing and manufacturing fibre composite solutions – the entire production process of lightweight construction materials takes place in Kirchdorf, from product development to assembly. The goal is to offer CFRP solutions that not only make economic sense, but offer added value. The benefits of the raw materials – such as corrosion resistance, special absorption properties and adjustable thermal expansion – will generate significant added value as finished products.

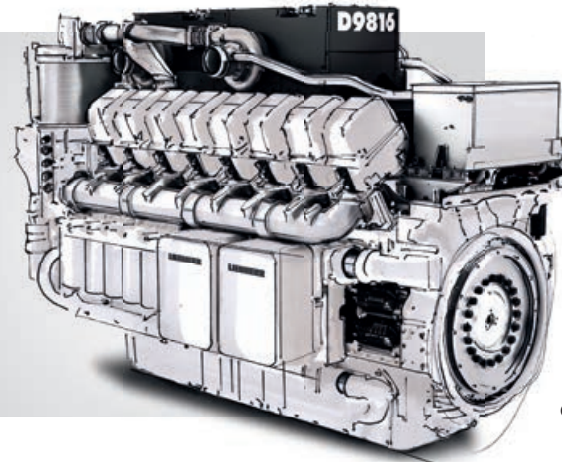


New Slewing Drive Units

Liebherr is upgrading its range of slewing bearings with slewing drive units consisting of new worm, pinion and toothed belt gears.

Their extremely compact construction and high power density mean that the worm gears are especially good at transmitting high loads and momentum in a small installation space. They are used in applications such as the steering systems of mobile cranes and HGVs, and in loading cranes or farming machinery.

The pinion drives typically come in the form of a double-mounted pinion. This type of slewing drive unit is characterised by a fast rotation speed with low heat development. The design is a perfect combination of original Liebherr slewing bearings and drives. The toothed belt drive is ideally suited for high peripheral speeds, whilst offering a high degree of efficiency and an especially quiet operation.



Upgraded Engine Range

Liebherr is forging closer partnerships with reputable OEMs and engine manufacturers and adding new upgrades to its diesel and gas engine range. The latest addition is the 6-cylinder D976 inline engine delivering 400 to 620 kW of power and 18 L capacity. The engine is ideally suited for C&I markets as well as agricultural technology. At booth 326 in hall A4, Liebherr will be showcasing the D9186 V16 engine model, the successor to the D9812 diesel engine, for the first time. The new engine delivers between 2,100 and 2,700 kW of power at 1,800 rpm, making it ideally suited for the challenges of the mining industry.

DC5 Display Controller

The DC5 family, the fifth generation of Liebherr display controllers for mobile machines, boasts a high-resolution display, touchscreen and programmability.

The DC5 offers viewing comfort whilst bringing processing power into the driver's cabin. Featuring a powerful processor, intelligent software and protection up to IP5K4, it is ideally suited for use in demanding applications such as farm machinery, construction machinery and materials handling devices. Optical bonding technology provides the requisite robustness and comfort: meaning better touch functionality and

excellent legibility even in strong sunshine. The range includes 7, 9 and 12-inch versions with a resolution of up to 1,280 x 800 pixels.

Liebherr's tried and tested display controllers offer excellent customisation options: design, display size, processing power and connectivity can be adapted to individual needs quickly and cost-effectively, with a high degree



of flexibility. If required, other functionality, such as GPS navigation and mobile radio, can be integrated directly into the display controller.



The New Generation LH30VO Medium Pressure Pump

Liebherr has launched the 20th generation of the LH30VO axial piston pump in nominal sizes of 28, 45 and 85 with a nominal pressure of 280 bar and a maximum pressure of up to 320 bar. It is now easier to fit the pump to power take-off devices and the enhanced modular regulator kit maximises ease of use. This new generation of pumps features a drive shaft system that is flexible even when the pump has already been fitted. Its higher suction pressure limits of up to 3,300 U/min and its drive shaft capabilities of up to 130% ensure that this robust medium pressure pump can be used in a variety of applications.

The New Generation of LPI Gearboxes

The LPI series is the latest addition to Liebherr's range of planetary gearboxes. It consists of seven basic gearboxes, from the LPI 600 to the LPI 1200, and covers a dynamic range of torque from 20,000 Nm to 335,000 Nm.

The gearboxes' reduced complexity means that they can easily be configured for any application. This makes the series ideal for use in lifting applications (e.g. rope winches) and driving applications, or as a drive for chain and crawler vehicles. Designed for use in both stationary and mobile applications, the planetary gearboxes boast high power density, minimal weight and reduced installation space.

New materials and manufacturing technology allow 20% higher output torque levels to be produced than with previous planetary gearboxes.





The Liebherr Group

Hans Liebherr established the company that bears his name in 1949. Since then it has grown into a Group of more than 130 companies on all continents, employing more than 46,000 people at the latest count. In 2018, the Liebherr Group achieved a total consolidated turnover of more than 10 billion euros.

The Group's holding company Liebherr-International AG is based in Bulle (Switzerland) and is wholly owned by members of the Liebherr family. The Liebherr Group's corporate culture has been determined from its earliest days by its family ownership. For 70 years, Liebherr has demonstrated what this

means in terms of stability and trustworthiness, and has striven for a close long-term relationship with its customers and business associates. Liebherr shapes technological progress and aims to retain its position at the leading edge of future technology. All its activities have top quality as their central

element. This principle is upheld by all the Group's employees in their day-to-day work. Liebherr's products are the outcome of its passion and dedication: tailor-made solutions that take the customer's needs and wishes wherever possible as their starting point. Today, Liebherr is not only among the world's largest manufacturers of construction machinery, but is an acknowledged supplier of technically advanced, user-oriented products and services in many other fields of activity as well. In addition to components and systems in

the mechanical, hydraulic and electrical driveline and control areas, they include maritime cargo handling, machine tools and automation systems, aerospace equipment, equipment for the rail industry, domestic appliances and hotels.



Responsive Handling in Tough Conditions

You can't see it; you can only feel it. The controls are hidden deep inside the machine and have been designed to be highly responsive and precise. One of the people behind this is Ramona Adam-Heinrich. As a software and control system developer, she is also responsible for running the crawler tractors and crawler loaders at the Liebherr works in Telfs for the very first time.

The crawler tractor pushes the excavated earth steadily and precisely around the rough terrain. It moves diagonally up the slope and then reverses quickly back to its original position. Heavy rubble sits there waiting to be removed as quickly as possible by the 22-m³ blade. With an operating weight of 72 tonnes, the PR 776 is one of Liebherr's heaviest tractor crawlers.

Both its colossal weight and all its features and performance capabilities need to be brought under control in some way; in other words, it needs direction. And this is exactly what sets Ramona Adam-Heinrich's world alight. She has worked as a software and control system developer at Liebherr-Werk Telfs GmbH since 2014. She is the first person in the company to operate the pipe layers,

telescopic handlers, crawler loaders and crawler tractors that are produced at this site. 'What makes my work at Liebherr so unique is that it is the perfect combination of information technology, electrical engineering and mechanics. First, I need to get familiar with and understand the mechanics and electronics in a machine so that I can custom-design and install the appropriate software.'

'Starting up a prototype for the first time is an impressive experience that never gets old!'

Ramona Adam-Heinrich

Keeping sight of the bigger picture

Ramona Adam-Heinrich knows her programming. She studied mechanical engineering and mechatronics, and started to develop software solutions for crawler tractors and crawler loaders during her master's degree in 2013. 'Working on my thesis on electronically controlled equipment on crawler loaders allowed me to gain a comprehensive insight into the company, and I was immediately inspired,' Ramona Adam-Heinrich goes on to explain. The fact that pipe layers, crawler loaders and crawler tractors are all made in their entirety at the same site is what makes the work so appealing to her. 'The machines are developed, manufactured and commissioned here at the factory. We take the product through every step of the development process from the first steel plates until they are handed over to the customers – which is really impressive.'

Total fascination

Twenty-eight-year-old Ramona Adam-Heinrich is currently working on software solutions for the entire new generation of Liebherr machines. A normal working day for her usually starts with programming tasks on the PC. As soon as she has completed the development tasks, which are based on various requirements and theoretical technical

data, it is time to work on the prototypes in the factory hangars. This is where the synergies between the software, the electronics and the hydraulics on the machine can be tested. The machine sparks into life the moment the ignition

'Technical expertise and a bit of intuition are ultimately the best way to win everyone over.'

Ramona Adam-Heinrich

is first turned on. 'The most captivating part of my work is starting up a prototype for the first time. It's an impressive experience that never gets old! I have to get to know each product, and this is when I get to experience technical progress the most obvious way. Every prototype is unique, which makes the entire commissioning process so interesting.'

Eliminating prejudice

Ramona Adam-Heinrich does not find being a woman in a male-dominated industry a barrier at all. 'I feel very much at home in my job even if I am only one of a handful of women who work in this profession. However, I notice that I have to hold my ground and prove myself every now and again. I believe that specific action needs to be taken across the entire industry to dismantle barriers and encourage young talented people to work in engineering irrespective of their gender.' Ramona Adam-Heinrich therefore advises all young women who are interested in working in the construction industry to be assertive. 'Even if you have to put up a fight every now and then in order to assert yourself, it is definitely worth persevering. Technical expertise and a bit of intuition are ultimately the best way to win everyone over.'

One Passion. Many Opportunities.

For 70 years, the Liebherr name has been standing for innovative products and services, and there is one thing that unites us above all else: a passion for technology.

We are always on the lookout for talented people who will contribute their expertise and enthusiasm to the Liebherr Group in many different fields.

Apply now!
www.liebherr.com/career

The World of Liebherr in Numbers

A look at the stats across the world of Liebherr tells you the following: Liebherr is fast, Liebherr is large, Liebherr is international, Liebherr is strong, Liebherr is all this and much more.



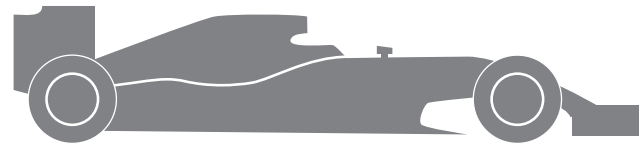
Roughly every **five seconds**

an aircraft takes off or lands that has been fitted with an **Liebherr-undercarriage system**

On average over the past year, every day

6 people

started their new job at Liebherr.



A new aviation gearbox developed by Liebherr and Rolls-Royce delivers

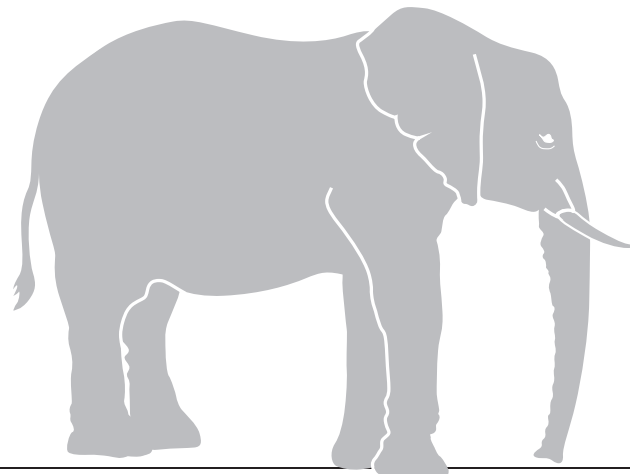
70,000 PS

equivalent to 74 Formula 1 cars.

The heaviest Liebherr product weighs in at

810 metric tons

as heavy as 135 elephants.



Premiere for the world's first mobile tower crane:

On August 19th 1949

Hans Liebherr applied for a patent

for his **first product,**

the **TK 10**, at the German Patent Office.

The largest Liebherr company is located at Ehingen and employs

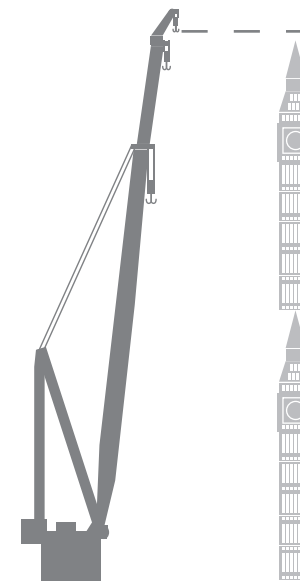
3,686 people.



The **PR 776 Litronic crawler tractor** is heavier than the

60 tonnes

of paint that cover the Eiffel Tower.



The **HLC 295000 offshore crane**, developed in 2017, is the Liebherr Group's

largest crane.

If it was set up on land, it could lift its load to more than twice the height of Big Ben.

It would take almost **54 A380 airliners** to transport all of Liebherr's employees.



We are at home all over the world: the Liebherr Group comprises over **130 companies** in more than

50 countries on every continent of the world.



Aerospace

The German Chancellor meets Liebherr

German Chancellor Angela Merkel and Federal Minister of Transportation Andreas Scheuer have visited the Liebherr Aerospace stand at the ILA Berlin Air Show, one of the largest international aerospace trade fairs in the world. Dr. h.c. Willi Liebherr showed them the Group's research on fully electrical components for the aircraft of the future.

Domestic Appliances

Domestic appliances production in India

The fast-growing Indian market: Liebherr has opened a 20-hectare production plant in Aurangabad. Liebherr Appliances India Private Limited specialises in the production of high-quality refrigerators and freezers for the Indian market. Due to the rapid transformation of living conditions there, India is expected to offer great sales opportunities in the future.



Domestic Appliances

New thinking

Liebherr's new Monolith refrigerator has delighted visitors at the the Berlin Radio Show (IFA) Innovative ideas, luxurious fittings and cutting-edge technology have made the Monolith a standout product for the home. A large number of items from the entire home appliance product range are now equipped for the future. Exhibition visitors had the chance to discover how networked refrigerators and freezers can help to make day-to-day living smarter. Did you forget to buy milk when you were out shopping? An app linked to the refrigerator knows that you did and can help to simplify the way you manage your grocery requirements.



Maritime Cranes

New heavy-load crane in Rostock Harbour

Liebherr has started to install the world's most powerful land-based heavy-duty crane at the Port of Rostock. The 164-metre tall TCC 78000 will be used to load Liebherr's increasingly larger maritime cranes and external companies operating at the Port of Rostock will also be able to use it to lift heavy loads.

Transportation Systems

Environmentally-friendly climate control

Liebherr has made local transport better for the environment: After a 24-month trial phase, Eco-Clim, the first 'green' climate control system has passed field-testing. This climate control system is completely free of chemical coolants. Instead, it uses an airborne coolant technology that originated in the aviation industry.



Hotels

Award-winning chefs

The Gault&Millau restaurant guide has awarded the chefs at two Liebherr hotels. The Gault&Millau toque is one of the most prestigious awards in haute cuisine, alongside the Michelin star. Thomas Cavalho de Sousa (left) cooked up two toques for the Löwen Hotel Montafon in Schruns, Austria. And Mario Döring (right), head chef at the Interlpen Hotel in Tyrol, Austria, was awarded with three of the coveted toques.





Gear Cutting Technology and Automation Systems

Digitalizing the future

Liebherr-Verzahntechnik GmbH has positioned itself at the AMB trade fair in Stuttgart (Germany) as a pioneer in gear technology and automation under the banner 'Join our digital revolution'. Hundreds of visitors flocked to Liebherr's stand over five days to find out more about the latest industry trends. The Liebherr Performance Area, which focused on the digital highlights of Industry 4.0, was particularly popular. Topics such as the new skiving tool, modern closed loop applications and the digitisation of manufacturing processes stimulated many interesting discussions.

Table Tennis

Historical title fights

The 54th table tennis world championships have taken place from 29th April to 6th May 2018 in the Swedish town of Halmstad. Liebherr was the title sponsor of this huge event which attracted a great deal of media attention across the world: over 28,000 expert articles were written about it and over 300 million people watched over 862 hours of play and commentary which were televised. News was also broadcast via various social media channels. World Cup titles were won by teams from China. The German men's team, which is also sponsored by Liebherr, won the silver medal. In addition to extraordinary demonstrations of world-class table tennis by the 87 teams which took part, the event had a special political resonance. The ladies' teams from South Korea and North Korea decided to join forces before the quarter final to symbolise understanding between the two countries. This caused a huge stir across the globe way beyond the field of sports.



Discover more:
www.liebherr.com

LIEBHERR



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