Bauma Magazine

2025

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Hands on the future – and what's behind it

Even in a constantly changing world, Liebherr is marching on into the future with confidence, innovation and visionary ideas. The Group stands squarely behind its customers and partners, collaborating to find opportunities, developing visionary solutions and so shaping the world of the construction site together.

Messaging to the point:

- **1. Partnership:** Liebherr reliably supports its partners throughout the entire process, way beyond the simple use of the machines, and works with them to develop customised solutions.
- **2. Digitalisation:** Liebherr develops digital solutions optimally tailored to the machines, which increase performance, reliability and safety at the construction site, such as machine autonomy, teleoperation and assistance systems.
- **3. Responsibility:** Liebherr has always prioritised efficient and safe products and reduced emissions throughout the machines' entire life cycle. This applies to machine use and sustainable end-of-life practices through the remanufacturing programmes, which contribute to the circular economy.
- **4.Product quality:** for over 75 years, Liebherr has stood for high-quality products, which combine performance, efficiency and sustainability. The focus rests on durable materials and components as well as innovative technologies, which are practical and perfectly fit customer requirements.



A highly dedicated team of over 50,000 employees work to ensure every individual criterion is met. Operating in an innovative family-run company, employees have the freedom they need to be inventive and pragmatic in their daily work – and to shape the future together with customers and partners.





Bauma 2025 Hands on the future

Dear guests,

Bauma 2025 has started – and we are building a bridge to the future. Liebherr's presence at Bauma brings to life our pioneering innovations and comprehensive digital solutions, dedication to quality and strength of a global team. Our hands-on approach to technology and our close relationships with our customers and partners empower us to pave the way for a resilient and exciting future.

This year's exhibition motto 'Hands on the future' is about contributing to technological progress combined with a quality-driven, can-do mindset. But innovation at Liebherr goes far beyond seizing opportunities with products; the skills and commitment of our employees mean that our ambitions become a tangible reality. The future is not simply a place we are going - it belongs to those who help shape it. While we are part of the gamechanging digitalisation landscape, the invaluable experience of in-person discussions and tactile engagement with our own exhibits cannot be replaced. Our extensive array of over 100 exhibits from the areas of construction machinery, mobile and crawler cranes, material handling, mining and components includes machines live in action. Spanning over 14,000 square metres, visitors from approximately 195 countries are set to attend. At Bauma, we are poised to lend a hand to new perspectives and fresh momentum across our diverse industry sectors, ensuring that we are anticipating and driving future trends as a master in technologies.



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

In an ever-evolving world, four key topics, highlighted in this magazine, propel us to reshape how we deliver value to our customers: partnership, digitalisation, responsibility and products. Our belief in the power of robust partnerships is showcased by the articles on Liebherr Mining and Fortescue or the L 566 H wheel loader, the world's first large wheel loader powered by a hydrogen engine, to name a few. For digitalisation, discover more about our latest breakthroughs in automation and our pursuit of smarter solutions like Liebherr Connect that optimises efficiency, enhances safety and contributes to a more sustainable tomorrow. We are particularly proud of presenting our advancements under the topic of responsibility, which is about safeguarding the future of the next generation – for society and the environment. Explore our comprehensive product updates across all areas, beginning with an insightful feature on past Liebherr winners of the Bauma Innovation Award; we are eagerly awaiting our esteemed winner in 2025.

During Bauma week, up to 2,000 Liebherr employees from almost 50 countries will gather, embodying our unparalleled commitment to our customers. In the spirit of our motto 'Hands on the future', we are reaching out to the future with both hands. Enjoy what lies ahead in our Bauma Magazine 2025.

Jan Liebherr and Stéfanie Wohlfarth Presidial committee of the Liebherr-International AG administrative board

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Bauma and the people who make it

Bauma is a name that stands for innovation, scale and spectacle in the world of construction machinery and the construction industry. Every three years, Munich transforms into a Mecca for technology enthusiasts and professionals from around the globe. An integral part in this event is played by Liebherr. But behind the impressive machinery and the incomparable exhibition booth are people who put months of passion and dedication into ensuring an unforgettable experience for visitors. These are the people who make Liebherr at Bauma so special.







The world's biggest construction exhibition

Bauma is not just the largest trade show in the world for construction machinery, but also an international event that draws visitors from all parts of the globe. For over 60 years, Liebherr has been a prominent participant, showcasing its products on an area covering over 14,000 square metres. This year there are more than 100 exhibits, including construction machinery, mobile and crawler cranes, material handling equipment, mining machinery and components.

Innovation and perfection: the work at the Liebherr plants

Long before the the stands are set up at the site, people at the Liebherr plants around the world are busy developing, testing and perfecting the latest innovations. Each development undergoes rigorous testing to ensure the best possible results for customers and visitors to the fair. Every detail, from the carpet to the catering, is planned and coordinated for months to create a cohesive overall experience. An entire team works on the visuals of the presentation so that they perfectly highlight the latest innovations. The Bauma caps, which are always a must-have accessory, are designed, produced and stored until they can finally be handed out.



















The preparation: a monumental effort

Six months before Bauma opens its gates, a huge construction site is established at the exhibition grounds in Munich, Germany. Liebherr employees from Germany, Austria, France and the United States, who usually work in entirely different areas, now come together every day to complete the impressive outdoor exhibition area.

Two imposing buildings are constructed, each 120 metres long, 14 metres wide and 13.50 metres high. The converted space covers 15,000 cubic metres, while the usable area of the buildings is 6,000 square metres. To achieve this logistical feat, 1,200 tonnes of steel are used, consisting of 3,200 individual parts.

The technical infrastructure is just as impressive: 4,000 lights are installed and 75 kilometres of cable are laid. Around 26,000 bolts are needed for the steel structure, while the wood construction requires a whole million screws, including 800,000 for the drywall alone.

The facade of the buildings is fitted with 5,000 square metres of glass, with individual panes weighing up to 600 kilograms. There are also 8,000 square metres of painted surfaces (not including steel supports for the buildings and filter systems) and 7,000 square metres of carpet. The building is equipped with 400 doors, a main staircase and three lifts. Every day, an average of 30 and, at peak times, up to 90 installers work on the project, which requires a huge amount of teamwork and dedication. This logistical feat not only demands technical expertise, but also impressive coordination and cooperation from everyone involved.

Made by Liebherr

'Do it yourself, think for yourself and less talk, more action.' Once upon a time, Hans Liebherr used this motto as the basis for establishing and consistently further developing the company. Since then, the courage to innovate has been in Liebherr's DNA. At the same time, it gives rise to a 'blueprint' for construction machinery and their applications that makes all the difference on the way to the future.

'The only constant in life is change,' said Leonardo da Vinci (1452-1519) - a universal scholar, who, more than any other, stands for creative thinking and surpassing boundaries. Yet innovation was a risky business even in his time. Many of his contemporaries deemed da Vinci's designs for parachutes, tanks or musclepowered aircraft absurd, if not insane. The concept of imagining something that has never existed before - and then turning it into a reality - is still one of the biggest challenges of our time. Innovation requires courage, persistence and, above all, people who are not discouraged by scepticism or setbacks. Hans Liebherr was one such person. In 1949, he invented the mobile tower crane and, in doing so, not only laid the foundations for a global company. but also for a culture of innovation that is unique to this day and serves as a blueprint for entrepreneurial progress: 'Do it yourself, think for yourself and less talk, more action.'

But what if the idea is bigger than the market or the imagination of those who could benefit from it? Flashback: full of enthusiasm, and in view of the reconstruction of post-war Europe, Hans Liebherr presented his mobile tower crane at the relevant trade shows. The response? Polite interest, but barely any orders. The market was not ready, and the idea threatened to fail. But instead of giving up, Hans Liebherr acted according to the principle now known in the field of innovation research as 'effectuation': he did everything he could to make his vision a reality with the means available to him. And so he star-



Stephen Albrecht Member of the board of directors of the Liebherr Group

ted production at his own expense, fine-tuned the product and had complete faith in its potential. The first orders soon followed and the tower crane became a 'game changer'. It's a great story that shows how innovation often begins with a contradiction – between what exists and what could be.

The people behind the machines

Then, as now, the innovative strength of Liebherr lay in more than just groundbreaking products. High-performance fibre ropes for tower cranes, ever new equipment for zero emission construction sites, battery-electric mining trucks, autonomous wheel loaders, the breakthrough for hydrogen combustion engines in heavy duty use, and much more, would not exist without the people who make everything possible. 'Innovation exists where there is freedom.' said Stephen Albrecht, member of the board of directors of the Liebherr Group. This belief is reflected in the corporate culture: 'Trust, personal responsibility and team spirit form the basis for top creative performance,' said Albrecht. 'Many employees stay with the company for decades - that's worth a lot in a world that is turning faster than ever. This long-term loyalty not only creates stability, but also the space to pursue ideas with perseverance.'

Pioneering spirit and pragmatism

Albrecht stresses that Liebherr's innovation strategy is anything but dogmatic. 'While many companies rely on individual technologies, we are pursuing a technology-neutral approach: whether for diesel, electric, hybrid or hydrogen drives – the aim is always to find the best solution for the respective use case.' Yet it is often not the big vision that counts, but the pragmatic implementation: 'How do we design long-lasting, complex technology reliably and efficiently?'

Today, with digitalisation and the new possibilities of artificial intelligence, innovations seem possible 'at the push of a button'. It's just a question of data processing and predictive simulation, isn't it? Well, reality tells a different story: progress requires time, patience and, above all, the willingness to make mistakes along the way. 'Innovations that endure require persistence,' said Steffen Günther, member of the board of directors of the Liebherr Group. 'We don't think in quarters, but in generations.'

Innovation through technology-neutral approach

In order to remain flexible within such wide horizons, continues Günther. Liebherr backed alternative drive concepts through its technology-neutral approach. These concepts meet the requirements of the legislator and society regarding the decarbonisation of the construction and industry sector, while also offering good economic prospects. They include, for example, hydrogen combustion engines, including with innovative injection solutions developed by Liebherr, which optimise combustion and power density. Liebherr is also pursuing this kind of pragmatic approach to innovation in the development of new, highly efficient electric motor technology with very high power and torque densities. 'It's about engineering that combines innovative strength with broad, practical experience,' stresses Stephen Albrecht. In order to meet the extremely challenging environmental conditions and power requirements of construction machinery and construction vehicles, this new

technology is significantly more compact and powerful when used in challenging, continuous operation, and it also requires minimal maintenance due to simplified cooling.

Embedded in a digital ecosystem

Liebherr places importance on drives as well as the continuous development and improvement of new and existing assistance systems. These support the machine operators in their daily work, while also increasing safety and productivity. Today, Liebherr's digital experts across all product segments are working



Steffen Günther Member of the board of directors of the Liebherr Group

on the data integration and creation of a comprehensive digital ecosystem for construction machinery. It's about more than just digital innovations – it's also about ever new ways of networking the hardware and the associated systems with each other. 'We have several hundred digital solutions in the field, from APIs to IoT solutions and training simulators – and more are always being added,' says Stephen Albrecht. But there is no need for the individual development departments of the different product segments to completely redesign the respective digital basis today. 'We are continuously working on finding and using synergies, wherever they appear,' says Albrecht.

A holistic approach to innovations

Liebherr's innovation strategy today is clearly centred around this type of holistic approach: 'These days, change is inevitable. Right now, nobody knows exactly where technology will go next,' according to Stephen Albrecht. But this doesn't leave Liebherr at a loss. Quite the opposite, in fact. 'As a Group, we keep up with all the latest issues affecting all product segments and do our utmost to find innovations.'

Courage to innovate means there is always an element of risk. And Stephen Albrecht and Steffen Günther are aware of this too. Hans Liebherr always had the possibility of failure at the back of his mind – but it never held him back from constantly contemplating big and small changes: as the company founder said: 'With dogged determination, it is also possible to achieve what appear to be almost unattainable targets. Don't allow yourself to be disheartened by setbacks, having faith can move mountains.' The countless innovations by Liebherr since it was founded over 75 years ago are more than just a confirmation of this theory. They also set the tone for an extraordinary success story with a title that says it all: 'made by Liebherr'.

7 first-hand Liebherr experiences

Join us for a future-focused Bauma 2025, where Liebherr is putting its 'hands on the future'. To ensure you capture every moment, we invite you to check out these top seven must-see highlights at the Liebherr booth. See you there!

Experience the future at our live machine shows 1

Join our eye-catching daily live shows, held several times a day, featuring Liebherr's latest technologies. Discover our advanced crane control systems and RemoteDrive technology in action. Explore the latest assistance systems and digital construction site solutions in our earthmoving and material handling machinery showcase. Witness the debut of autonomous construction machine concepts in live operation and catch the spectacular mining highlights.

Discover more – with our Bauma audio guide Immerse yourself in the construction and machinery world of the future: our audio guide is available to accompany you to Bauma 2025, providing extra information about how Liebherr is taking the future in its hands and reshaping it. Whether you're standing right in front of one of our exhibits or using the audio guide on the move - you can find out more about our innovations and techno-

logies. All you need is a set of headphones and an inquisitive ear!

Become part of our success story

3 In our career lounge, students, graduates and professionals can discover more about Liebherr as an employer. Do you want to find out what it's like to be part of Liebherr, as well as explore our various career opportunities? Then come visit us on the ground floor of the Liebherr pavilion. In the THINK BIG! Liebherr training booth in the ICM, we focus on our apprenticeship programme. Here, pupils can use our interactive Job-Check and experience our products up close with miniature excavators.

Step into the future with Liebherr at the InnovationLab Liebherr shapes the technologies of the future in many industries and markets as a reliable partner, responsibly pursuing ambitious visions for and with its customers. How will the construction machinery of tomorrow be powered? How do machines perceive the environment and how do digital solutions contribute to greater safety or a reduction in CO₂? In the InnovationLab, Liebherr is already addressing tomorrow's questions.

Strike a pose at our photo spots

Snap photos next to our impressive exhibits. Find the diverse photo spots scattered throughout the different booths at Bauma. Let's foster a sense of community: share your fun photos on social media with the hashtag #handsonliebherr and **#bauma2025** to connect with fellow attendees. Follow us on LinkedIn. Instagram. Facebook and TikTok to see more of the Liebherr world.

Take home a piece of Liebherr

Get the exclusive and limited Bauma collection, available only during the trade show, as a unique souvenir. In addition, the Liebherr shop offers detailed miniature models that will thrill any collector.

Your daily Bauma fix with our video magazine Craving more Bauma even after your visit? No problem with our daily Liebherr video magazine. Here you will find a new video every day to help you relive the experience and get a preview of what's to come.



Partnership

The art of partnership

Even the very finest technology and the greatest innovation only has value if it represents a benefit for the user. This is why the future of construction machinery lies in customer relations built on partnership.

Even Hans Liebherr knew that 'we can only be satisfied when our customers are satisfied too'. This was - and still is - based on the strong belief that innovations and technological advancements are not an end in itself. The central question, therefore, is always how customers can make effective use of the machines to complete their tasks successfully. Integral to this is the quality of the partnerships, which are based on trust, openness and a willingness to accept responsibility. In the construction machinery sector especially, where innovation, robustness and reliability are of central importance, one thing is clear: progress is not a single-handed achievement. It is virtually always the result of a dialogue between companies, their customers and a shared vision.

'We can only be satisfied when our customers are satisfied too.'

Dr-Ing h.c. Hans Liebherr Founder of the Liebherr Group





Trust that doesn't fade

The relationship between Liebherr and its customers does not start at the signing of a contract. It starts long before then. And it does not end the moment an excavator, crane or crawler dozer is delivered. Partnerships in the construction machinery sector must be robust just like the machines themselves. Ultimately, it is a matter of achieving maximum performance (often in challenging conditions 'out in the field'), ensuring absolute safety and reliability, and extending the machine's service life well beyond the norm. Yet these technical aspects tell only half the story. A partnership only really becomes viable through reciprocal

becomes viable through reciprocal trust and appreciation that develop over years and that are based not on the product alone, but on the entire solution behind it. For a manufacturer, this also means being present even when things get tough.

Close to customers, close to the solution

The Liebherr ethos is to truly understand the customers needs at all times. Construction sites are often extreme and in many respects challenging places. Things on site don't always go perfectly to plan. Time and again something happens in the blink of an eye to determine whether a project progresses or grinds to a halt. A delay of any kind always costs money – not to mention stress. When something goes wrong, every minute counts. All the more important therefore to have machines, materials and a service crew you can depend on. A manufacturer who understands this knows: their work is not over once the sale is secured. In fact, that's when their work really begins: for instance, with the configuration of the machines for the required application or with the provision of a service that is available around the clock in the event of emergencies. As such, customer focus cannot be simply marketing puffery, it is an absolute must. And that is precisely what sets Liebherr apart: applying their own expertise to help customers achieve both short-term and long- term success, resulting in satisfied customers.

Partnership as a driving force behind innovation

Innovations that strive to deliver customer satisfaction are never the result of solo work in laboratories and development centres. These are the places where ideas are born, prototypes built and technologies tested. But the key impetus often comes from elsewhere: from the people who work with the machine every day. Their everyday needs, observations and their suggestions based on first-hand experience are fundamental to long-term market success. A company that is prepared to listen to users and is truly 'at home' on the most diverse construction sites and work environments has an invaluable advantage when it comes to creating practical innovations and designing new technology.

Example: climate targets are calling for a drastic reduction of carbon emissions. yet, at the same time, the machines still need to be high-performance, robust and economical. Manufacturers that want to strike this balance with the relevant drives do well to involve their customers from the very start of the development process and in the implementation of eco-friendly technologies. Take, for instance, alternative drives for heavy machinery that perform hard labour in quarries or mines without producing any emissions. From the very outset, manufacturers need to clarify certain questions with users: what are the requirements in the field and for those involved? Where might there be room for compromise? And what pays off and makes a real difference for the customers operating the machines? The partnership and collaboration required to achieve this with the

customers doesn't just happen. It takes time, patience and a willingness to engage with the unknown and unfamiliar. The result of all this is a better product and a better understanding of each other. In the end, it allows manufacturers and customers to grow together.

Technology as a useful tool

From this perspective, technology is not an end in itself. It has to serve people. A machine that is technically impressive but not intuitive to use is a machine that has missed its target. The same is true of a technology that works in theory but fails in practice at the first sign of uncertainty. Liebherr's modus operandi of developing machinery in close collaboration with customers (together with science and research) results in more than just products that are more efficient, longerlasting and more economical. They also serve as 'tools', which make user's working day easier and operations on the construction site safer.



Reaching this point, however, is a marathon, not a sprint. It takes lots of small steps and slow, steady breathing. Another factor for success, which is often overlooked, is financial stability. Family-run companies like Liebherr, who don't allow themselves to succumb to short-term pressures, but rather think in the long-term, have a clear advantage in this regard. That is because they are able to tread new paths and remain true to their visions, even when success isn't immediately apparent. The construction machinery sector is not an industry that demands technologies simply because they are current, relevant and 'state-of-the-art'. Instead, it demands technologies that will stand the test of time, and will still be working hard in ten or twenty years or more. 'Modest' progress, aimed at achieving this longevity, brings about better machines and a stronger understanding between customer and manufacturer. Then, in future, this partnership grows into a worthwhile joint venture. 'We can only be satisfied when our customers are satisfied too.' For Liebherr, this is precisely what makes partnership an art form.



A giant leap towards sustainable mining

A historic milestone for the mining industry: at MINExpo 2024 in Las Vegas (NV/USA), Liebherr and global technology, energy and metals group, Fortescue, sealed a deal for developing and delivering a fleet of zero emission machines that will also be largely autonomous, signifying the dawn of a new era of mining

It was a truly remarkable moment. Last September, during the world's largest exhibition for the mining industry – MINExpo – Liebherr and Fortescue announced a significant expansion of the partnership between the two companies. Together, they are committed to having a comprehensive and large scale zero emission mining ecosystem operational by 2030.

With a contract that includes the supply of 475 Liebherr machines, and is worth an enormous €2.5 billion, this deal not only marks the largest single order in Liebherr's over 75-year history, but also sends a strong signal for the future of the industry. The two companies are committed to producing mining equipment no longer reliant on fossil fuels that also provides the performance, efficiency and reliability expected of heavy-duty machinery. The innovations developed as part of this contract will support both companies as they work towards their respective 2030 decarbonisation targets.

'At MINExpo, we wrote a new page of Liebherr history and are proud to be able to make an important contribution to the decarbonisation and autonomisation of heavy-duty machines,' explains Dr Jörg Lukowski, executive vice president, sales and marketing, at Liebherr-Mining Equipment SAS. Blazing a trail for the mining industry

The partnership between Liebherr and Fortescue is driving two key trends in the mining industry: decarbonisation and autonomy.

'The technology we're developing with Fortescue will put us well on our way to becoming one of the first providers in the mining market to combine a zero emission drive and a fully autonomous transport solution in one mining truck. This will support our customers on their path to decarbonisation,' says Dr Lukowski. The planned fleet of machines for Fortescue, consisting of 360 batterypowered mining trucks, 55 electric excavators and 60 dozers, will operate entirely without fossil fuels. One highlight of the collaboration is the zero emission and autonomous T 264 Battery Electric mining truck, which is equipped with a battery power system developed by Fortescue Zero, Fortescue's technology arm. This technology has been specially designed to handle the extreme demands of mining: long operating times and moving heavy loads in challenging environments.





Fully autonomous operation

Liebherr and Fortescue are also developing a comprehensive Autonomous Haulage Solution that will enable machines to be operated completely autonomously. The Autonomous Haulage Solution also includes an Energy Management System that coordinates the charging assignments for the battery-electric trucks. 'This combination of zero emission drive technology and autonomy is unique on the market and reflects Liebherr and Fortescue's leading role when it comes to technological progress,' explains Dr Lukowski. These machines will not only offer a reduction in carbon emissions, but also considerable efficiency gains. Autonomous machines can minimise downtimes and optimise the use of resources, while zero-emission drives make it easier to meet global environmental targets.

Heading for a new era

As an industry that has long relied on fossil fuels, this partnership paves the way for a new era of more sustainable and efficient mining.

'We are committed to meeting the technological needs of our customers while actively contributing to the reduction of global carbon emissions,' says Dr Lukowski in summary. 'With this partnership with Fortescue, Liebherr is showing that innovation and sustainability can go hand in hand – and that the future of mining has already begun.'

At a glance: the Liebherr-Fortescue partnership

The extended partnership between Liebherr and Fortescue is setting new standards in the mining industry

475 machines – a large scale zero emission mining operation

Liebherr and Fortescue will deliver what is expected to be one of the first and largest full-scale operational zero emission and autonomous mining fleets in the world by 2030. The fleet is comprised of 475 machines, including mining trucks, excavators and dozers.

360 autonomous, batterypowered T 264 Battery Electric mining trucks

Forming a key element of the order are the 360 autonomous, battery-electric mining trucks that combine maximum performance with sustainability. These vehicles are designed to autonomously transport 240 tonnes of material and are therefore setting new technological standards.

Up to operating hours per year

The machines are designed for continuous operation under extreme conditions. That equates to around 80 per cent of the 8,760 hours there are in a year on average. Such endurance is essential to meet the challenging demands of the mining sector.

A contract value of €2.5 billion

Worth €2.5 billion, this deal is the single largest in Liebherr's over 75-year history.

55 grid-connected R 9400 E electric excavators

The machine fleet includes 55 gridconnected R 9400 E mining excavators. These machines can be connected to a constant energy source, either directly to the power grid or to a large-scale battery energy storage system (BESS). This ensures constant and reliable performance – even in the toughest working conditions.

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About Fortescue

Fortescue was established in Western Australia in 2003 and has since become a global technology, energy and metals company that is working to accelerate commercial decarbonisation through heavy industry, rapidly, profitably and globally.

Fortescue's metals business comprises of iron ore operations in the Pilbara region of Western Australia as well as a pipeline of exploration projects globally. The company is one of the world's largest iron ore producers. On top of this, Fortescue also works in the field of energy, building a global portfolio of renewable green hydrogen and green ammonia projects and developing green technology solutions.





Connected despite distance: services reimagined

In an increasingly interconnected world, Liebherr is redefining its customer focus – regardless of time and place. With innovative digital solutions and a global service network, Liebherr is now closer to its customers than ever before. The experts provide quick, efficient and proactive support, whether that's Remote Services, smart assistance systems or AI supported analysis.

This combination of technical excellence and personal engagement ensure the best possible service. The claim: firstclass support to bridge gaps, minimise downtimes and build trust. Liebherr is and remains your reliable partner to tackle today's and tomorrow's challenges.

MyLiebherr – access to all services

The MyLiebherr online portal is your gateway to the Liebherr service world. After registering, customers can manage your machines, order spare parts or obtain licences. Technical documentation, service instructions and software are also available digitally. The single sign-on enables access to all relevant applications with just one login. Another plus point: you can also easily check prices and availability of spare parts and make orders conveniently online. For expert advice, MyLiebherr offers the option to contact Liebherr's service partners directly.



Parts Assistant

With the new Parts Assistant, Liebherr will in future be offering a comprehensive solution for the coordination of service materials. Spare parts can be identified using image recognition, QR codes or text searches. Customers will be automatically notified of service intervals and provided with a list of the required materials. Spare parts can then be easily and conveniently ordered online.

Digital Service Booklet for mobile cranes

With the Digital Service Booklet, Liebherr plans to simplify maintenance by providing a central platform for service technicians and crane operators for new mobile crane models by the end of 2025. All maintenance work and service histories will be digitally recorded, structured and documented and can be accessed at any time. An intuitive user interface shows the device type, last service and operating hours at a glance. Digital checklists with a comment function enable efficient planning and tracking of maintenance work. Completed services and outstanding work are clearly displayed. Future enhancements and the integration of additional models will increase the benefits of the Digital Service Booklet. This is how Liebherr ensures maximum transparency and optimal machine availability.

MyGuide for Earthmoving – everything at a glance

The MyGuide for Earthmoving app gives crane operators and construction machine fans constant access to the latest product information and news about Liebherr earthmoving and material handling technology. With the user-friendly app, you can save favourites, compare products and call up recently viewed news to your personal dashboard. Liebherr's sales and service partners are also directly integrated into the app so making contact is quick and easy at all times. A particular highlight is the integrated product configurator with which you can create, save and manage individual construction machines with just a few clicks. The app is optimised for smartphones as well as tablets and offers a simple, centralised information source for everyone interested in Liebherr construction machinery. This makes all relevant information accessible to users at all times and keeps it concise, digital and always up-to-date.

Remote Service: fast remote support

Liebherr Remote Service allows machine malfunctions to be rectified quickly and efficiently – without requiring any on-site work. Using a secure VPN, software specialists can directly access the control system, analyse machine data and initiate the necessary measures right away. This reduces downtimes, which demonstrably reduces operating costs. In addition, Remote Service supports process optimisation to reduce cycle times and improve product quality. Thanks to clear documentation and direct expert involvement, customers benefit from a streamlined and consistently strong service process.

Maintenance & performance for earthmoving and material handling technology

Furthermore, Liebherr has added MyLiebherr Maintenance and MyLiebherr Performance to its digital service offering for earthmoving and material handling machines. MyLiebherr Maintenance helps prevent unplanned downtimes by clearly displaying machine conditions and optimally planning service work. A traffic light system displays at a glance which machines require immediate attention. MyLiebherr Performance can provide a detailed analysis of machine applications, idle times and consumption values. Operators can therefore reduce costs and raise productivity by optimising their machine utilisation. A comparison function facilitates benchmarking within the machinery fleet - for reliable data-based decisions and efficient operation.

Sound of Silence – pioneer of zero emissions construction sites

Electromobility has long been part of every day life in Scandinavia. Now the capital city of Norway is pressing ahead with more than just the electrification of road traffic: since this year, machinery powered by combustion engines is only permitted on construction sites in Oslo city centre in exceptional cases. This is where the LTC 1050-3.1E mobile compact crane can play out its strengths. This relies on a combustion engine for the journey to the construction site but, once there, can complete all work with zero emissions and no noise using the site's electricity supply. It sets a precedent – in Scandinavia and far beyond.



Norway is in a comfortable position: the country has so much water, wind and wave power that it can cover over 95 per cent of its 5.4 million inhabitants' electricity and heat demand using renewable energies. Due to its integration in the European electricity grid, the German weekly newspaper 'Die Zeit' once called this Scandinavian country 'Europe's battery' – and one of the pioneers of sustainability.

Norway's serious attitude to zero emissions e-mobility is also reflected in the registration figures for electric cars. More than every second car sold is electric. In 2024, fully electric cars made up about 90 per cent of new car registrations, with conventional diesel and petrol cars accounting for just four per cent of new registrations. Now the country is taking measures to also ensure a sustainable transformation of the construction sector. And so, for example, since 1 January 2025, only zero-emissions machinery may be used in Oslo city centre.

Zero-emissions as standard

'Zero Utslipp' – zero emissions – is proudly displayed on the sides of some of the bright red construction machinery owned by the Norwegian construction company Skoveng Kranservice AS, based in Lillestrøm. For managing director Lars Christian Steen, this is more than just a marketing statement – it's a business necessity. One of the stars of this revolution is Liebherr's LTC 1050-3.1E compact crane. Liebherr delivered the first machine with this crane type to northern Europe. For Lars Christian Steen, this hybrid machine represents the logical bridge between conventional combustion drive and electric drive. On the journey to the construction site, the mobile crane still uses its combustion engine, but once it has arrived at its destination, the electric drive takes over – noise-free, emission-free and efficient. Skoveng Kranservice AS ordered five of these cranes from Liebherr in one go, using them to replace a large part of its crane fleet. 'Together with a Liebherr MK 88-4.1 mobile construction crane, half of our fleet is now made up of machines that can also be operated electrically,' reports Steen with pride. 'These noise-free and zero emissions machines mean we are now in a very strong position, and they are, of course, ideal for crane work in the city centre, in tunnels or for use at night.'

Skoveng Kranservice uses the LPO 100 'Liduro Power Port' to supply electricity on construction sites that have no electricity supply of their own. This mobile energy storage system based on lithium-ion batteries has peak power of up to 110 kVA. 'The battery life is sufficient to last for about the same length of time as the normal working day of an LTC 1050-3.1E,' explains Joachim Eussem from Liebherr-Components GmbH. Liebherr is currently expanding its Liduro series. In the future, there will be different power ranges between 50 and 150 kVA.

Scandinavia as trailblazer for the construction industry

The development of hybrid and electric drives in Scandinavia is being closely observed in the construction sector. Strict environmental requirements, particularly in urban areas, are putting developers, investors and fleet and machine operators in Scandinavia under pressure. This is why many companies face the challenge of converting their fleets while still working cost efficiently. A whole host of tangible advantages have resulted from electrification, which have ultimately had a positive impact on the balance sheet: 'Less wear, lower operating costs and a significantly reduced carbon footprint.' This has been very well received by Liebherr customers - not only in Scandinavia. 'The LTC 1050-3.1E mobile e-compact crane marks the beginning of a new era of zero-emissions construction sites. And there's more to come in other industries. Globally, over 50 mobile cranes, drilling rigs and crawler cranes from Liebherr are 'unplugged' today, i.e. they are being used without a stationary power supply,' says Tommy Borgring, who was born in Sweden and works at the Liebherr plant in Ehingen, where he is responsible for sales in Scandinavia and the Baltic region. 'We are at the early stages of an increasingly sought-after technology, for which Scandinavia is setting a good example.' On the operator side too, the LTC 1050-3.1E offers another advantage, which is difficult to quantify in terms of costs. Siv Hege Barstad is a crane driver who has worked on construction sites in and around Oslo for more than six years for Skoveng Kranservice AS. 'It is a bit strange when the engine noise is suddenly missing. But it is also very, very pleasant,' she said. The power is about the same as that of a combustion drive. 'If I can operate the crane with 125 amperes, then it works just as quickly as with a combustion engine. I don't

notice any difference when swivelling, lifting or telescoping.' Yet since there is often just 63 amperes of current available on construction sites, work can be a bit slower in some cases. 'You only notice a power drop if the crane is making several movements at the same time and a lot of energy is required. But if you're only using the hoist gear, for example, then the process is almost as quick as with a current strength of 125 amperes.'

Electrified by the possibilities of the future

Knowing not just about mobile cranes, construction site topographies, lifts and load movements, but also about current and voltage, electrical power, high-voltage power connections and energy storage, has long since become second nature to Siv Hege Barstad and Lars Christian Steen. 'We are, in the best sense, 'electrified' by the possibilities of a zero emissions construction site,' says the managing director of Skoveng. 'This is where the future lies. Because 'Zero Utslipp' benefits all those involved – the clients and the construction employees as well as the contracting companies and the residents who live near the construction site.'



Tommy Borgring sees this as validation and motivation in equal measure. 'In the meantime, we have sold ten of these electric machines in the greater area of Oslo,' he says. 'And we are working hard on electrifying additional machines.' Rising demand is setting the pace. One thing is already certain: the sound of silence on zero-emissions construction sites is receiving more and more attention, and Scandinavia is setting a good example.

Working together for a zero-emissions future

Pioneering work in the quarry: Liebherr and STRABAG are trialling the L 566 H hydrogen wheel loader in Styria (Austria). The pilot project may be a key to further reducing CO_2 emissions on construction sites.



The construction and building sector is one of the largest sources of emissions. According to the United Nations Global Status Report for Buildings and Construction, this sector accounted for around 38 per cent of greenhouse gas emissions worldwide in 2020. A large proportion of these emissions in construction are caused by the use of fossil fuels in construction machinery. Zero-emissions technologies are therefore crucial to achieving the industry's climate targets. Liebherr und STRABAG, one of Europe's leading technology groups for construction services, are setting a striking example with a pilot project. At the Kanzelsteinbruch quarry in Gratkorn (Austria), the L 566 H, the world's first large wheel loader with hydrogen drive, is being put to use.

The use of zero emissions drives in everyday work is a challenge, especially with large construction machinery. While battery-electric drives have already proven their practicality for smaller machines in countless hours of operation, they reach their limits more quickly in vehicles with high energy requirements. Hydrogen engines that use green hydrogen obtained from renewable energies such as wind, hydropower or solar energy offer significant advantages beyond climate protection.





Advantages at a glance

- Longer operating times: hydrogen drives allow for continuous operation without long charging times.
- High performance: large construction machinery such as wheel loaders require enormous amounts of energy during operation, which hydrogen can provide efficiently.
- **Easy to refuel:** with a hydrogen refuelling station located directly on the construction site or with mobile refuelling solutions, refuelling is quick and easy.



Though the technology is advanced, the big challenge remains: green hydrogen is a very scarce resource. Still, research into the production of technical hydrogen from renewable energies is being conducted at full speed worldwide. Nevertheless, the corresponding refuelling station network in Europe, as elsewhere in the world, is still largely in its infancy. This is largely due to a clear imbalance between the current limited supply and the constantly growing demand. 'Hydrogen engines make it possible to operate even large vehicles - which are difficult to electrify due to their high energy requirements - extremely efficiently and, above all, CO₂-free,' says Dr-Ing Herbert Pfab, chief technical officer of Liebherr-Werk Bischofshofen GmbH, gets to the heart of the possibilities. The concept is aimed at both economic and ecological

sustainability.

Consistently reducing emissions

This is in line with STRABAG's goal of becoming climate-neutral by 2040. The way to achieve this is primarily through a consistent reduction in emissions, which also includes the operation of construction machinery. Liebherr-Werk Bischofshofen not only supports STRABAG with innovative technology. but also ensures that solutions are tailored directly to specific requirements through proximity and flexibility. 'The hydrogen wheel loader project shows how manufacturers and users can join forces to accelerate technological progress,' emphasises Dr-Ing Pfab. The result has not only the experts fascinated. The prototype of the L 566 H hydrogen wheel loader that is used in Styria (Austria), is equipped with a hydrogen engine that was specially developed by Liebherr - a technological highlight. The green hydrogen for the drive is supplied by Energie Steiermark. This provides Dr-Ing Herbert Pfab with an ideal test environment for the prototype: 'In Gratkorn, we can test the wheel loader under real conditions and continuously collect valuable practical data for further development.' This also includes the fact that Liebherr-Werk Bischofshofen has put its own hydrogen refuelling station into operation as part of the development of the hydrogen wheel loader - the first of its kind in the province of Salzburg. One important strategic partner for Liebherr here is the filling station developer 'Maximator Hydrogen.' Together, they are researching mobile refuelling options so that construction machinery can subsequently be refuelled with hydrogen without leaving the construction site. This is particularly important for remote construction sites and machines that are not very manoeuvrable.

'The two-year test run is aimed at jointly delivering decisive findings to bring the hydrogen wheel loader to series production readiness. Our strength lies in working together with our customers to develop solutions that precisely fulfil their requirements and are convincing in practice,' emphasises Dr-Ing Pfab. 'Once again, it's been proven that innovations are born from pooling all strengths. We must continue to utilise this. In pioneering pilot projects like the one in Styria and beyond. We at Liebherr are ready for this.'

MyLiebherr: a continuously developing and future-oriented platform

The MyLiebherr online portal has established itself as a key contact and access point, helping Liebherr's customers and service partners in their daily work – across all the Group's product segments.

The intuitive and clearly structured interface allows users to quickly and easily access a wide range of digital applications, services and functions. Registering is worthwhile, as it provides access to functions and services which greatly simplify everyday work and are mostly free of charge.

MyLiebherr serves as a central hub for all the important information and services. Users can view and download various documents such as machine and spare part documentation, manuals and operating instructions whenever they need them. The portal also enables customers to easily contact service partners and provides the option of checking the availability of spare parts. Frequently required applications and products can be quickly found using the simple navigation. Users can also easily manage their customer data in MyLiebherr, while always keeping track of the status of their orders.

Another advantage of MyLiebherr is the ability to purchase various types of licences in the 'Licenses' section. This allows users to directly increase the scope of functions of Liebherr applications and machines. Since 2022, users have been able to map their entire machinery and vehicle fleet. With MyLiebherr, you can keep track of every device, whether it's a hammer drill, a van or a mini excavator.

At a glance: 5 advantages of MyLiebherr

Intuitive user interface:

▲ MyLiebherr has a user-friendly and clearly structured interface that allows users to quickly and efficiently access all functions and information.

O Up-to-date information all in one place:

the portal brings together all the relevant information in a single place, including technical documentation, manuals and product details. The constant availability of this information allows users to access the data they need at any time, regardless of business hours.

Enhanced functions and services:

• by registering with MyLiebherr, customers gain access to a variety of digital services and functions, many of which are free. This includes the ability to purchase licences to enhance the functionality and performance of their machines.

4 Efficient communication with service partners: MyLiebherr makes it easier for customers to contact service partners and Liebherr staff so that questions and concerns can be resolved more quickly.

5 Optimised order and procurement processes: customers can find spare parts at a single place, request prices, check availability and easily monitor orders and their status. These features optimise the procurement process and ensure smooth maintenance and management of the machinery fleet.

Courage by design

In a twist of serendipity, Jenni Rekola's career at Liebherr began with a recruiter's call, awakening her curiosity from a prior encounter at Bauma. While her expertise was primarily rooted in underground mining electrification, even having spent two years teaching electrical engineering in Asia and Latin America after her PhD studies, she embarked on a courageous new beginning with open pit mining in November 2023. Leaving her native Finland behind and embracing the vibrant city of Perth (Australia), she set her sights on joining Liebherr-Australia Pty. Ltd. Jenni Rekola works as a systems engineer, driving the design of the battery-electric truck. Enthusiastically, she joins the call remotely and a gripping conversation unfolds about the development of cutting-edge technologies.

Can you describe your role and responsibilities as a systems engineer at Liebherr Mining?

Working closely with my exceptional team, my role at Liebherr Mining is multifaceted. My focus lies in the systemlevel aspects of the new battery electric truck, including logic specifications, data logging specifications, supporting Human-Machine Interface (HMI) design and defining electric safety requirements. I am delighted to support the testing of the very first battery electric truck by creating commissioning documents, hand in hand with Fortescue. I work together with the customer support team, ensuring the high reliability of Liebherr trucks at Fortescue sites. I am excited that we're developing and collaborating on this!

Which technical aspects of the batteryelectric truck are you helping to develop?

The successful battery-electric truck design is the result of daily cooperation among multiple Liebherr divisions in the US, Germany and Australia, as well as Fortescue and Fortescue Zero.

Our technical team at Liebherr-Australia is an extension of the Liebherr Mining Equipment Newport News Co. product engineering team in the US, the Liebherr-Electronics and Drives GmbH team to help develop the drive system and the Liebherr-Components Biberach GmbH team for system testing. In cooperation with Fortescue Zero, we have created an interface between the battery system and the truck. I enjoy working as a systems engineer, both on hardware design and software design of the truck. The role also requires me to work with a variety of design teams. Additionally, our team is also responsible for multiple analysis related to truck safety, such as conducting arc flash studies for the battery electric truck.

How does your work on the batteryelectric truck align with Liebherr's partnership with Fortescue and the respective 2030 decarbonisation targets?

The strong alignment between the battery-electric trucks and Liebherr's partnership with Fortescue, along with the 2030 decarbonisation targets, is pivotal. To achieve the decarbonisation



Jenni Rekola, systems engineer





goals, I recognise the substantial contribution of the trucks to the total fleet's CO_2 emissions. This partnership fosters continuous learning, innovation and sharing best practices. By leading the technological change in the mining industry together with our customers, we strive to create a better future and meet the ambitious decarbonisation targets.

Curriculum vitae

2009	MSc Power Electronics at Tampere University of Technology (Finland)
2010 - 2015	PhD Electrical Engineering at Tampere University of Technology (Finland)
2015 - 2018	Postdoctoral researcher at Tampere University of Technology Developed curricula and taught international MSc programme related to power electronics and Smart Grids; taught the impact of renew- able energy on power systems in Asia and Latin America.
2019	University lecturer at Tampere University of Technology Taught electric drives, supported new teachers, supervised BSc and MSc theses, mentored tutors of international students and developed an industry-supported BSc thesis programme.
2019 - 2023	Principal applied research engineer, electrics
Since 2023	Systems engineer, Liebherr-Australia Pty. Ltd. Extension to the broader Liebherr Mining Equipment Newport News, Co., USA team. Providing local support to Fortescue and helping to ensure the voice of the customer is heard.



Digitalisation



Marcel Flir Head of digital business and strategy at the Liebherr Group

The machine does the thinking for you

The construction machinery industry is facing great opportunities. Digitalisation opens up new opportunities to increase efficiency, safety and sustainability on construction sites worldwide, for example by networking and standardising data formats. Liebherr is actively shaping this transformation and developing digital solutions that are tailored to the individual needs of customers and users. Traditional working methods are increasingly reaching their limits on the construction site. Increasing efficiency requirements, a lack of qualified personnel and strict environmental regulations call for innovative approaches. 'Digitalisation is changing the way the construction industry works - from project planning through to machine deployment and maintenance,' says Marcel Flir, head of digital business and strategy at the Liebherr Group. 'Our aim is to shape this transformation together with our customers and create solutions that sustainably increase their efficiency and competitiveness.'

Despite the obvious advantages, however, there are still many reservations about digitalisation in the industry: many companies fear high investment costs for the implementation of digital technologies. In addition, the introduction of new systems usually requires training and customisation, which is perceived as time-consuming and resourceintensive. And then there are also concerns about the protection of sensitive company data and the risk of cyberattacks, which in many places stand in the way of the readiness for far-reaching digitalisation.

Minimum effort - maximum results

Stephen Albrecht, member of the board of directors of the Liebherr Group, relies here on the confidence-building power of the experience gained from numerous model cases from the world of Liebherr: 'It is crucial to see digitalisation not as added complexity, but as an opportunity to simplify and increase efficiency. With our solutions, we enable customers to achieve maximum results with minimum effort.' The focus is on identifying and utilising synergies between Liebherr's various digital solutions, which extend across all 13 product segments and all areas of the customer journey. This includes, for example, operational planning, maintenance management, digital inventory management, smart home integration and organisational matters. Liebherr attaches great importance to modular and scalable digital offerings



Stephen Albrecht Member of the board of directors of the Liebherr Group

that enable customers to invest gradually and clearly understand the return on investment. For Marcel Flir, the userfriendliness of the systems and tools and a precisely tailored training programme are just as important for acceptance. Intuitive systems, according to the digital expert, significantly reduced the training costs during the transition here. 'To guarantee data security, data governance and cybersecurity at all times, we implement security protocols in Liebherr's digital products and services that exceed the standards. These ensure the protection of sensitive data and significantly strengthen trust in digital solutions.'

From ego system to ecosystem

Overall, Liebherr is pursuing an integrative approach with its digital strategy that goes beyond the technological excellence of individual machines. 'Customers, manufacturers, associations and providers of solutions are all in the same boat when it comes to adding value and achieving the decarbonisation targets that are now needed. To achieve this, we are bringing a real paradigm shift into play: away from the ego system and towards the ecosystem,' explains Marcel Flir. Advanced data collection and analysis would optimise processes and conserve resources.



A milestone in the digitalisation strategy is 'Liebherr Connect'. This state-ofthe-art connectivity solution networks people, machines and the environment.

Thanks to intelligent machine networking, Liebherr Connect provides access to comprehensive machine and process data, and supports the development of machine-autonomous solutions. The connectivity solution is already integrated into various Liebherr machines and can also be retrofitted to existing device generations. It allows for secure networking of the machine via cloud applications in the digital world and is available in almost all of the Group's product segments. 'With Liebherr Connect, we create the basis for a future-proof, networked construction site"; explains Marcel Flir. 'The ability to analyse data in real time and make decisions based on it is fundamentally changing the way machines are used.'

This opens up entirely new horizons. For example, Liebherr-Werk Telfs (Austria) recently presented an innovative remote control system for dozers at the world's largest mining trade show, MINExpo in Las Vegas (NV/USA), which caused quite a stir. Using the Liebherr Remote Control System (LiReCon), a dozer in Zams, Tyrol (Austria), could be controlled directly from Las Vegas (NV/USA) via a transcontinental Internet connection. The live video transmission impressively demonstrated how dozers and other equipment can be operated safely in future, even in extreme or difficult-toaccess areas.

Leading up to Bauma 2025, Stephen Albrecht draws an all-round positive balance of digitalisation: 'Liebherr proves that digital solutions are not only efficient and secure, but can also be customised. In this way, we are actively shaping the future of the construction site and creating solutions that offer sustainable added value for our customers. In these transformative times, we are still a long way from reaching our goal. But we are on a very, very good path.'

Wheel loader colleague

A 26-tonne wheel loader that moves bulk material – evenly and with perfect timing. And it does all of this without a driver. In Bischofshofen (Austria), at the Group's competence centre for wheel loaders, a research and development team has started the future of autonomous working. In future, this should also benefit small and mediumsized companies and their employees in particular.

It is a grey December day. By midday. the sun has already retreated behind the peaks of the Salzburg Alps. At the foot of these mountains stands Liebherr-Werk Bischofshofen (Austria), the competence centre for wheel loaders. But that does not bother the bright yellow wheel loader. Undaunted, it picks up grey gravel from the covered storage area and piles it into a large heap 30 metres away. Shovel after shovel, always in the same rhythm. Why it is doing this is not the question here. How it is doing this, however, is revolutionary. This is because the large L 576 XPower from Liebherr works fully autonomously. There is no operator in the cab. A white attachment is mounted on the cab roof with all kinds. of state-of-the-art sensors. On the sidelines, Manuel Bös stands on the balcony of the visitor centre. wrapped up in thick winter gear. He looks at his open laptop and takes a deep breath. 'Seeing a machine weighing more than 20 tonnes in action without a driver gives you goose-bumps,' he admits.

Pioneering work: ten years for a vision

Dr Manuel Bös, PhD (Eng.), came to Liebherr in Bischofshofen (Austria) in 2010. The trained mechanical engineer from Hesse (Germany) had already majored in mobile working machines during his studies and completed his doctorate on total vehicle simulation and dynamics.

'The development of autonomous wheel loaders began in 2015 at Liebherr,' reports the 38-year-old. 'Ten years ago,



we asked ourselves how monotonous, tedious tasks could be performed more precisely and efficiently by machines.' The path led to assistance systems and remote control solutions and then onto the autonomous wheel loader that is making its rounds in Bischofshofen (Austria). He explains that the biggest challenge for the developers is reducing the complexity according to the K.I.S.S. principle: 'keep it simple and smart,' was the motto. For Bös, this means: 'our machines not only have to be robust, but also very easy to operate – without special programming knowledge and an IT department behind them.' Just a few steps from the visitor centre with its demonstration area, Manuel Bös' team has set up its 'offices for emerging technologies' on the upper floor of Hall 11. Downstairs, Liebherr wheel loaders undergo final quality checks – they are screwed, measured and tested. 'We didn't want to move into a secluded office building. We feel right at home in the middle between the test site and series industrialisation,' enthuses Bös.
Multifunctional: autonomy for all vehicle classes

It has been a long and rewarding journey. With the support of other Liebherr companies in France, Germany and Austria, the vision of the autonomous wheel loader has become increasingly tangible since 2015. In 2017, the first test drives with wheel loaders from the XPower class, from L 576, took place. Since 2021, more and more size classes have been added. 'The task arose from our customers' requirements,' reports Bös. 'The autonomous wheel loader should be capable of multifunctional use - sometimes with, sometimes without a driver. Whether manually controlled, with radio remote control, via teleoperation over greater distances, or even fully autonomous.' The first prototypes of an autonomy kit were developed, equipped with laser scanners, cameras, sensors and lots of electronics. The wheel loader is controlled via an integrated computer unit, 'with centimetre precision, reliably and safely,' as the chief developer emphasises.

The work assignment: maximum precision and efficiency

A detailed definition of the working environment and the prevailing conditions forms the basis for autonomous operation of wheel loaders. To achieve this, three 360-degree laser scanners designed for robust construction site and off-road use capture the surroundings and create an exact map when first entering the construction site. With the help of a special evaluation algorithm, the system recognises all passable routes and possible obstacles. 'What matters here is not the beauty and depth of detail of the maps, but localisation to the nearest centimetre based on the smallest possible amount of data,' explains Bös. GPS is not necessarily required here. 'The machines can therefore move reliably and methodically at all times, even in shielded environments such as halls or tunnels.'

This also shows there are many possible applications for autonomous wheel loaders. The Liebherr team is particularly focused on medium-sized companies that operate quarries, gravel pits or material handling facilities with a small workforce, for example. Wherever relatively simple, constantly repetitive material handling work is carried out, the developers believe that automated processes could reduce the strain on employees and enable companies to remain productive in a plannable way, even when there is a shortage of skilled labour.

In addition, it has been shown that autonomous systems can work much more precisely than a human in continuous operation. 'Once programmed to the working environment and 'taught in', an autonomous wheel loader

achieves optimum, even loading of the bucket without major energy and friction losses caused by dragging over the ground. This saves maintenance costs and keeps the resale value high for longer. In combination with wear-optimised driving, this results in a considerable increase in efficiency, which has a particularly positive effect in 24/7 operation,' Manuel Bös explains. In addition to efficiency and depth of added value, the developers have placed great emphasis on making the system as simple and intuitive to use as possible. 'All the operator needs is a web browser and an internet connection. A company does not need to set up its own IT department for this, employ-



ees can concentrate fully on their core tasks,' adds Bös. 'And it works regardless of the type of drive. A diesel wheel loader can be equipped with this in just the same way as a future electric or hydrogen wheel loader from Liebherr.'

Play it safe: accident prevention as the top priority

Machines that get out of control and cause accidents are a nightmare for any operator. 'The safety system is designed with every conceivable problem and case of damage in mind,' says the developer. 'The system never gets tired or inattentive and constantly monitors itself, which is an important advantage, especially during hours of monotonous processes.' To play it completely safe, cordoned-off areas in which there are no other manually controlled machines or pedestrians are ideal for an uninterrupted process. 'The electronic fencing for the operating site premises is a manageable expense that can be solved with a comparatively small investment.'

The next step in the evolution: from Bauma to the market

An autonomous XPower wheel loader will make its first major international appearance at Bauma 2025 in Munich (Germany). In parallel to this, large-scale field tests are being carried out at customer sites to further prove the robustness and reliability of the technology under real-life conditions. Manuel Bös and his team fully believe in the technology. 'We are in an evolutionary process with the autonomous wheel loader and are already developing the fifth generation with a high degree of maturity,' says Bös.

This way of thinking and acting over the long term is entirely in line with the Liebherr philosophy: 'nobody in our family-run company questions the idea of working on autonomous machine operation for ten years. Quite the opposite, in fact. All divisions work closely together: the earthmoving division with its plants in Bischofshofen (Austria) and Telfs, Kirchdorf (Germany) and Colmar

(France), electronics development from Nenzing (Austria) and Lindau (Germany) or the Liebherr Digital Development Centre in Ulm (Germany). We are all in constant dialogue, helping and complementing each other,' says Bös. Together, they have managed the complex technology in such a way that the wheel loaders now function as simply as vacuum robots in the home. 'They just do exactly what you ask them to,' states Manuel Bös. And he is already thinking ahead. The next step will be to network fleets of autonomous machines in such a way that they work together with swarm intelligence and while constantly learning. 'We have made a start - and now it's getting really exciting.'





At a glance: autonomous wheel loaders from Liebherr

A head start thanks to intelligence and networking: autonomous machines have what it takes to completely redefine construction sites and the way they work. This brings decisive advantages for operators and users.

Increased efficiency thanks to precision

Autonomous wheel loaders optimise work processes with even loading and minimise empty runs. Result: increased productivity and reduced operating costs.

Relief from monotonous work

Repetitive, tedious and tiring work can be carried out without operating personnel. This allows employees to focus on more demanding tasks. Additionally, this also effectively counteracts the increasing shortage of skilled labour.

T Minimisation of wear

Due to intelligent control, fuel is saved and machine parts are protected, which extends the service life and reduces maintenance costs.

Extremely simple operation

Autonomous wheel loaders can be controlled via a web browser – no costly IT infrastructure or specialised knowledge of programming and data processing is required.

Safety first

State-of-the-art, robustly designed 3D scanners and sensors ensure safe navigation. They detect obstacles in real time, even in complex environments and after hours of monotonous work.

Built-in sustainability

• The possibility of networking several autonomous machines opens up new dimensions for efficient, swarmintelligent working methods – with even greater decarbonisation effects.

Controlling construction machinery remotely

Liebherr revolutionises construction sites: LiReCon remote control sets new standards for safety, efficiency and flexibility. And takes working in construction machinery to a new (and highly convenient) level.

The world premiere – the MINExpo in Las Vegas (NV/USA): in September 2024, at booth no. 7832 in the Central Hall of the Las Vegas Convention Center, Rudi Tangl, an experienced crawler dozer operator from the Tyrol (Austria), sat down at a futuristic-looking control station. Experts, journalists and engineers gathered around him at the Liebherr booth, all eyes glued to the monitor, which showed the work environment in razor-sharp detail. But the view was not of the Nevada desert; it was of a quarry in Zams, Austria, more than 9,000 kilometres away!

Rudi Tangl put his hand on the joystick, took a quick breath, and slowly moved

the joystick forward. Immediately, the Liebherr PR 776 G8, the world's largest hydrostatically driven crawler dozer, began to move. No one was sitting in its cab and there was no operator on site. Yet everything functioned as if Rudi Tangl was there in person. He steered the machine through the rough terrain, raised the blade and pushed rubble aside, all with impressive precision. Astounded spectators began whispering in wonder - the future is here. in our hands. History has been made. For Liebherr, this experience of neverbefore seen crawler dozer remote control was more than simply one spectacular showpiece. 'The machine con-

trol is no longer tied to a specific location. The Liebherr Remote Control system, or LiReCon for short, makes remotely operating all kinds of construction machinery possible - safely, efficiently and in real time, explains Florian Falbesoner. The 39-year-old mechatronics engineer joined Liebherr 24 years ago and knows the company and its machinery from the ground up. Since 2017, he has led the technology and pre-development department at Liebherr-Werk Telfs (Austria), with specific focus on alternative drive systems as well as machine autonomy and assistance systems and thus LiReCon.





From niche idea to market solution

The idea of controlling machines remotely is not a new one. 'We have already seen various special solutions for extreme application scenarios in the past,' says Falbesoner. For example, the nuclear reactor disaster in Chernobyl (Ukraine) in 1986 or during the landslide in Nachterstedt (Germany) in 2016. 'Working in contaminated surroundings or environments at risk of explosions or collapse was previously only possible using machines specially and painstakingly converted for the purpose. However, it was primarily about safety, not productivity.' The project leader adds that with LiReCon, Liebherr has taken a decisive step forward: 'Our Remote Control technology is now no longer just a niche product for catastrophes and exceptional cases; it is a market-ready solution for daily use in the most diverse of scenarios with a clear focus on productivity.'

'The fully electronic pilot control system in modern machinery formed the basis for the teleoperation design in all machines. Together with modern and intelligent assistance systems for blade and bucket guidance, for optimal bucket loading and modelling complex terrain features, this has opened completely new doors for teleoperated work,' explains Falbesoner. He continues with how Liebherr, together with specialists from the product segments earthmoving, maritime cranes and tower cranes, first provided an insight into the future of teleoperated work at the 2019 Bauma. At that time, a crawler dozer designed especially for demonstration purposes without an operator's cab and a remotely controlled wheel loader were used. 'The aim of our cross department and product segment collaboration was to develop a teleoperation system kit which offers a Plug&Play solution, instead of completely retrofitting the machines, says Falbesoner. The first customers are already using the system: in particular, the Austrian armed forces are using the system in hazardous working environments such as dealing with possible unexploded ordnance at the military

training area in Allentsteig or if disasters occur. Offshore crane operators also use the remote control system, for example, by being able to perform maintenance working from home as a prerequisite for renewing the crane's approval certificates. This means no hassle and high costs arising from "flying people in".



Florian Falbesoner, head of technology and advanced development, Liebherr-Werk Telfs GmbH

A comprehensive system architecture with proven standards

'A fully developed control system architecture at machine level is essential for remote control. It puts us in a position to integrate tried and tested Liebherr components and existing assistance systems into the machine's complete system,' says Florian Falbesoner. These include, for example, sensors and cameras which are compatible with construction machinery and designed for high stress levels such as extreme temperatures, shocks and vibrations as well as dust and dirt. They also have cleaning mechanisms and enable a 360-degree view of the environment. Special microphones also assist by

recording machine noises and radio receivers and transmitters ensure seamless connections. The high-resolution video signal from the main monitor provides operators with a comprehensive overview of the crawler dozer's entire surroundings. An optionally available active personal detection system also identifies persons and obstacles in the working area, which also increases safety, and prevents damage and accidents.

This equips LiReCon for the widest range of applications: for an onsite remote control system with a distance of one to two kilometres between the control station and machine, but also for an onsite remote control system 100 or more kilometres away. This requires point-topoint data connections using private wireless networks. Florian Falbesoner explains, 'Here we are using complex encrypted data conforming to the highest security standards.' He adds that the actual data processing only takes place on the machine and elaborates that the machine monitors the data transfer and reacts immediately if the latencies on the radio path are too large or if data packages have been transferred incompletely. 'The machine will then immediately shut down - safety has top priority.'

Authentic operating experience "working from home"

The Liebherr experts have specially designed the operator station to be able to operate different machines in various application scenarios. 'We don't want a simulator, we want a real operator stand. Above all, this stand must be ergonomic, provide an authentic movement and operating experience and perform all functions intuitively,' explains Florian Falbesoner. This includes installing standard modules like joysticks, keyboards, displays, seats and armrests, with which not only the operators, but also Liebherr service staff are familiar. 'The maintenance and repair of operating components work exactly like on any other construction machinery in the field,' says Falbesoner.

To ensure that only operators can access the machines and to prevent external manipulation. operators must identify themselves in the IoT backend on MyLiebherr. When performing work, they are provided with a 1:1 visualisation of the machine and its surroundings via this platform. All information appears on the display in real time. 'It's so easy to forget while you're working that you're not on site in the machine. And most operators quickly become familiar with the special comfort of there being no vibrations, jolts, or engine and operating noises, which makes their work easier and considerably reduces the physical strain on them,' continues Florian Falbesoner. Elaborating further, Falbesoner maintains that long absences for assignments on remote and often inhospitable construction sites and mines could be reduced. improving work quality. 'At a time when there's a shortage of skilled labour, an attractive and also more easily accessible working place will provide an increasingly important competitive advantage. While experienced machine operators certainly find the lack of physical feedback unusual at first, Florian Falbesoner believes, 'They usually feel right at home with what they're doing within a few hours.' They're definitely having a lot of fun working as well, he concludes - even if there's an entire ocean between the control station and the crawler dozer, like in Rudi Tangl's case.



At a glance: LiReCon

The Liebherr Remote Control system, LiReCon, is revolutionising daily processes at construction sites. The system offers completely new perspectives: from flexible remote control to accessing hard-to-reach or dangerous areas – without the operator having to be on site. This increases safety, convenience and productivity.

Six top advantages of LiReCon:

T Flexible remote control: usable as an on-site or off-site solution without direct visual contact with the machine.

2 Intelligent machine integration: fully integrated into the machine control system; all current and future assistance functions available for use.

3 Modular, intuitive system: a carefully developed User Interface allows LiReCon to be integrated into different Liebherr machines.

4 Ergonomic operating comfort: the **Liebherr teleoperations stand** has been optimised for maximum comfort and intuitive control.

Maximum safety:

integrated **emergency stop system**, encrypted data transfer, monitored data packages and operator certification with individual authorisation steps.

6 Greater efficiency and productivity: faster shift changes, reduced machine downtimes, greater operational efficiency, greater operator satisfaction.

From childhood dream to pioneer

Manuel Bös was practically born with a passion for large machinery. His grandfather established a haulage and construction company after the Second World War, which played an active role in the reconstruction of Germany and already relied on Liebherr machines at that time. This made an impression on Manuel Bös's childhood and kickstarted an early interest in engineering.



During his mechanical engineering studies at KIT (Karlsruhe Institution for Technology), he became fascinated by the wide scope of technology in mobile working machines. Finally, he completed his thesis in 2010, incidentally at Liebherr's Bischofshofen plant (Austria), where he still works to this day. Manuel Bös is now in charge of the 'Emerging Technologies' development department there. Together with a ten-strong team of developers, all at the top of their game, he works on future-focused solutions. These range from assistance systems to remote control and teleoperation solutions and even fully automated operation. Areas such as artificial intelligence. sensor data processing, high-performance computing and total vehicle simulation are also high on the agenda. The department is connected with wheel loader development, but the solutions are being developed and put into series production for both the earthmoving and material handling technology product segments.

Dr-Ing Manuel Bös

You were heavily involved in the development of the first autonomous wheel loader, which is now being nominated for the Bauma Innovation Award. Was that the most challenging project you've encountered at Liebherr and what motivates you every day?

Yes, that was undoubtedly my biggest and most challenging project. It incorporates an enormous range of fields: from hardware and sensor technology to algorithms, software and beyond to legal considerations, functional safety and cybersecurity. Even IoT infrastructure and cloud infrastructure, UI/UX design and series industrialisation and service interfaces come into it. We are collaborating with highly motivated teams across the entire plant. Their enthusiasm for these technologies and the clear customer value give us the daily motivation we need.

How does Liebherr's Bauma motto 'Hands on the future' manifest in your daily work?

At Liebherr, we pool together expertise in specific product lines all in one place. From pre-development right through to aftersales, we are all on 'team wheel loader'. This means a developer can go straight to the test site and try out their solution then and there – just 200 metres from their desk. We are also 'hands on' with our customers when it comes to our prototypes. If we are looking to go into series production, we discuss calibration processes while standing on the assembly line, which is 500 metres in the other direction.

What impact does your job have on the construction machinery sector?

I see three clear megatrends right now: decarbonisation, skills shortage and the need to complete construction tasks and raw material activities faster, more economically and more transparently. Colleagues are working on battery-powered electric drives, hydrogen technology and other alternatives. We are developing assistance systems, remote control solutions and autonomous means of operation. We are combining these solutions within a modular and scalable machine concept that customers can operate flexibly and simply.

What advice would you give to young people starting out in their career?

I would encourage everyone to get involved in the industry of mobile working machines, including as part of an internship here with us. When I started out, I thought I would go into the automotive industry. But as a developer of a mobile machine, you have a broader scope of technical operations and can have a greater impact on the field. It gives a sense of fulfilment to be able to work more effectively with capital goods. In our team, we have mentored more than 25 students on their bachelor's and master's theses, giving them an excellent opportunity to get to know our company from the inside.

Manuel Bös will be at the Liebherr booth at Bauma all week and is looking forward to face-to-face chats with visitors.

Curriculum vitae

present

2005	Abitur (school leavers exam)
2005 - 2010	Degree in Mechanical Engineering specialising in Product Development and Mobile Working Machines at the Karlsruhe Institute for Technology (KIT)
2010	Thesis on 'Optimising cabin suspension for wheel loaders at Liebherr-Werk Bischofshofen GmbH (degree qualifica- tion: diploma in Engineering)
2011 - 2014	Doctorate of Engineering as part of a project between KIT and Liebherr-Werk Bischofshofen GmbH on the subject of 'Holistic and automated assessment of the vehicle dynamics of a wheel loader focusing on vibration comfort, driving dynamics and structural stability'
2014 - 2017	Developer in the wheel loader pre-development department, Liebherr-Werk Bischofshofen
2017 to	Head of the R&D Emerging Technologies department,

Liebherr-Werk Bischofshofen



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Discover our new Bauma collection – now in the shop or online. You can expect product innovations with limited-edition highlights and selected souvenirs for everyone. Be inspired and immerse yourself in the fascinating world of Liebherr.

We look forward to seeing you! Find us at booth 809-813 in the <u>new location</u> in the Liebherr pavilion.



Liebherr Connect



Q&As

What is Liebherr Connect?

Liebherr Connect stands for intelligent machine networking. It allows for the real-time exchange of data and is therefore the basis for optimising operating processes and costs.

What advantages does intelligent machine networking offer Liebherr customers?

- Increased efficiency: data helps to optimise the operating status and identify bottlenecks at an early stage.
- Reduced costs: precise analyses improve the planning of maintenance intervals and reduce downtimes.
- Sustainability: intelligent fleet management reduces CO₂ and noise emissions, and minimises the ecological footprint.

Can connectivity solutions be retrofitted to older Liebherr machines?

The connectivity solutions are already integrated in various Liebherr machines, but can also be retrofitted accordingly for generations of devices already on the market.

How does the networking work?

Thanks to a wide range of connectivity solutions, machines are connected to digital solutions that are made available via the MyLiebherr customer portal or in the App Stores.

Why is Liebherr Connect important for the future?

Liebherr Connect is the basis for new technologies such as autonomous operation, AI-supported maintenance and networked machine operations.



Networked into the future

Liebherr Connect connects people, Liebherr products and their environment into a high-performance system. The result: future viability, time and cost savings, safe and convenient operation and efficient machine management.

The morning on the construction site begins as usual – and yet everything is different. Before the work starts, the team checks the construction machinery fleet together on the tablet: fuel level, battery status, maintenance instructions, upcoming tasks and so on. All with just a few taps on the display. All equipment is ready. They are ready to go. In some cases, the operator no longer even has to get into the cab – thanks to intelligent networking, one or the other Liebherr machine can already be conveniently and safely controlled from a distance. What may sound like science fiction is already a reality on some construction sites today. This is made possible by Liebherr Connect.

A new level of construction site management

'Construction sites are complex ecosystems with numerous machines and equipment from different generations and with different drive concepts. Added to this are tight schedules, high-cost pressure and increasing efficiency requirements,' says Marcel Flir, head of digital business and strategy at the Liebherr Group. 'The solution: intelligent, locationindependent networking. Whether it's in the city or in remote areas, when every minute counts, data on machine conditions, operating times and maintenance requirements is crucial for minimising downtime and increasing productivity.' In addition, automation is playing an increasingly important role: 'The connection to digital solutions will enable more and more processes to be remotely controlled or even carried out autonomously in the future using new technologies such as AI pattern recognition.'

'Digital transformation has long been a reality and a decisive success factor,' says Flir. And that's exactly what Liebherr Connect is all about: 'Optimal networking with digital services and analysis tools.'

With Liebherr Connect, Liebherr machines can be networked with a wide range of digital solutions and services that are provided via the MyLiebherr customer portal or in the app stores. This gives machine owners and their teams simple, secure and reliable access to comprehensive machine data at all times. 'This raises the productivity of a construction site to a new level,' says the expert. But the connectivity solutions can do much more than 'just' network the construction site – they also put the cost-effectiveness of machines and machine fleets on a new footing.



Broadly scalable connectivity solutions

The technological connectivity solutions behind Liebherr Connect were developed together with cybersecurity specialists, design engineers and service experts from across the Group. This ensures that both Liebherr's B2B and B2C customers benefit optimally from the advantages of intelligent networking.

Right from the start, Liebherr focused on an open architecture that is compatible with common fleet and asset management systems. 'Our connectivity solutions allow seamless integration into existing fleets – from individual machines to large fleets,' Flir continues. Operators of a wide range of machine types benefit from this: from earthmoving machines to mining equipment, tower cranes to mobile harbour cranes and mobile and crawler cranes.

For Marcel Flir, it is clear: 'The future of the construction site is digital and networked – Liebherr Connect is a key factor here.' This progress in digitalisation can already be felt on more and more construction sites.

Liebherr Connect-enabled exhibits at Bauma*

Product segment	Product		Product segment	Product
Components	LPO 100			HTM 905 (Volvo electric)
	LPO 600			HTM 905 + LTB12+4+1
	A 909 Compact		Concrete technology	31 XXT
	A 911 Compact			36 XXT
	A 918 E			Mobilmix 4.0
	A 918 Compact G8			LTM 1055-3.3
	R 917 Compact G8			LTM 1120-4.2
	R 920 E G8			LTM 1150-5.4
arthmoving	R 926 G8			LTM 1150-5.4E
	R 930 Tunnel			LTM 1300-6.4
	R 945			LTM 1400-6.1
	R 998 SME			LTM 1650-8-1
-	RE 25 M		Mobile and crawler cranes	LTC 1050-3.1
	TA 230			LTC 1050-3.1E
Y	LH 40 M Port E	- - - -		LRT 1130-2.1
d	LH 60 M High Rise Port E			LTR 1150
	L 586 XPower			LG 1800-1.0
	L 546 G8		N	MK 120-5.1E
	L 566 H			LR 1300.2 SX unplugged
4aterial handling echnology	L 550 Autonomous			LR 1400.1 SX Derrick
	PR 716 G8			HS 8100.2 Dual Power
	PR 726 G8			HS 8130.1 with diaphragm wall
	PR 776 G8		Deep foundation	LB 45 1
-	LR 636 G8			
	T60-9S			
- Tower cranes - -	91 K			T 264 Pottony Electric
	43 K		Mining	
	33 L			K 7400 E
	61 K			
	240 EC-B 12 Fibre	<u>K</u>		
	620 HC-L			
	520 EC-B 20 Fibre			

*The right connectivity solution can also be retrofitted to many types of devices. Contact your local service partner directly to find out more.





Responsibility

Making tomorrow possible today – responsibility at Liebherr

As a family-run company, Liebherr is aware of its obligation to operate in a way that ensures future generations will also find promising living and working conditions within and through the company. This approach gives rise to a wide range of opportunities for action.

'I shall act always so as to increase the total number of choices.' This ethical imperative of the Austrian physicist and cybernetician Heinz von Foerster (1911-2002) describes a principle that is crucial not only for individual actions, but also for business decisions. The idea behind it is as simple as it is prescient. When companies take responsibility for the environment, society and long-term economic viability, acting sustainably does not limit future options, but in fact expands them. Liebherr has always treated responsibility as more than just a buzzword. Throughout its over 75-year history, the family-run company has always thought far ahead. This applies to its products and services, its strategies. processes and business models, in the way it develops employees and in its relationships to customers, partners and sites around the world. The idea of sustainability has always been present.

Taking responsibility for employees, the environment and society as a whole is also anchored in the Group's core values. It views sustainability as an integral part of its core business and its corporate behaviour. As an independent and long-term-oriented, familyrun business, Liebherr focuses on resource-efficient products, processes and infrastructure, prioritising safety, economic efficiency and environmental compatibility. With the introduction of its first sustainability strategy in 2023, Liebherr aims to be an economically, environmentally and socially sustainable company offering innovative solutions and improving the quality of life for current and future generations.

Sustainability: in harmony with the global community

The framework for responsible business practices is set out by the 17 United Nations Sustainable Development Goals, or SDGs for short. For Liebherr, this results in four key areas of action: products and services, environment and energy, employees and society, and sustainable business practices. Central themes have been identified for each area, and specific sustainability targets and measures are currently being developed.

To achieve the SDG-related target of net zero greenhouse gas emissions by 2050, Liebherr has put decarbonisation and digitalisation on its agenda for technological development. This is based on the realisation that the heavy machinery industry, including Liebherr, plays a crucial part in this journey, and that applies in many different ways.





For example, Liebherr machines are used to extract the raw materials required for the electrification of the transport sector: copper, lithium, nickel, manganese and many others. Liebherr drive units and bearings are key components used in wind turbines. Liebherr cranes are used for the construction of onshore and offshore wind farms to generate electricity from renewable energy sources. In addition to this, Liebherr machinery and cranes are extensively used inthe construction of new, energy-efficient buildings and the renovation of older, less efficient ones.

Technology-neutral approach: focussing on feasibility and practicality

The machines themselves must also become more sustainable. It is crucial that the transition to low-emission or even emission-free drives is successful. without compromising the performance, cost-effectiveness and practicality of the machines. This is being intensively worked on worldwide, including at Liebherr. One thing is already certain: there is no universal, one-size-fits-all solution. This is why Liebherr takes an open approach to technology for alternative drives, considering all options available today and in the foreseeable future. The company uses a wide range of alternative drives and energy sources to find the right solution for each application. In addition to the drive and the energy sources, the entire life cycle of a machine is considered. Life cycle analyses (LCA) show that most of the CO₂ emissions from Liebherr machines do not occur during manufacturing, but during use. However, a sustainable strategy must also take the infrastructure, operation and maintenance into account.

An example is the electrification of construction machinery that Liebherr has been intensively promoting for many years. Where a sufficient power supply is available, many Liebherr machines such as cranes, material handling machines, excavators and wheel loaders can already be operated with grid electricity - with no local emissions. However, on construction sites without an adequate connection to the electricity grid, alternatives are required. This is where Liebherr's mobile energy storage systems and hybrid drives come in. Not everything can be electrified. For machines used for long periods of heavy-duty operation, Liebherr's developers see synthetic fuels or hydrogen engines as the most practical solutions. Liebherr is already testing its own hydrogen engines in real-world operating conditions. These engines not only offer high power density, but also refuelling times that are comparable to current diesel machines. In combination with a jointly developed mobile refuelling option, the machines do not need a complex on-site supply infrastructure - a crucial advantage when operating in remote locations.

Remanufacturing: responsibility in the circular economy

The most sustainable resources of all are those which do not have to be newly extracted. This is where Liebherr leverages the concept of the circular economy. Instead of disposing of machines or components after their usual service life, targeted remanufacturing now allows used parts to be reconditioned and returned to the cycle as new. This approach is not new, but is continuously optimised at Liebherr with the latest manufacturing technologies. And the idea is a success: completely disassembling, cleaning, inspecting and reassembling engines, gearboxes and hydraulic components with new or refurbished parts not only saves material, but also significantly reduces energy consumption and CO₂ emissions compared to producing new components. Remanufacturing offers economic advantages for everyone involved. Customers get spare parts that are just as reliable as new ones, but less expensive and more resource-efficient. At the same time, the lifespan of the machines is extended and the total cost of ownership is reduced. By saving up to 78 per cent of raw material and reducing the CO₂ footprint by up to 66 per cent, remanufacturing makes a significant and measurable contribution to sustainable business.

Digitalisation: efficiency and sustainability through smart technologies

Sustainability and responsible business practices cannot be efficiently scaled without digitalisation and the use of AI. Smart machine controls, connected systems and data-based analyses enable Liebherr to make processes more efficient, save energy and operate more sustainably. Take Liebherr Connect for example. This portfolio of connectivity solutions allows the efficient use of digital services while maintaining the highest cybersecurity standards. This enables processes such as predictive maintenance, where machines can autonomously report when they will soon be needing maintenance. This reduces unexpected downtime and optimises the use of resources. Digital twins are also becoming increasingly important. These allow machines to be virtually modelled and operated in order to simulate and optimise operational processes before they are built. When trial and error for research and development takes place in a virtual space rather than with real prototypes on test benches and special testing grounds, it not only reduces costs, energy and resource consumption, but also speeds up development and significantly shortens the path to series production and market entry. In addition to efficiency gains during pre-development, digitalisation also significantly reduces the CO₂ footprint of machines and components when in use. Data analyses from practical operations now show where energy can be saved or emissions reduced. Connected machines also allow perfectly orchestrated organisation of different trades, which brings significant potential savings, especially on large construction sites, and reduces stress from coordination issues.

Proximity to customers: a win-win for everyone

Digitalisation strengthens the relationship between manufacturers, customers and other partners. The MyLiebherr customer portal now provides machine operators and users with full access at all times to spare parts, maintenance information and technical support, with relevant information available to customers with just a few clicks. The combination of sustainable technology and digital efficiency is a crucial factor for the future viability of Liebherr and its customers. There are big challenges, but with highly qualified, motivated employees and a strong network, they can be overcome. For Liebherr, responsibility does not mean foregoing opportunities, but rather creating new ones wherever it is beneficial.



Drive technologies: many routes leading to the same destination

Through the systematic defossilisation of drive systems for construction machinery, cranes and mining equipment, Liebherr has its own climate targets firmly in its sights, and those of its customers, too. The only way to reach these targets is via a path that embraces technology-neutral approaches. After all, there is not a one-size-fits all solution for every application scenario.

The drive is more than just the 'engine' of a machine. It in fact conceals inside it the complex system of converting and transferring energy within a machine. This is true not only of combustion engines, but also gearboxes, hydraulic pumps and engines, valves, hydraulic cylinders and, in the case of electric drives, the electric motors and performance electronic components too. The development departments at Liebherr maintain a clear focus here: to provide the optimum technology for the area of application in question. The basis for this is established by four pillars, upon which rest all of the drive concepts Liebherr has developed as an alternative to burning fossil energy carriers:

- 1. Reducing greenhouse gas emissions
- 2. Availability and infrastructure of the energy carriers
- 3. Technological maturity of the developments
- 4. Foreseeable costs of future energy carriers

These four pillars form the framework for Liebherr's technology-neutral approach to development, while also paving the way towards the future of sustainable technological leadership.

Fossil diesel

- Status: still the primary source of energy for heavy, mobile off-road machinery
- Areas of use: construction and mining machinery with high performance requirements and long operating times
- Potential: further efficiency gains through technological advances. The Liebherr balance sheet: 97 per cent less nitrogen oxide and soot particles than in 2000
- To-dos: to reduce CO₂ emissions by adding or switching to sustainable alternatives (e-fuels, HVO)

Synthetic diesel (e-fuels)

- **Status:** Liebherr machines are compatible with minimal or no adaptations. Production volumes are low and energy consumption in production is high.
- Areas of use: as an addition to or replacement for fossil diesel in existing engines. Liebherr is working on injection technology, where e-fuel can be used as an ignition aid (for e.g. ammonia).
- Potential: long-term carbon-neutral, if manufactured using exclusively renewable energies
- **To-dos:** to expand the generating capacities

Hydrotreated vegetable oil (HVO)

- Status: all Liebherr machines are already supplied HVO-ready. Energy carriers available on the market, but in limited volumes
- Areas of use: alternative to diesel in existing combustion engines
- Potential: no aromatic compounds, lower emissions than fossil diesel
- To-dos: availability of raw materials limited, cannot fully replace diesel and kerosene

Biodiesel

- Status: used in Europe in small amounts as an admixture (B7) to diesel
- Areas of use: road traffic, sometimes in off-road use
- Potential: low. Sustainability issues due to the large space required to cultivate the raw materials
- To-dos: competition with food production, widespread use improbable.
 Pure biodiesel 'ages' faster. Longer downtimes of the machines must be avoided.

Mains-operated machines

- Status: already in operation for decades at Liebherr (e.g. tower cranes, mining excavators)
- Areas of use: construction and material handling machines with (semi-)stationary application.
 Mobile cranes in crane companies
- To-dos: zero-emissions operation when used in combination with green energy. Network coverage, use of (mobile) energy storage systems to increase peak performance, overcoming power cuts and zero-emissions operation without available mains connection.

Battery-operated machinery

- Status: Liebherr offers solutions that are ready for series production. Increasingly widespread, especially in smaller machines
- Areas of use: small and mediumsized machines. Large machines such as dump trucks in mining operations, provided suitable application profile and necessary charging infrastructure available
- **Potential:** zero-emissions if operated with green electricity. High efficiency
- To-dos: to expand the Liebherr Battery Competence Centre in Biberach (Germany). Charging infrastructure required, limited energy density of the batteries

H₂ piston engine

- **Status:** Liebherr's first prototypes in operation
- Areas of use: larger machines with long operation time and high capacity, such as wheel loaders and excavators
- Potential: carbon-neutral operation when using green hydrogen. Fast refuelling
- **To-dos:** infrastructure for green hydrogen production and distribution

Fuel cells

- **Status:** in pre-development phase for construction machinery from Liebherr
- Areas of use: medium and large machines
- Potential: zero-emissions operation when using green hydrogen. High efficiency. Fast refuelling
- To-dos: infrastructure for green hydrogen production and distribution, technological maturity of fuel cell systems for off-road applications and marketable costs of fuel cell systems

Ammonia

- **Status:** in pre-development phase for mining applications from Liebherr
- Areas of use: large machines with very high energy turnover
- Potential: carbon-neutral operation when using green ammonia. Provisionally the most affordable green energy carrier for use in piston engines
- To-dos: technical maturity for operation in initial prototype machines, infrastructure for production and distribution of green ammonia

Like new, only better – giving used components a second life

Age before beauty: in Liebherr's Ettlingen plant (Germany), new life is breathed into used engines, gearboxes and other drive components. This saves resources, energy and money. Compared with producing from scratch, this uses significantly fewer raw materials and leaves a much smaller carbon footprint.

A lifetime of working on the construction site inevitably leaves its mark on equipment: rusting metal, cables showing their age, corrosion spots, scratches and scrapes. Not to mention grease and dirt all over. Even after several years of operation, the diesel engine of the material handling machine from a steelworks is still an impressive and considerable unit, but it's not likely to win any beauty contests. Nevertheless, Nina Wirth, product manager at Liebherr-Ettlingen GmbH, was delighted to see the engine arrive in the plant hall on a transport frame. 'You can see that this workhorse has already lived quite a life,' says Wirth, while she inspects the crankcase for any cracks or holes. 'And it's our job to make sure that life doesn't end here.' Let Operation 'Reman' commence!

'Remanufacturing is fundamentally different to recycling,' explains Wirth, as the oil-covered engine enters the steam jet booth. 'Whilst recycling involves an energy-intensive process of melting used materials back into raw materials, remanufacturing focuses on continuing the use of the existing structures. We take components, such as engines, gearboxes and hydraulic pumps, take them apart, clean them, inspect them, if necessary refurbish them and then reassemble them.' The aim is to restore or even exceed the original functionality and quality.





More than 20 years serving the circular economy

Ever since 2004, the Ettlingen Liebherr plant in the district of Karlsruhe (Germany) has been specialising in remanufacturing, or 'reman' for short. 'Back then, remanufacturing procedures were relatively unknown to many market players,' explains Daniel Schöninger, managing director of Liebherr-Ettlingen GmbH. The notion of giving entire machine components a second life was initially met with questions over quality – questions that needed answering. In the years since, however, manufacturers and machine operators alike have changed their minds and have come to see it from a more holistic view. In fact, the first-rate quality of reman products is, quite rightly, rarely questioned now.

The 'Handbook of Sustainable Engineering', published by Joanne Kauffman and Kun Mo Lee, provides us with the explanation: 'Remanufacturing, a process whereby used products are restored to 'good-as-new' working order with the corresponding guarantees, is considered a more sustainable manufacturing method, because it can be cost-effective and better for the environment than conventional manufacturing.' In Europe today, remanufacturing makes up roughly two per cent of the manufacturing sector – representing a revenue of around 8.7 billion euros in Germany alone.

A study by Germany's VDI Competence Centre for Resource Efficiency predicts that, if current conditions prevail, the remanufacturing sector will grow by more than 50 per cent across Europe by the year 2030 to 46 billion euros. If political and economic conditions become more favourable, however, market researchers forecast the sector will triple in size. Even now, the savings associated with remanufacturing are tremendous: an in-house study by Liebherr revealed that it uses up to 78 per cent fewer raw materials and 66 per cent less CO_2 in direct comparison with new production.

Save money, drive down CO₂ emissions

'Reman pays off,' attests Daniel Schöninger. 'By using this alternative to new parts, we can lower the costs of spare parts by between 25 and 50 per cent. That also filters through to the life cycle costs. Just by reconditioning combustion engines, we can reduce raw material consumption by up to 78 per cent. When the effects of transportation and scrap rates are taken into account, CO_2 emissions are 52 per cent lower than with the manufacture of a new part. That is a very sizeable contribution to the circular economy and a perfect win-win-win situation: for manufacturers, for customers and for the environment.'

Liebherr – and Liebherr customers – demand high quality from products and services. 'We are approaching reman with a requirement for production that matches new-part quality,' explains Daniel Schöninger. However, this does of course mean that the design, material quality and processing of new parts must ensure a long service life in the first place, so that disassembly, cleaning and restoration preferably only require the replacement of typical wear parts.

Liebherr Reman – eight steps to a second life

Pre-cleaning: dirt, oil and deposits are removed using steam jets and sand blasting.

2 Disassembly: the components are broken down into their individual parts.

Deep cleaning: individual parts are cleaned with maximum precision.

Diagnostics: every part is inspected to identify any wear or damage.

5 Mechanical processing: where necessary, individual parts are refurbished

Assembly: the components are put back together.

Testing: every unit is run through tests in line with series production standards.

8 Painting and delivery: the finishing touches before the product goes to the customer.





Maintenance and repair for added value that lasts

The engine of the material handling machine is already fully dismantled after its initial clean. Now, the Ettlingenbased team can inspect the pistons, piston rods, cylinder heads, etc. and, where necessary, replace parts. Badische Stahlwerke GmbH, a steelworks company based in Kehl (Germany). where the excavator worked in tough conditions alongside various Liebherr wheel loaders, is turning to remanufacturing for both economical and ecological reasons. 'In Europe, especially in Germany, we are witnessing a transformation, shifting towards the manufacture of "green," i.e., zero-emissions, steel,' explains a representative from the steelworks. He also added that this extended beyond merely production processes. There are numerous building blocks that make sustainable steel production possible. The in-house goods handling is an important factor in this: '[...] When it comes to maintenance and repair, we look no further than the reconditioned reman components from Liebherr. Firstly, because they provide the same quality as new parts but at a lower price, and secondly, because they are an excellent fit for our environmental and sustainability philosophy of a "steelworks of the future". The result is smooth processes, reduced costs and an active contribution to the circular economy.

'And what's great is that some of the scrap steel that goes into the steel plant as a raw material comes from the unusable components of the Liebherr reman programme,' notes Daniel Schöninger. And that's precisely what they mean at the Liebherr plant in Ettlingen when they say: like new, only better.

At a glance: Liebherr reman in facts and figures

Products

- Combustion engines
- Fuel injection technology
- Hydraulic pumps and motors
- All types of gearbox
- Hydraulic cylinders
- Rope winches
- Electronics
- Various individual parts





employees around the world

7,500 components refurbished



per year, as well as countless individual parts

The story is far from over

More than 20 years ago, Nolte Autokrane in Hanover (Germany), became the first customers to acquire the LG 1750 lattice boom mobile crane. Now, years later, that model is being replaced by its successor, the LG 1800-1.0 – with the very same licence plate. Back then, it was Detlef Schlesner in the cab; today, his son Rainer takes his place behind the wheel. This is the story of a very special relationship.

The trade community was in awe. More than 20 years ago, Liebherr unveiled the LG 1750 lattice boom mobile crane to the crowds at Bauma in Munich (Germany). This combined the advantages of a mobile crane with the load capacity of a 750-tonne lattice boom crane. The red and white painted power mobile crane drove straight from the exhibition to Hanover to arrive with the crane rental company Nolte Autokrane. 20 years later, almost to the day, the successor model, an LG 1800-1.0, rolls into Hanover.

It's a story that puts a smile on the face of company owner Dirk Nolte: 'These days, Detlef Schlesner is enjoying his welldeserved retirement. It's special enough that his son Rainer has been driving mobile cranes with us for 17 years. But the fact that he's driving the successor of his father's crane really is the perfect next chapter to this story.' That being said, Dirk Nolte and his team have worked hard writing this story. Over the years, Nolte has purchased several LG 1750 machines, at times operating three of these 750-tonne cranes at once in its fleet. 'When the licence plate of our first LG 1750 became available again, we pounced on it straight away and registered the new LG 1800-1.0 with that plate,' says Dirk Nolte proudly of this 'historic' move, which also brought great joy to the crane-driving Schlesner family.

This attention to personal details is part of the Nolte's familyrun company. So too is their commitment to performance and quality. 'Lattice boom mobile cranes are ideal for assembling wind turbines. We use around 70 per cent of our LG 1750 machines in this area,' explains Dirk Nolte.



'The LG 1800-1.0 is even more powerful. With this model, we can now install wind turbines with hub heights of up to 180 metres. What's more, the new crane is also well-suited for industrial applications, just like its predecessor.' Mobile cranes from Liebherr, as Dirk Nolte can confirm from his own extensive experience, are the result of long and extensive technological development. Over the course of two decades, the LG 1750 has earned legend status in the crane market. Since the new 800-tonne model's performance far exceeds that of its predecessor, Liebherr has coined the slogan 'The legend grows' for the LG 1800-1.0. Further to this, the new crane also features state-of-the-art crane technology, such as V-Frame®, VarioTray, ZF Traxon Torque transmission with ECOdrive and WindSpeed Load Charts.

Suitable for all markets due to flexible driving modes

'The 800-tonne mobile lattice boom crane, the LG 1800-1.0 with its nine axles, is extremely attractive for challenging, heavy lifting operations on public roads,' confirms crane operator Rainer Schlesner. In practical terms, he adds, it pays off that the non-telescopic folding beams of the XXL mobile crane manage with a support base of 13 x 13 metres. 'That's all the base the LG 1800-1.0 needs to achieve enormous load capacities with the Derrick system, and even very good erectable lengths without it.

At a glance: on the road with the LG 1800-1.0

The LG 1800-1.0 boasts not only nine axles but also a truly unique chassis: the unusual arrangement of its axles allows the lattice boom crane to drive on public roads with an axle load of just ten tonnes with all four supports and a total weight of 90 tonnes. Alternatively, transport is possible with just two supports and a total weight of 70 tonnes, as well as completely without supports at around 50 tonnes.

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Liebherr expertise for wind energy

As a leading manufacturer of innovative products and technologies for wide-ranging requirements, Liebherr is helping to shape the future of the wind energy industry. High-performance cranes and material handling machines can be seen in use in the construction of wind turbines, both on land and on the open seas. The specially developed components for wind turbines are extremely reliable and durable, even in extreme conditions, making them suitable for the high quality standards required in the wind energy sector. With high-quality geared parts and the production of quality concrete for tower crane segments, Liebherr has the fields of gear technology and concrete technology covered.

The benefit on the construction sites: 'Fixed supports are more stable and save weight. They're also easier to assemble and disassemble. And a quick coupling system makes these processes especially fast.'



Proven prowess on its very first job

For its first deployment, Rainer Schlesner took the new Nolte crane to the northernmost end of Germany. In Wanderup, not far from Flensburg, the entire rotor of a six-megawatt wind turbine had to be removed in order to replace the defective rotor shaft. 'At 147 tonnes, the blade and hub assembly alone was extremely heavy. But the wind conditions were such that we were able to lift it without any problems,' reports Schlesner. To this end, the 800-tonner was equipped with 129 metres of main mast and a twelve-metre fixed jib for a hook height of 144 metres. The necessary counterweight was provided by 170 tonnes of ballast on the turntable and 130 tonnes of suspended ballast.

'With the VarioFrame[®], the lift was so straightforward. We removed the rotor with a ballast radius of 15.6 metres. The suspended ballast was extended to 24.5 metres to place it on the ground,' explains Schlesner. It came as no surprise to the crane driver that he was able to adapt to the new crane so quickly. 'The controls on Liebherr cranes are very standardised, from the smallest right through to the biggest cranes.'





Nina Wirth, product manager

A second life from the first

Right from her early years, Nina Wirth began developing a fascination for technical drawings, construction sites and machines and this took her from a technical diploma to vocational training as a technical designer. To expand her knowledge, she began further training in mechanical engineering in parallel to her work and then changed to project specialist, where she designed automated shelving systems and provided technical support for construction sites.

In parallel, she completed further training in technical business management so as to also understand and manage the economic aspects of projects. She switched to Liebherr in Ettlingen (Germany) after spending five years in this role. While Nina Wirth already knew the company back then, the idea of remanufacturing – 'new from the old' – was new and fascinating for her. In her role as product manager, she saw the perfect opportunity to combine her technical knowledge with sales operations. The interfacing tasks between different departments and managing the product programme were particularly appealing. Today, she is responsible for the strategic management of the Reman programme throughout the entire product life cycle. Her tasks include creating business plans, performing product analyses, introducing and discontinuing products as well as cross-divisional coordination and strategic alignment. Working within the components product segment and in collaboration with OEMs and customers, she ensures that the Reman product programme is successfully established.

Which was the most challenging or exciting project for you personally?

A very exciting project I'm working on right now is defining and developing a Reman programme with the Liebherr plant in Ehingen (Germany). With a focus on "a new life for an old winch" sustainability and availability programme, we want to offer the market a broad product programme in general overhauls of rope winches. Thanks to this collaboration and definition of the new Reman programme, future crane downtimes will be reduced, providing customers real added value.

How do you realise Liebherr's Bauma motto 'Hands on the future' in your daily work?

Every day, I work to consistently integrate changes in sustainability into our Reman product programme and future developments into our processes.

By constantly engaging with our OEMs and customers, we endeavour to integrate their needs and requirements into our varied Reman programmes. Together with various specialist departments, it is our job to take these new aspects into consideration and integrate them into our projects.

What impact does your job have on the future?

My job as a product manager has the significant task of introducing new 'Reman capable' products and constantly adapting the product programme to customer expectations and the market. We make a very important contribution to establishing a sustainable mentality and building a circular economy within society. Through my daily work, I hope to inspire other people to reuse or repair objects instead of throwing them away.

What advice would you give to young people starting out in their career?

Stay curious and daring. Even if starting out does not seem easy, you can master every challenge with the right level of passion and drive. My path from technical designer to product manager was shaped by continuous further training and hard work. Learning is a continuous process, which will also pay off for you one day.



Curriculum vitae

business manager

2009	Qualification: technical secondary school leaving certificate	2012 - 2015	BITO-Lagertechnik Bittmann GmbH, Meisenheim, Germany Technical designer, equipment design
2009 - 2012	Vocational training at BITO-Lagertechnik Bittmann GmbH, Meisenheim, Germany		department
	Qualification: technical designer, machines and system technology	2015 - 2019	BITO-Lagertechnik Bittmann GmbH, Meisenheim, Germany Project specialist, project handling
2013 - 2015	Advanced training at Fachschule für Technik (technical college), Kaiserslautern, Germany		department
	Qualification: state-certified engineer for machine technology, specialising in mechanical engineering	2019 to present	Liebherr-Ettlingen GmbH, Ettlingen, Germany Strategic sales department, product manage
2015 - 2017	Advanced training at Fachschule für Technik (technical college), Kaiserslautern, Germany Qualification: state-certified technical		



Highlights from the product segments



Looking to the future together

On the eve of the world's leading exhibition for construction machinery, construction material machines, construction vehicles and construction equipment, the international Bauma Innovation Award kicks off proceedings with much highly anticipated fanfare. 2025 sees the coveted prize awarded for a 14th time. In the first round of the selection procedure, Liebherr entries produced five finalists, three of whom went on to make it into the final 15.

Just under twelve hours before Bauma opens its doors, the pulse of the industry is racing. This is not just in anticipation of the imminent trade show, but also a sense of excitement for the international Bauma Innovation Award, which is this year being awarded in the ICM on the show ground for the first time. As with the Oscars award ceremony, the event organisers' lips are firmly sealed regarding the winner. The list of 15 nominees is the only indication the esteemed guests from the worlds of construction, politics, science and the media are given about who – from the full 208 applications received – might be in with a shot at the top prize. A sense of anticipation once again fills the air at the reception, as the candidates take one last glance at the trophies on display – intricate stainless steel designs first created by students at Offenbach HfG Design College.



This evening is especially important to Liebherr. At the most recent ceremony, in 2022, Liebherr France SAS won the coveted prize in the climate protection category with its R 9XX H_2 hydrogen crawler excavator – a groundbreaking step towards a zero-emission construction site. In 2025, at the 14th ceremony of the international Bauma Innovation Award, Liebherr continues to be well represented. An impressive five submissions across three categories, made it into the second round comprising a total of 52 finalists:

Climate protection category: Liebherr Mining Equipment Newport News Co.: T 264 Battery Electric truck and autonomous mining truck

Digitalisation category: Liebherr-Werk Bischofshofen GmbH: autonomous system for wheel loader

Mechanical engineering category:

- Liebherr-Werk Biberach GmbH; Positioning Pilot assistance system
- Liebherr-Werk Ehingen GmbH; driver assistance systems to increase traffic safety
- Liebherr Corporate Ventures AG; prototype of a single-axle truck

On 18 February 2025, the event organisers finally announced the results of the next selection round. Three Liebherr innovations made it into the top 15 finalists from which the winners will be crowned: Liebherr-Werk Biberach GmbH with its Positioning Pilot assistance system for tower cranes, Liebherr-Werk Bischofshofen GmbH with its 'Liebherr Autonomous Operations' development and Liebherr Corporate Ventures AG with the Liebherr single-axle truck S1 Vision.

A coming together of top associations and Bauma

The history of the award speaks of its significance within the industry. This prestigious honour has its roots in German Construction Machine day, where cutting-edge technologies from Germany were awarded prizes until 2004. After this, the award evolved into an international contest for groundbreaking innovations in five categories – climate protection, digitalisation, mechanical engineering, construction and research. Since 2022, the prizes have been awarded every three years at Bauma as a mark of recognition from the VDMA, VDMA Services GmbH, Bauma and the most prestigious associations of the German construction industry, HDB, ZDB and bbs. This alliance of organisations is led by VDMA (Verband des Maschinen- und Anlagenbaus, the German Association of Mechanical and Plant Engineering).







Martina Scherbel Project manager of the Bauma Innovation Award

In the multi-stage selection process, the judging panel, made up of representatives from science and industry, as well as the trade press, focuses on futureoriented innovations of great practical value. In addition to technological progress, aspects such as energy efficiency and resource efficiency, sustainability and socially responsible work design also form central evaluation criteria. 'The selection process is very demanding and time-consuming. Even though there is no prize money and the award itself is immaterial, it is still held in high regard within the industry,' stresses Martina Scherbel, project manager of the Bauma Innovation Award.

Martina Scherbel attributes the success of the Bauma Innovation Award to more than simply the exceptional products and services of the participating companies. 'Universities, colleges and associations also play a vital role, in that they provide judges and bring the public's attention to the contest. All those involved invest a great deal of time in evaluating the entries and do not take their decision lightly. They know that innovation is the key to preparing our industry for the future in the face of international competition. This is precisely why the prize is so important.' Partnerships with scientific institutions and industry-specific organisations have provided exceptional stimulus for the transfer of knowledge and have laid the foundations for technological breakthroughs. 'The Bauma Innovation Award offers an ideal platform to make these synergies visible,' adds Scherbel.

If Liebherr uses Bauma 2025 to present its visions of a sustainable and digitalised world of construction on the big stage to a global audience, then simply being in the race for the award is part of Liebherr's entire innovation story. This way, the award not only provides affirmation of the targets achieved. It also provides motivation to keep working on the instrumental technologies of the future. And that is undoubtedly what underscores the sense of anticipation on 6 April 2025 in the moments before the winners are announced.

Earthmoving

930

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Conquering the depths

Designed for confined and hard-to-reach underground construction sites, the R 930 Tunnel excels in dark places. Its adjustable attachment, with 2 x 45° swivel bearing, precisely follows the excavation profile. A short slewing radius and resilient LED headlights minimise collision risks. Strategically positioned cylinders and hoses provide maximum protection against potential impacts. With robust steel bodywork and Liebherr's quick coupling system, tool changes are effortless and swift.

A 909 Compact and A 911 Compact: compact, powerful, versatile

The new A 909 Compact and A 911 Compact wheeled excavators combine a compact design with high performance for maximum versatility.

With their small swing radius and robust design, these machines are ideal for constrained construction sites. The powerful hydraulic system ensures that they can work efficiently, while the maintenance-friendly design positively impacts operating costs.

Facts & figures

Tail swing radius	1.5 m (A 909)/1.6 m (A 911)	
Engine output	55 kW or optionally 80 KW	

R 926 G8: power and precision

With 150 kW/204 hp and its ability to handle up to 28.95 tonnes, the R 926 G8 provides comfort, ergonomics and performance. The crawler excavator – developed in Colmar – also features electric joysticks for greater operating comfort and less heat generation in the cab. The innovative machine will be presented at Bauma and will showcase its Leica guidance system and the new Liebherr Remote Control (LiReCon).

Facts & figures

Reach at ground level	18 m
Operating weight	26,500 – 28,950 kg

R 930 Tunnel: powerful excavator for underground construction sites

The R 930 tunnel was specially developed for confined spaces when tunnelling.

Thanks to its pivot bearings and compact design, it enables precise work with minimal risk of collision. Robust steel cladding and protected components make the machine very durable, while the comfortable cab with protective structures and cameras maximises safety. The powerful LED headlights improve visibility and minimise the risk of accidents.

Facts & figures

Pivot bearings	2 x 45°
Safety cab	ROPS, FOPS, FGPS





A 918 Compact G8: innovative cab design and intuitive controls

The A 918 Compact G8 boasts an innovative cab design and intuitive control options.

The ultra-modern cab comes with an advanced operating and display concept as well as intelligent functions for personalised use and fast navigation. Optimum operating comfort is ensured by various joystick configurations, generous glass surfaces, an infinity windscreen and powerful LED headlights.

Facts & figures

Cab	operating and dual display concept (INTUSI), 10" main display		
Work environment	Skyview 360° camera system		

R 920 E G8: zero emissions yet extremely powerful

The first battery-powered electric crawler excavator from Liebherr works quietly and with zero emissions at full power.

With high-voltage batteries of up to 282 kWh, the R 920 E G8 is ideal for urban and enclosed construction sites. The new generation cab also features the INTUSI interface for a modern control system that offers maximum comfort. Charging is possible with up to 150 kW direct current.

Facts & figures

Operating weight	20,900 kg
Battery capacity	180 - 282 kWh

Rail-road excavators RE 25 M: new standards in rail construction

Powerful rail-road excavator with innovative undercarriage concept, profile-free superstructure and new INTUSI operating concept.

The RE 25 M Litronic expands the Liebherr portfolio and combines tried and tested technology with new features: hydrostatic rail wheel drive, low tail swing radius and a comfortable double cab for greater safety and efficiency.

Facts & figures	
Operating weight	24.4-25.7 1
Engine output	120 kW

Material handling technology

LIEBUERR



In a port in Bamberg (Germany), the LH 110 M High Rise Port Litronic is the heavyweight champ, effortlessly juggling bulk materials. Port handling is its forte: with mighty load capacities and impressive reach, this powerhouse makes efficient loading cycles a breeze and keeps costs low. When teamed up with the Liebherr clamshell bucket GMZ 120, handling capacities of up to 8.0 m³ per loading cycle are achieved with ease.
Liebherr PR 776 G8: efficient and robust crawler dozers for mining

The PR 776 G8 sets new standards for efficient material handling.

Due to its hydrostatic drive and assistance systems such as 'Auto Blade Pitch', the machine enables precise material transport with reduced fuel consumption. Its robust design, modern maintenance solutions and the optional LiReCon teleoperation system make it the ideal choice for demanding mining applications.

Facts & figures

Operating weight	73 t
Fuel consumption	Ø 38 l/h
Assistance systems	Free Grade, Definition Grade, Auto Blade Pitch
Remote control	Liebherr LiReCon

Telescopic handlers Generation 6: more performance and comfort

A higher load capacity, more comfortable operator's cabs and new assistance systems: Generation 6 telescopic handlers comprise of eight models spanning from 3.2 to 4.2 tonnes and lifting heights of 6 to 10 metres.

With the T 48-8s, Liebherr is launching a telescopic handler in the 8-metre class for the first time – ideal for heavy industrial applications and loading lorries.

Max. lifting capacity	4.8 t
Max. lifting height	8 m





Port handling: zero-emissions powerhouses for bulk and general cargo

The LH 40 M Port E and LH 60 M High Rise Port E material handlers are specially designed for the efficient handling of bulk and general cargo in harbours.

Their electric drive concept enables zero-emission and low-noise operation with low operating and maintenance costs. While the LH 40 M Port E with its 145 kW electric motor enables dynamic work movements, the LH 60 M High Rise Port E impresses with its weight-optimised design, high payloads at long reaches and the 190 kW electric motor.

Facts & figures

LH 40 M Port E	
Reach	18 m
Operating weight	41,100 – 45,500 kg
LH 60 M High Rise Port E	
Reach	23 m
Operating weight	72,800 – 80,300 kg

Medium-sized wheel loader: flexible all-rounder

The medium-sized wheel loaders L 526–L 546 G8 combine high performance and reliability with innovative technology: the efficient hydrostatic drive and robust components reduce operating costs in the long term. Strong lift arms ensure maximum handling performance, with which the operator can work dynamically even with heavy-duty attachments such as high-tipping buckets or log grapples. A large selection of assistance systems such as active person recognition, LIKUFIX quick-change system or intuitive joystick steering rounds off the range.

Tipping load articulated	5,030 – 11,010 kg
Bucket capacity	2.0 − 7.5 m³
Operating weight	13,170 – 16,970 kg

Mobile and crawler cranes

Game changer for tomorrow's energy

The LR 12500, the largest crawler crane of the Japanese DENZAI Group, is being used for the first time in Ulsan (South Korea). The 2,500-tonne crane has been erecting a refinery there since last year. With its 7.5-metre-wide 'HighPerformanceBoom' and enormous load capacities, the power pack is a beast in industrial applications. It is just the ticket for loading heavy-duty goods such as offshore wind power components in ports.

LTM 1055-3.3: less weight for heavy lifting

The LTM 1055-3.3 is a 3-axle all-terrain crane that redefines mobility.

Its lightweight design and low axle loads mean that driving licences are now unnecessary in many markets. With its 40-metre telescopic boom and high lifting capacity at large radii, it offers impressive lifting performance – ideal for assembly work in industrial halls and for work in confined spaces.

Facts & figures	
Telescopic boom	40 m
Max. lifting height	54 m
Max. load	55 t





The LTM 1150-5.4E and LTM 1150-5.4 mobile cranes set new standards in terms of performance and efficiency.

The LTM 1150-5.4E combines electric drive with maximum power and enables zero-emission operation and up to four hours of autonomous use due to its integrated battery. Ideal for zero-emission construction sites and noise-sensitive areas. The LTM 1150-5.4 is a 150-tonne mobile crane from the latest generation, equipped with the modern LICCON3 control system. The trusted operating concept and assistance systems ensure a seamless changeover and even greater safety.

Facts & figures

LTM 1150-5.4	
Max. lifting capacity	150 t
Telescopic boom	66 m
LTM 1150-5.4E	
Power of electric motor	111 kW

LTM 1300-6.4: more powerful with LICCON3

The LTM 1300-6.4 is the third Liebherr mobile crane with the new LICCON3 control system, which delivers maximum efficiency.

In addition to the renowned range of services,

it offers a modern crane design and smart technologies that guarantee a high level of safety and simple operation. The mobile crane features VarioBase® Plus, which provides a flexible support structure and even higher lifting capacities.

Max. lifting capacity	300
Telescopic boom	90 m



LTM 1400-6.1: the most powerful 6-axle crane in the world

The new LTM 1400-6.1 is the most powerful 6-axle crane in the world and the successor to the LTM 1350-6.1.

It offers impressive lifting capacity, a 70-metre telescopic

boom and is easy to set up. As the smallest crane with Y-guying, it is the perfect introduction to lifting capacity-enhancing jib technology and is ready for use in just a few minutes because of the uncomplicated self-assembly of the guying.

Facts & figures	
Max. lifting capacity	400 t
Telescopic boom	70 m
Max. lifting height	120 m

LR 1300.2 SX unplugged: battery power meets heavy-duty technology

The new battery-powered 300-tonne crawler crane works completely autonomously and with zero emissions for up to 13 hours as a result of its 392 kWh battery.

With seven different jib configurations and a maximum jib length of 169 metres, it is exceptionally versatile. Innovative assistance systems such as the 'Gradient Travel Aid' and the 'Boom Up-and-Down Assistant' help to maximise safety during all operations.

Facts & figures

Electric motor	438 kW
Battery capacity	392 kWh
Operating time without mains	up to 13 hours
Charging time	4.5-8.5 hours

LR 1400.1 SX: improved load and utmost safety

The LR 1400.1 SX crawler crane with derrick equipment and suspended ballast is optimised for heavy-duty hoisting operations and long jib configurations.

VarioTray enables flexible ballast adjustment without the need for an auxiliary crane, while assistance systems such as 'Gradient Travel Aid' and the 'Boom Up-and-Down Assistant' ensure maximum safety.

Maximum ballast adjustment	VarioTray with 10.1 t ballast weights
Assistance systems	Gradient Travel Aid, Boom Up-and-Down Assistant, Ground pressure indicator

Concrete technology

LIEBMERR

All set for the future

Liebherr's new Mobilmix series is all about rapid assembly, flexibility and sustainable concrete production. With cutting-edge tech, the new generation of mixing plants delivers sustainable concrete production faster than you can say 'whip it up!' Their folding design and integrated technology container with pre-cabling ex-works make setup smooth. Plus, the plants are characterised by their energy and resource efficiency due to a significant reduction in cement demand and energy savings of up to 30 per cent.

24 XH truck-mounted concrete pump: compact precision for demanding work laying concrete

The compact Liebherr 24 XH truck-mounted concrete pump is specially designed for use in buildings, halls and tunnels.

With an unfolding height of less than 5 metres, it enables precise work in the tightest of spaces. The flexible boom ensures vibration-free concreting even at high delivery rates. Practical hose and cable trays offer storage space on five levels and simplify handling on the construction site.

Facts & figures

Unfolding height	< 5 m
Hose/cable trays	five levels, up to 158 m tube/hose length

31 XXT truck-mounted concrete pump: more versatility and efficiency for indoor construction sites

The new Liebherr 31 XXT boasts a compact design and a low unfolding height of just 5.4 metres.

Due to five flexible arms and the reliable XXT support structure, it is ideal for use in halls and buildings. With LiDriveln, the 31 XXT can be driven into a building with the arm assembly folded in front of the cab during normal operation. The machine fits through a building opening with a height of only 4 metres with the arm assembly in front of the cab.

Facts & figures

Unfolding height	5.4 m
LiDriveIn height	4 m
Tube and hose storage	up to 90 m

Truck mixer with conveyor belt: efficient material transport for construction sites

The LTB conveyor belt from Liebherr is an attachment option for truck mixers and enables concrete, sand and gravel to be transported directly to the construction site.

With a conveying capacity of up to 70 m³/h and a belt speed of 3.5 metres per second, it works quickly and precisely. Various length variants up to 16.2 metres with double telescopes mean that they can be used in a wide range of applications. Operation is made easier with a radio remote control and support structure.



Conveying capacity	approx. 70 m³/h	
Belt speed	up to 3.5 m/s	
Maximum length (with double telescope):	16.2 m	



Ring-pan mixer RIV 2.5 D: for demanding types of concrete

The RIV 2.5 D ring-pan mixer is suitable for producing demanding types of concrete.

Two independent drives and variable agitator speeds enable maximum flexibility and efficiency in the mixing process. In particular, when manufacturing high-tech or special concretes, nothing is left to be desired. The special ring trough design guarantees complete and rapid homogenisation of the mix. The open design also makes cleaning and maintenance easier.

Facts & figures

Agitator speeds	continuously adjustable during the mixing process
Drive systems	two powerful electric motors

Mobile concrete mixing plant: reducing costs with Mobilmix

The new Mobilmix series from Liebherr enables flexible configuration, short delivery times and fast assembly owing to its modular design. The use of the LiPerformance process optimisation reduces power consumption by up to 30 per cent and ensures precise dosing with savings of up to 8 kilograms of cement per cubic metre of concrete

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Mixer sizes	2.5 to 4.0 m³
Maximum output	up to 170 m ³ of concrete per hour
Energy saving	up to 30 % due to LiPerformance process optimisation
Cement savings	up to 8 kg per m³ of concrete



Tower cranes

The completion of a landmark

A crane job for the history books: 710 HC-L and 125 HC-L luffing jib cranes are at work on Antonio Gaudi's Sagrada Familia in Barcelona (Spain). The assembly is no ordinary feat: the construction starts at 54 m and climbs to 130 m, where it is anchored. Our Tower Crane Solutions team nailed the planning, ensuring safety and precision. It's an honour to lift Gaudí's legacy to new heights!

K-series fast-erecting cranes: smart technology for modern construction sites

The revised K-series from Liebherr offers fast-erecting cranes with intelligent assistance systems for increased safety and efficiency. Thanks to the new control system and operating system TC OS 2, the 43 K, 61 K and 91 K cranes are ready for the future. The cranes can now be ordered with the five intelligent assistance systems. Smart functions such as

sway-free lifting of loads without diagonal pull increase safety for people and sensitive components, while semi-automated lifts ensure high operating comfort. Variably adjustable hook heights and high load capacities make them the ideal solution for demanding construction projects.

Facts & figures

Maximum hook height	40.4 m (91 K)
Maximum load capacity	6,000 kg (91 K)
Radius	up to 48 m (91 K)

HC-L series: powerful luffing jib cranes for confined construction sites

The HC-L series is being expanded with the new 440 HC-L 12/24 and 18/36 models and its bigger brother, the 620 HC-L 18/36. The Load Plus function enables the 620 HC-L model to achieve a 76 per cent increase in lifting capacity in specific diagrams, amounting to an additional 3.250 kilograms. This is the first time that aramid guying has been used for this series. The lightweight material saves weight on the jib and increases lifting capacity. Pre-assembled modules and compact transport units ensure fast, cost-efficient assembly.

Increased lifting capacity (Load Plus)	up to 3,250 kg (+76 %)
Max. lifting capacity for 1-fall operation	18,000 kg
Max. load for 2-fall operation	36,000 kg
Decommissioning	12 m (620 HC-L)

240 EC-B and 520 EC-B Fibre cranes: lightweight with jib head lifting capacity

Due to its high-strength fibre rope, the EC-B and 520 EC-B Fibre cranes from Liebherr offer up to 20 per cent higher jib head lifting capacities compared to steel rope variants.

Lighter components ensure easier assembly and higher lifting capacities as a result of the weight-optimised design. Various lifting capacity versions and high-performance drives enable the machines to work precisely using Micromove and adjustable slewing gear modes, and the 2-fall operation provides maximum handling capacity. Downtimes can also be reduced with the proven fibre repair set. If a fibre rope is irreparably damaged at any point, it can now be shortened.

Facts & figures	240 EC-B/520 EC-B
Max. hook height	68.2 m/96.0 m
Max. lifting capacity	10,000 kg/20,000 kg
Max. radius	68.0 m/83.0 m
Lifting capacity at max. radius	2,500 kg/2,900 kg

L-series fast-erecting crane: 33 L with intelligent assistance

The new L-cranes feature a radical redesign of the structural steelwork, an improved hydraulic system and an extended modular drive system. Another new feature is a standardised radio remote control for all Liebherr fast-erecting cranes. The 33 L is equipped with the Sway Control system as standard. This assistance system automatically recognises movements that lead to swinging loads and actively counteracts them. The 33 L is ready for immediate use without the need for multiple transport and can work with a slightly reduced lifting capacity immediately after assembly. If required, a further two tonnes can be added to the 15,000 kilograms of ballast carried, thus achieving the full lifting capacity.

Max. lifting capacity	4,000 kg
Hook height	up to 21.30 m
Max. radius	30 m
Lifting capacity at the jib head	up to 1,050 kg

Deep foundation

Superior flex

At the harbour in Port Arthur (Texas), Liebherr's LRH 200 demonstrates teamwork at its best. Together with the 110 D-K concrete pump, the piledriving and drilling rig is installing 5,532 CFA piles for the foundations of the LNG pressure vessels. The piles are 33.5 metres deep and have a diameter of 45.7 centimetres. Superior Foundation, Liebherr's customer, highlights the LRH 200's flexibility due to its extensive working radius of up to 8.7 metres and the superior length of the leader.

HS 8100.2 dual power: first fully electric duty cycle crawler crane from Liebherr

The innovative HS 8100.2 dual power offers different drive variants depending on the conditions on the construction site.

With a power input of 125 A, the duty cycle crawler crane is operated entirely via construction site power. At 32 A or 64 A, some of the necessary energy comes from the power grid, while the rest is supplied by an optional diesel generator that is fully integrated into the machine. In addition, the device can be assembled or disassembled independently due to the battery or moved over a distance of around 400 metres.

Facts & figures

Fields of application: work with scraper bucket, mechanical gripper or slot wall gripper, as well as lifting work

Free-fall winches	2 x 300 kN (with energy recovery)
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Lifting capacity 100 t

Pile-driving and drilling: the LRB 19 combines performance and digital innovation

As the versatile successor to the LRB 16 and LRB 18, the LRB 19 piling and drilling rig boasts an innovative hydraulic quick-change system for various attachments. The powerful 450 kW motor and compact design enable a wide range of applications with easy transport, while digital assistance systems such as LIPOS ensure maximum precision and safety. An intelligent self-assembly system for the ballast and the optimised LED lighting round off the practical features.

Facts & figures

Engine output	450 kW
Travel	19 m
Transport weight	48.2 t (incl. 8 t ballast)
Maximum torque of drilling drive	180 kNm
Attachments	vibrator, hammer, auger drive



LB 45.1: power and efficiency

The LB LB 45.1 drill rig sets new standards in specialised civil engineering with impressive performance, precision and efficiency.

With a maximum torque of 450 kNm and cutting-edge hydraulic technology, the rig effortlessly masters even the most challenging ground conditions. An optional lattice mast extension enables even deeper full and partial displacement drilling, making the model flexible for a wide range of construction projects. With its innovative assistance systems and intelligent energy management, the LB 45.1 offers maximum productivity with low fuel consumption.

Facts & figures	
Engine power	450 kW
Torque	450 kNm
Max. winch pull	420 kN
Max. pull-back force	1000 kN
Auger drilling	max. drilling depth 37 m



LSC 8-20 and HS 8130.1: the perfect team for diaphragm walling

The new LSC 8-20 cutter now offers a higher nominal torque of 147 kNm for each cutter wheel, enabling diaphragm wall thicknesses of 800-2,000 mm.

The base body can be extended by 4 metres for improved verticality. The cutter's resulting overall height of 12 metres and its heavy weight with a low centre of gravity make it easy to control. The cutter can be used to dig trenches with a length of 2,800-3,200 millimetres and a maximum depth of 150 metres. In combination with the HS 8130.1 cable excavator, which is a real powerhouse with its new motorisation and 35-tonne free-fall winches, it forms a high-performance duo for demanding diaphragm walling work.

Facts & figures

LSC 8-20		HS 8130.1	
Torque	147 kNm	Motor power	565 kW
Diaphragm wall thickness	800-2,000 mm	Free-fall winches	35 t
Pitch length	2,800-3,200 mm		

LBX 600 unplugged: sustainable machines for cutting slurry walls for urban construction projects

The battery-powered unplugged version of the LBX 600 enables zero-emission and low-noise slurry wall work.

No noise, no exhaust fumes and a compact design to boot – the perfect carrier machine for diaphragm walling work in confined spaces in noisesensitive areas. The battery is charged using conventional site power. A modular jib system enables three different versions of the machine. The LBX 600 unplugged can also be equipped with mechanical and hydraulic grippers.

Max. working depth	80 m
Max. grab weight, full	30 t
Max. pull force in grab operation (dual-winch operation)	450 kN
Max. pull force in recovery mode (dual-winch operation)	600 kN



Components

Unlimited potential – components for the future

High-performance components are the lifeblood of every construction machine. They guarantee better performance, greater availability and maximum energy efficiency – and high operational safety at the same time. Whether it's for classic combustion engines with optimised fuel consumption, alternative drive solutions or mobile energy storage systems, there is suitable technology for every application. Digitalisation also brings new opportunities: a broad portfolio of digital products and services to support the transformation within the industry. And that is just the beginning. Find out which innovations will shape the future!

0011000

Under the spell of electrification

Liebherr is responding to the increasing electrification of construction sites and rising demand for zero-emission machines with innovative solutions such as extremely compact electric motors and a Liduro Power Port (LPO) energy storage system.

Hybrid or fully electrically powered construction machinery and systems can be supplied with energy or operated locally with zero emissions using the LPO. Its high power density and compact design enable efficient and flexible supply to machines and construction sites with a wide range of power requirements.

Facts & figures of the LPO 100

Gross energy content	94 kWh
Peak power	110 kVA
Output slots	16 A (230 V) / CEE 16 A / 32 A / 63 A / 125 A (400 V)
Input slots	16 A (230 V) / CEE 16 A / 32 A (400 V)
Medium	Lithium-ion batteries (replaceable)



Robust technology for heavy-duty tasks

Reliable mechanical solutions that guarantee maximum performance and durability even under extreme conditions:

- slewing bearings and slew drives: digital, electric and maintenance-free
- hydraulic cylinders: sustainable and repairable with integrated sensor technology for condition monitoring, also as a lightweight solution and with alternative coating for piston rods
- DPVG hydraulic pumps with hydrostatic cradle bearings: reliable, modular and durable
- drive technology: low-backlash and resilient gearboxes, whether electric or hydraulic



Resource-saving solutions for the future

Liebherr combines reliable technologies with pioneering developments to reduce environmental impact while increasing efficiency and performance.

With the aim of achieving net-zero emissions in the future, Liebherr is consistently focussing on the further development of hydrogen technology for use in combustion engines, including injection. Research is also being carried out on a concept for an ammonia engine and the injection of other alternative liquid fuels such as methanol and ethanol and ammonia as a system solution.

A9812 ammonia engine

- no greenhouse gas emissions
- spark ignition
- high efficiency and power density
- common basic engine components as in a diesel engine to simplify the transition to the use of alternative fuels

Relevant applications: mining (excavators, dump trucks), power generators, railway

Intelligent machines, smart progress

Interconnected technologies for precise data, optimised processes, maximum productivity and safety on the construction site.

Our digital products and services:

- BCM digital wear measurement of slewing bearings
- Energy Planner the software for planning the power and energy requirements of construction sites in different construction phases
- digital cameras and camera monitor systems
- E2E edge gateway solutions
- LiDIA solution for diagnosing combustion engines, even remotely

Mining

Electric excavator revolution

DOD DO

O Fortescue

EX7135.

The R 9400 E 350-tonne electric excavator showcases Liebherr's over 40-year history in electric excavator technology. Transforming sustainable mining, the R 9400 E combines top performance with zero emissions. Equipped with up to 300 metres of autonomous cable reeling, it enhances manoeuvrability and safety. Liebherr and Fortescue will deliver 55 of these machines to Fortescue's Western Australian operations by 2030, with the first already working on site.

T 264: autonomous, battery-electric truck

The autonomous, battery-electric truck has a 3.2 MW battery and a capacity of 240 tonnes.

Static and dynamic charging solutions, including the innovative 'Liebherr Power Rail', provide versatile and efficient charging. A sophisticated energy management system (AHS) coordinates charging orders and enables vehicles to be charged without queuing. Michelin energy-saving tyres reduce energy consumption and optimise the service range of the truck. All existing Liebherr mining trucks can be retrofitted with the Autonomy Haulage Solution (AHS).



Facts & figures

Battery capacity	3.2 MW
Charging capacity	up to 6 MW
Charging time	12 to 58 minutes
Capacity	240 t



The Liebherr R 9400 E is an efficient and zero-emission solution for mining because its modular design can be easily converted to electric drive and connected directly to the power grid or to an energy storage system. Water-cooled radiators, fan exhaust systems and air intake systems make way for an electric drive power pack and a high-voltage switchgear cabinet. The 400-tonne excavator therefore offers the same robust performance as its diesel-powered predecessors – but with zero emissions. The R 9400 E is equipped with an autonomous cable management system for improved manoeuvrability and greater operational safety in a more dynamic operating environment.

Drive	electrical
Weight	400 t
Switching on process	6,600 volts at 50 hertz
Cable management	autonomous cable





S1 Vision: pioneering single-axle truck for efficient material transport

At the beginning, the company had the vision to make a sustainable change to material transport. The result delivered the S1 Vision – a groundbreaking invention that increases productivity, improves safety on construction sites and reduces emissions at the same time. The S1 Vision single-axle truck features a self-levelling system for maximum stability and safety. The vehicle is stable even on uneven terrain and maintains its balance at all times without tipping over. A smooth driving style paired with a zero turning circle offer optimum flexibility: the S1 masters turns and manoeuvres in the tightest of spaces with ease. Due to its lightweight design, it can also be moved quickly and easily from one location to another. This reduces logistics costs for larger transport vehicles, cuts CO₂ emissions through a streamlined logistics chain and lowers operating costs because of reduced maintenance requirements. When in use, the electric drive ensures environmentally friendly and quiet operation, guaranteeing emission-free travel.

The efficient material transport is topped off by its autonomous control system: the S1 uses advanced sensors to move autonomously, avoid obstacles and navigate efficiently through traffic. For modern construction site traffic, several vehicles can be connected and exchange information in real time. This optimises fleet operations as a whole.

Axles	1
Turning radius	0°
Drive type	battery-electric
Payload	0.25–145 t



The Liebherr Group

Liebherr – a question of personality

World-leading technology, pioneering innovations and exceptional service are all characteristic of Liebherr. But behind every machine and every idea there are people with passion, experience and a shared motivation to shape the future.

When work starts at the construction site, the heavy machinery from Liebherr takes centre stage. A crawler excavator lifts tons of rocks, the mobile crane precisely positions a concrete structure on its foundations, while a wheel loader moves bulk materials just as a truck mixer arrives with fresh concrete. All of these are seamless operations with advanced technology and maximum efficiency.

But behind every movement, innovation and advancement there are not just machines – there are people too. It's the engineers, designers, mechanics, logisticians, IT specialists and service teams who characterise Liebherr, a company with deep roots, a clear vision and a strong ethos.

For decades, the Liebherr Group has been globally successful and renowned for its excellence in many fields of technology. The family-run business is shaping the future around the world, employing over 50,000 people in more than 140 companies and 50 countries. Enthusiasm, consistency, team spirit and autonomy have been the core values of the Group for over 75 years, forming the thread that unites the company across continents and cultures. Working for Liebherr not only means choosing a job and career, but also an ethos. It's all about a unique quartet of values that typify the company:

1 Enthusiasm: innovation meets engineering excellence and technical mastery with high quality standards. Whether operating in extreme mining conditions or building skyscrapers and wind turbines, Liebherr machines and the services we offer for them are among the best in the world. That's what makes the brand so special. The people who work here are passionate about delivering solutions that go beyond the standard.

2 Consistency: Liebherr's growth is sustainable – as a 100 per cent family-run company with a long-term vision. Our employees know that we're not looking for quick profits, but sustainable success. That means secure jobs and cooperative partnerships based on fairness and personal recognition. As a result, many Liebherr employees stay with the company for decades. **Team spirit:** no crane or excavator is built alone, and no construction site is managed solo. It's done by teams from various departments working together to solve complex challenges. This confidence and mutual trust allow colleagues to support each other, work successfully and achieve lasting success at Liebherr.

4 Autonomy: trust creates freedom, and freedom leads to success. Liebherr employees value this freedom and take responsibility for their own actions and for our customers around the world. This opens up space for their own ideas and the courage to think differently. 'Get it done' is a key mindset that has been encouraged and expected since we were founded – across every area of the company.

Liebherr sums it up like this: One Passion. Many Opportunities.

Are you a good match for Liebherr?

Answer these questions and find out how well you'd fit in at Liebherr.

What drives you most at work?

- A) New challenges and the chance of developing something groundbreaking.
- B) Clear structures, long-term prospects and reliability.
- C) Working in a team and the feeling of achieving great things together.

How do you deal with problems?

- A) I love finding creative solutions.
- B) I use tried-and-tested methods and experience.
- C) I discuss the problem with my colleagues and we solve it together.

What's your ideal working environment?

- A) Plenty of space for new ideas and innovations.
- B) A company with a rich tradition that offers stability and security.
- C) A strong team that I can rely on.

How important is responsibility to you?

- A) Very! I like making decisions and taking responsibility.
- B) I like responsibility to be clearly assigned.
- C) For me, responsibility means finding the best solution as a team.

What would your dream project be?

- A) Developing a new, sustainable construction machine with innovative technology.
- B) Building a robust network of professionals for long-term success.
- C) Leading a large, international project with many specialists.

How you did:

Mostly A?

You're a visionary! At Liebherr, you'll find exciting opportunities in innovation and development.

Mostly B?

You're a rock in the storm! Liebherr values and needs people with a long-term outlook and a desire for responsibility.

Mostly C?

You're a team player! Your strengths lie in cooperation – and Liebherr is the perfect place for you to achieve great things together.

Ready to get started? Visit the Liebherr careers page and discover your dream job. Or follow us on Instagram @liebherrcareers or TikTok @LiebherrGroup.

Highlights from the other product segments

Gear technology and automation systems Award for automation solution

Liebherr-Verzahntechnik GmbH received the Best of Industry Award in the Robotics category for its automated solution for dismantling battery packs from electric vehicles. This innovation is part of the ZIRKEL project on recycling battery systems, which is funded by Germany's Federal Ministry of Education and Research (BMBF). Liebherr is working on strategies for efficiently dismantling high-voltage battery systems and maximising the recovery of components and raw materials. The first pilot plant was set up and put into operation in November 2023 in Wolfsburg.







Maritime cranes Half a century of innovation

50 years of excellence in mobile harbour cranes. Since the introduction of the LGM 1130 in 1974, Liebherr has continuously advanced, bringing innovative models like the LHM 250 and LHM 550 to market. The fully electric LPS 420 E and the new LHM series reflect the commitment to sustainability. Liebherr has taken a leading role in the global market for mobile harbour cranes. This is thanks to the consistent satisfaction of customers who rely on the brand's proven equipment and comprehensive service network, which reaches even the most remote locations.

Hotels Tyrolean hospitality meets modern luxury

The rooms and suites on the lower floors of the Interalpen-Hotel Tyrol in Austria have been given a sparkling makeover. The spaces have been refurbished to combine traditional Tyrolean design with modern accents and comfort. High-quality natural materials, artisan craftsmanship and stylish details create a calming atmosphere and refined ambience. Warm wood surfaces, luxurious fabrics and elegant furniture make it cozy and inviting. The new rooms on the south side have an individually adjustable climate ceiling that regulates the temperature from outside, eliminating the need for air conditioning.



Refrigerators and freezers A freezer for the circular economy

The refrigerators and freezers product segment has developed the FNXa 522i, the first Cradle to Cradle Certified® freezer. Cradle to Cradle Certified® is a registered trademark of the Cradle to Cradle Products Innovation Institute. The certification is based on a comprehensive, globally recognised and cross-industry standard for designing and rating products for the circular economy. It evaluates products in five areas: material health, material reutilisation, renewable energies, water management and social justice. The FNXa 522i freezer with BluRoX technology is the result of over ten years of development and represents a sustainable future. The three core principles of C2C – water equals food, use renewable energy and celebrate diversity – define the design philosophy and help create closed, regenerative systems.





Transportation systems

Propane-based HVAC systems for Stadler's Nordic Express

Liebherr-Transportation Systems is supplying 166 propane-based heating, ventilation and air conditioning (HVAC) units for Stadler's new NT FLIRT NEX trains, also known as the Nordic Express. These HVAC systems use the environmentally friendly refrigerant propane (R290) and will be delivered starting from early 2025. The order includes 34 HVAC units for cabs and 132 units for passenger compartments. The units are produced at Liebherr-Transportation Systems Marica EOOD in Tsaratsovo/Plovdiv, Bulgaria – Liebherr's centre of excellence for manufacturing HVAC systems. Propane is a climate-friendly alternative to conventional refrigerants, providing reliable, lowmaintenance HVAC solutions with minimal downtime. This helps Liebherr support sustainable mobility in rail transport.

Aerospace Liebherr supplies next-generation flight control computers to Airbus

Liebherr-Aerospace has been commissioned by Airbus to supply two new integrated next-generation flight control computers for the A320 family. These innovative devices, developed and manufactured at the sites in Lindenberg and Lindau in Germany, meet the highest safety standards and ensure greater operational reliability. They support future functions and help reduce pilot workload. The contract was secured thanks to Liebherr's clear focus on research and development of highly integrated solutions for high-performance and multicore control computers. Liebherr-Aerospace Lindenberg GmbH is Liebherr's centre of excellence for flight control systems, landing gear, gearboxes, electronics and software. Liebherr-Electronics and Drives GmbH is the specialist for developing and manufacturing electronic hardware. Together they provide the expertise in electronic systems for the flight control computers from a single source.



Short profile The Liebherr Group

Founded in 1949 by Hans Liebherr, today, the Liebherr Group includes over 150 companies on all continents and employs over 50,000 people.

The Liebherr Group is a family-run technology company with a highly diversified product programme. Not only is the company one of the largest manufacturers of construction equipment in the world; it also provides high-quality and user-oriented products and services in a wide range of areas. The holding company of the Liebherr Group is Liebherr-International AG, whose registered office is in Bulle, Switzerland. All of its shareholders are members of the Liebherr family. For the company, long-term success, sustainable development, stability and reliability are what count.

Liebherr is a pioneer. It is with this pioneering spirit that the company makes a decisive contribution to the history of technology in many industries and already dedicates itself today to challenges that customers will face tomorrow. The Liebherr Group develops and manufactures an enormous variety of fascinating products, which have made their mark on global markets on account of their high precision, excellent implementation and longevity. The understanding of key technologies allows the company to also offer its customers customised solutions – the highest quality standards apply here and, at Liebherr, the focus is always on customer satisfaction.

To this day, employees around the world share the courage of the company's founder to tread previously unknown paths, and to achieve goals that at first seem unimaginable. They all share a passion for technology and exciting products, as well as a determination to provide excellent solutions for their customers and constantly redefine the limits of what is possible. Working together on these fascinating tasks creates a strong bond that Liebherr's employees can rely on – beyond national borders and continents.



Main locations of the Liebherr companies



Find out more about the Liebherr Group in the annual report

Little hands, big future

From the limitless imagination of our employees' children come the fantastical designs of tomorrow's technologies. Regardless of age, creative ideas spring from curiosity, the freedom to explore, our surroundings, stories and dreams – all driven by an innate desire to understand and proactively shape the world. Inspired by Liebherr – big and small.



Johanna, 4 years old



Timo, 8 years old, sieve loader with wind power

Emil, 6 years old



Nicolai, 5 years old, rainbow construction machinery



Tim, 5 years old, rocket construction machine on Mars with excavator shovel and drill



Henrik, 6 years old



Franziska, 6 years old, Sissi Liebherr



Greta, 9 years old, jet-crane excavator LR 179



Theo, 6 years old





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