Bauma Magazine

2022

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LIEBHERR

The innovative path to an environmentally friendly future **p. 12**
Intelligent, connected, automated: our future-oriented technologies **p. 31**
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On your side

The active shareholders of the Liebherr Group (f. l. t. r.):
Jan Liebherr, Stéfanie Wohlfarth, Sophie Albrecht, Philipp Liebherr, Patricia Rüf, Johanna Platt, Isolde Liebherr, Willi Liebherr

Bauma 2022 On your site

Dear guests,

Welcome to Liebherr at Bauma 2022. As a technology company, we are pleased that we can once again present our innovative products and solutions to the global public during these seven days here in Munich. Even though the forecasts of the economic research institutes are less positive than they were some time ago and we are operating in a challenging environment, we at Liebherr are confident.

Our exhibition motto this year is “On your site”. An all the more fitting motto, as we can now look forward to personal contact and dialogue with our customers, partners and business associates from around the world again after the pandemic-related restrictions of the past years. The pandemic has shown us a lot of potential for digital communication. However, this does not replace personal contact with you and experiencing our more than 100 exhibits from the areas of construction machines, cranes, material handling, mining and components. Our presence with various exhibition booths covering a total area of more than 14,000 square metres and displaying numerous world firsts reflects our innovative capacity and the consistently high investment in research and development. At the same time, it also makes clear that we expect Bauma to once again provide valuable impulses for the industries in which we are active.

“On your site”, however, means for us that we are not only at your side during the exhibition, but always and everywhere: Whether on the construction site with our efficient machines or with our individual advice, services and comprehensive solutions. In this way, we also have concepts for the construction site of the future, which we would like to present to you in greater detail in this magazine. What is particularly noteworthy here is that we are not focussing on just one technology to reduce emissions. At the Liebherr Group, we are instead pursuing an approach that is open to different technologies. You can find details on this in our special feature on alternative drives, in which we would also like to introduce you to various exciting uses of our products. In a second major special feature, we devote ourselves to the digitalisation of our industries. Read here, for example, how we accompany our customers along the entire value chain or how our digital solutions are preparing the intelligent construction sites and mines of tomorrow.

Our declared goal remains to support our customers and partners to the best of our ability, all true to the motto: On your site. We hope you enjoy reading our Bauma Magazine 2022.

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

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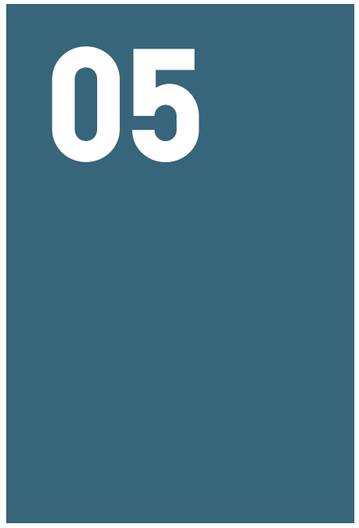


The Liebherr Group

Liebherr on your site – then and now

In 1949, Hans Liebherr presented his first mobile tower crane at the Frankfurt Autumn Trade Fair – but the presentation was quite a disappointment for the company founder. “After the exhibition, I could have actually stopped my crane production,” he commented. Instead of giving up, Hans Liebherr fought his way through, and thanks to his determination and entrepreneurship, turned what was then still a small construction company into a leading global manufacturer that helped shape technological progress in many industries. All his perseverance has paid off. At the Bauma in 1956, Liebherr was already able to exhibit other machines, including Europe’s first hydraulic excavator, a wide range of construction cranes as well as products from the area of concrete technology. This Bauma marked the beginning of a success story. Over the years, 30 more Baumas followed with visitors from all over the world. At first, the exhibition received around 8,000 visitors. Today there are almost 80 times as many. And Liebherr’s exhibition booth has also grown steadily. With his down-to-earth manner, Hans Liebherr always took great interest in the needs of his customers. We have upheld this principle to this day, and will continue to embody it in the future, in line with the motto of our company founder:

> ***“We can only be satisfied when our customers are satisfied too.”***
>
> **Dr.-Ing. h. c. Hans Liebherr**
> Founder of the Liebherr Group

A journey through time over the Bauma years

Trend-setting prototype
Everything started back then with serial number 181001. In 1979, it was assigned to the prototype of Liebherr’s first duty cycle crawler crane, the forefather of Nenzing’s construction machines production. Previously, only ship cranes had been built there. The operating weight of the excavator was 80 t and the dragline bucket could hold up to 3.5 m³ of material. In dragline operation, the boom had a maximum length of 30 m. This first model was in daily use for four decades. Over the next decades, the HS 870 was followed by a large number of construction machines from Nenzing. In 2020, 40 years after the first duty cycle crawler crane was built, Liebherr unveiled the new, state-of-the-art HS 8070.1 with an operating weight of 72 t. The boom length is 29 m (in dragline mode) and the dragline bucket has a capacity of 3.8 m³. The compact machine has a lifting capacity of 70 t and is the first choice for a broad range of applications, including material handling, deep foundation and lifting work. It represents the all-round qualities of Liebherr’s HS series and features improved safety, simple operation and superb driver comfort.

Start of a success story
The first two Liebherr wheel loaders were built in the 1950s, but still had some “teething problems” at that time. By contrast, the third Liebherr wheel loader, which was developed and built from 1962, was robust and reliable. With a weight of approximately 10 t, the LSL 1500 had a 108 hp diesel engine and a bucket volume of 1.5 m³. In its day, this wheel loader was a state-of-the-art, technical milestone and was exhibited at Bauma 1963.

Since then, standards have changed. The L 526 is a representative of the new 8th generation of medium-sized wheel loaders. Its dimensions are similar to those of the historic LSL 1500, but it outscores the older model by far with its excellent performance and state-of-the-art technology. This includes, for example, the new lift arm featuring a z-bar linkage, the comfortable operator’s cab and innovative assistance systems such as active personnel detection and a brake assistant.

Aiming high
As we know, everything at Liebherr started with cranes. In 1949, Hans Liebherr invented Europe’s first mobile tower crane, laying the foundation for the company’s decades-long success story. At Bauma 1969, Liebherr presented several successor models, including the then newly released 50 HC, the first representative of the still extremely successful HC series.

A lot has happened since Bauma 1969. For example, fibre rope technology has found its way into Liebherr top-slewing cranes. At Bauma 2022, Liebherr will be presenting a new large crane, the 1188 EC-H 40 Fibre, which features an outstanding jib head lifting capacity. It is the first high-top crane to be fitted with high-tensile fibre rope and is Liebherr’s most powerful series production crane currently available.

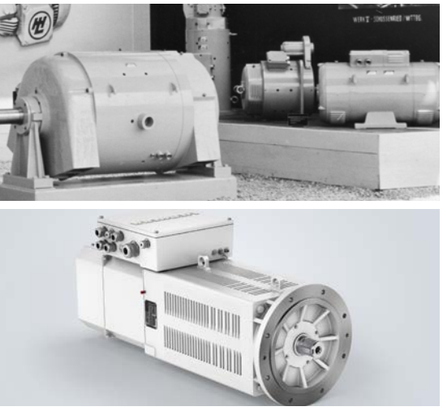
Heavyweight champions
The Liebherr R 991 was a 160-tonne excavator that was introduced in 1976, only two years after the production of Liebherr’s very first mining excavator, which had an operating weight of merely 66 t. The R 991 ran on two 6-cylinder diesel engines. The excavator’s bucket had a capacity of 4.50–5.50 m³ in backhoe bucket configuration.

Decades later, Liebherr introduced the R 9200, a mining excavator with an operating weight of 205 t. It was first unveiled at Bauma 2016. The bucket has a capacity of 12.50 m³ in both backhoe and bottom dump shovel configuration, meaning its size has doubled in comparison to the R 991, while the operating weight is almost equal. The R 9200 comes with a powerful 810 kW

engine but is also available with an electric motor. Its many assistance systems and advanced technologies make it a state-of-the-art mining excavator. The R 9200 is designed to match mining trucks with payloads of up to 140 t and is fitted with the Liebherr advanced bucket and GET solution. It can also be equipped with the Bucket Filling and Truck Loading Assistants and provides service staff with on-board diagnostics, giving them an overview of performance, operating time, and fuel efficiency.

Mobile worldwide
In 1980, the LT 1200, the most powerful Liebherr telescopic crane at the time, came onto the market with a maximum lifting capacity of 200 t. In addition, it had a 55-metre telescopic boom and could achieve lifting heights of up to 92 m with a lattice jib.

At the time, the LT road crane series was being converted into all-terrain LTM cranes, as LT cranes were able to operate on the road, but less well in construction site terrain – the turning radii were too large and the tyres too small. All this is now a thing of the past. Today's most powerful 8-axle, the LTM 1650-8.1, has a maximum lifting capacity of 700 t and is ideally equipped for driving on almost any terrain. Its telescopic boom is optionally 54 or 80 m long and can achieve a lifting height of 152 m with lattice extensions.



Everything runs smoothly
The Liebherr electric machine was presented at an exhibition for the first time in 1958. This special machine was used in dredgers and had an output of 140 kW.

Today's electric motors from Liebherr require a significantly smaller installation space while maintaining the same power. Increases in performance and effectiveness have been achieved over the decades with more efficient materials and ever better manufacturing methods. Optimised insulation systems and resins as well as winding and cooling methods ensure that the motors are far more heat-resistant, for example. Liebherr's current squirrel cage motors are high-performance machines (7.5 to 160 kW) for use in construction machines, ship and harbour cranes as well as other applications.

The mixture makes the difference
A Betomix 30 in star silo design was exhibited on the Liebherr exhibition booth at Bauma 1969 on the Theresienwiese in Munich. It was showcased to the public for the first time as a novelty. The truck mixers of the first generation (HTM 601/701, recognisable by the angular feed hopper) were also presented to the world here for the first time, as production of the truck mixers began in 1967/68.

Continuous further development has made Liebherr's mixing plants more and more innovative and efficient. In 2022, the new edition of the Betomix 2.5 will be on show at Bauma. The modular structure of the new Betomix and Mobilmix mixing plant series allows them to be optimally adapted to all customer requirements. Transport and assembly are quick and easy, and a wide range of optional accessories can be integrated without additional expense.

7 things you should not miss from Liebherr at Bauma

This year Liebherr is once again one of the largest exhibitors at Bauma. To make sure you don't miss anything, we have summarised seven highlights that you should see during your visit to the Liebherr booth.

1 Visit attractions at the Liebherr square
Visitors can marvel at some of the highlight exhibits at the Liebherr square: demonstrations of the product areas mining, material handling machines and crawler cranes take place here several times a day.

2 Sign the „On your site" guestbook
"On your site" is Liebherr's Bauma motto this year and you are part of it! Leave us a greeting on our three-dimensional guestbook. The large letters are hard to miss! All you have to do is choose one of the colourful pens and then leave your mark with your name. By the way, our giant guest books will find a new home at various Liebherr sites after Bauma.

3 Attend a machine show
See Liebherr machines in action – and your heart will beat faster. In live shows that take place several times a day, guests can gain insights into Liebherr's work in the field of alternative drives for earthmoving and material handling machines. Digital solutions for operator assistance, construction site communication and automated data exchange are another focal point.

4 Take a souvenir picture in the photo box
Want to beam yourself onto a construction site or take a group picture with cranes, construction- and mining machines? This is possible in the Liebherr photo box. Here you can choose your favourites from various backgrounds. Then pose in front of the camera and your special Bauma photo souvenir is ready. Well then, cheese!

5 Discover alternative drive concepts in the InnovationLab
How will the construction machines of tomorrow be powered? Liebherr addresses this question in its InnovationLab. The focus is on alternative drive concepts – from electric or hydrogen drives to new fuels. Liebherr is already working on the most diverse drive concepts that are available today and in the near future and is pursuing an approach that is open to technology. You can experience this and much more in the InnovationLab at Liebherr's main booth.

6 Buy a souvenir in the Liebherr-Shop
It's not Bauma without a special souvenir. Our tip? In the Liebherr-Shop you will find everything your heart desires: from key rings to Liebherr T-shirts and caps to many of our newly released miniature models. So you can find the right Liebherr article for (almost) every wish and every budget. You will find the Liebherr-Shop at the Liebherr main booth in the outdoor area.

7 Review the day with the Liebherr video magazine
You want to experience even more Bauma after your visit? With our Liebherr video magazine, you can do just that. Join our host on their journey of discovery through the Liebherr world at the exhibition. A new episode with many exciting insights awaits you on the evening of each day of the exhibition. You can find the videos on the Liebherr Bauma website **www.liebherr-bauma.com** and of course on our YouTube and social media channels.

7 Highlights

From the Bauma booth to Liebherr

With the big machines, it’s the smaller details that count. Ricardo Dieing, among others, is responsible for ensuring that all components of the huge mobile and crawler cranes are capable of withstanding the loads and only lift the what they can handle.

Ricardo Dieing has been working as a civil engineer in the structural engineering department at Liebherr since October 2019. He can live his passion for technology and be up close when fascinating innovations are created. He has a very special connection to Bauma.

The fact that Ricardo Dieing now works in the structural engineering department at Liebherr in Ehingen is in some ways thanks to Bauma. As a trained civil engineer, he first found his way to Bauma and the Liebherr booth in 2019, where he happened to get into conversation with a member of the human resources department. A short time later, the latter sent him suitable job offers for his profile and Dieing applied to work at Liebherr-Werk Ehingen GmbH. With success – because just six months after Bauma he had his first day at work. “For me, Liebherr has always been an attractive employer with an exciting field of work,” explains Dieing. Already during his studies at Biberach University, he came into contact with the Group through a factory tour in Biberach. That laid the foundation for him to want to work at Liebherr later on. “Liebherr has a big presence in the construction sector. That’s why everyone knows Liebherr and would like to work here,” says Dieing.

Fascination with cranes

The fact that he chose the Ehingen site is partly due to his area of responsibility, but above all to his fascination with the huge dimensions of mobile and especially crawler cranes. As a civil engineer, Dieing can work directly on the product that will be used later on the construction site. In doing so, he has two main tasks. He calculates components and load charts. This ensures that the individual components of a mobile or crawler crane meet the demands placed on them, comply with the load capacities and that the cranes are not overloaded. Based on his calculations, the crane control system then automatically limits the load so that the crane does not exceed its load limit – a major responsibility for him and his colleagues. “With products of this size, there are enormous forces at work and we are talking about huge payloads that have to be moved,” Dieing explains. “But that’s also what makes my job so appealing to me.” What he appreciates most about his day-to-day work is the versatility and the fact that he can constantly develop himself. “I have many colleagues who are very experienced and have been working in crane statics for a long time,” he says. “I can still learn a lot from them, but at the same time I don’t miss out on the fun in between.” Dieing was gradually introduced to his tasks. First, he calculated components that were already very advanced or of which he already had similar templates. After that, he received components for which he himself was responsible from the beginning and for which no load cases had yet been specified. “You have to approach the task in a completely different way,” Dieing explains. “But I could always rely on my colleagues and managers, who always had an open ear for my questions.”

Close to the products

When he visits the Liebherr booth at Bauma this year, he can marvel at products that he himself has worked on. For example, he calculated components for the LR 1700-1.0 crawler crane erected in Munich. He also worked on the new LR 12500-1.0. Only its hook is on display at Bauma, as the crawler crane with its maximum load capacity of 2,500 tonnes and a jib length of up to 168 metres is too large to be erected at the exhibition. So this year everything has come full circle for Dieing at Bauma. His conclusion after about three years in Ehingen: “I have never regretted it for a day since I started at Liebherr.”

One Passion. Many Opportunities.

For more than 70 years, the name Liebherr has stood for innovative products and services, and we all have one thing in common: a passion for technology.

We are always on the lookout for talented people who can contribute their expertise and enthusiasm to the Liebherr Group in very different areas.

APPLY NOW! →

Alternative drives

On your side when it comes to new technologies

Innovative without blinkers

We live in transformative times, characterised by climate change, the shift away from fossil fuels and rapidly advancing digitisation. The innovations and drive systems that will lead into the future are a matter of concern for politicians, scientists and researchers – and especially for the manufacturers of construction machines. Jürgen Appel, head of technology coordination at Liebherr-International AG, on a technology-open approach, bundled competences and the not-always-easy search for the right solutions for different applications.

Jürgen Appel
Head of technology coordination
Liebherr-International AG

Mr Appel, we are living in unusual times, which today are often described as VUCA: Volatility, Uncertainty, Complexity and Ambiguity. How do you experience this at Liebherr and what challenges does this pose for technological development?

VUCA is impacting many areas of technological development. Climate change, digitisation and the globalisation of production and supply chains are defining the guidelines. Under these changed conditions, Liebherr's task is to modernise the drives of its construction machines in such a way that they produce significantly less CO_2 – across the entire product life cycle. At the same time, we have to keep pace with ever new legislative and regulatory requirements when it comes to selecting the right drives for the most diverse application scenarios of our machines.

What does this mean for the overall view of technology?

We definitely have to define them much more broadly than in the past. Just think of the digitisation of machines and their processes. Today, construction machines no longer only perform physical work, but also produce a large amount of data that makes life easier for users, but can also be used for further technological development and process optimisation. In addition, the data obtained also pave the way for completely new business models for our customers. All this shows that the development of construction machines and technologies today requires far more than just conventional engineering. It is more about bundling different competences and achieving a new level of quality in terms of development.

What does that mean, exactly?

Whereas in the past the focus was clearly on the product during development, today it is also a question of including environmental aspects and thinking about existing possibilities and impossibilities from the outset. It makes no sense, for example, to develop alternative drives based on renewable energies without taking into account their availability and the development of a corresponding infrastructure. In the end, our machines should also actually be able to work for our customers.

Why is attention only being shifted to alternative drives now? The fact that they would be in demand against the backdrop of climate change and the finite nature of fossil fuels is not an entirely new or surprising realisation.

This has mainly to do with the fact that fuel, above all diesel, was available everywhere as a means of propulsion and that engine technology was continuously developed with a view to reducing pollutants. Nevertheless, Liebherr has been working on alternative drive concepts for a long time and has various machines in its portfolio that are also powered purely from the mains. In the meantime, the political and legislative assessments, exacerbated by the supply bottlenecks in the wake of the war in Ukraine, have changed fundamentally. The end of fossil fuels is a done deal. In order to quickly arrive at independent and feasible alternatives in this scenario, we at Liebherr see this as confirmation of our efforts to continue not simply relying on just one factor, such as electric mobility, but looking at several different solutions in parallel.

How does Liebherr go about this?

Looking at sustainable CO_2-free or at least CO_2-neutral drives, there will not be a single, one-size-fits-all concept for every application covered by construction machines. A compact wheel loader in horticulture simply has different requirements than a 100-tonne crawler excavator for mining at 5,000 metres in the Andes. In other words, a whole host of very different competences are required to develop drive concepts.

Where do these competencies come from?

At Liebherr, we are very broadly positioned across our various product segments. The Liebherr family wanted to bundle this practical knowledge accumulated over many decades, create synergies and enable springboard innovations, when three years ago it brought together various future and development projects of its product segments in specially created, centrally coordinated groups of experts in its newly created Corporate Technology central unit.

How does such cooperation between experts from the different product segments work? Do they enjoy sharing and discussing their ideas?

There are no reservations at all. On the contrary. We were soon able to identify experts, who now meet regularly across all segments and exchange views on the upcoming future topics in a very intensive and motivated manner. It is in the nature of things that the individual product segments arrive at various solutions for different customers on similar topics, such as new digitally driven business models. The earth-moving product segment sets its priorities differently to our crane experts. However, if there are overarching issues, such as the equipment and use of battery-electric drives, it makes sense to bring together the individual competences available to us in each case. We have created our own competence centres at Liebherr for this purpose, such as the one in Biberach for batteries or the “Liebherr Digital Development Center” in Ulm.

And what do the product segments have to say about this form of centralisation?

They are aware of the advantages that result from this strategy for the company as a whole, but also directly for themselves. After all, the product segments are and will remain responsible for their respective products at Liebherr. They simply know the needs of their customers and target markets best. Thus, the bundling of cross-divisional competences is not at all about centrally prescribing which products are to be manufactured and how they should look. Rather, the competence centres start where a product segment reaches the limits of its expertise and wants to open up new possibilities for action in dialogue with others who are already further advanced at this point.

Can you give an example of this?

There are many examples on the technological side, such as batteries and charging infrastructure or in the broad field of hydrogen drives. The transfer of expertise at Liebherr has recently been particularly intensive and extremely successful on the regulatory side. Brexit had been hanging over the economic partners as a sword of Damocles since the 2016 vote, but when the time came on 1 January 2021, there was great uncertainty on both sides as to which rules would apply to whom and what would have to be observed administratively in the exchange of goods and commodities.

How were you able to meet this challenge at Liebherr?

All of our sites that supply equipment or components to the UK were faced with the question of which administrative and customs requirements had to be fulfilled overnight for the movement of goods when Brexit came into force. Because there was a lot of uncertainty and confusion on both sides of the border, we very soon set up an expert group. Together with lawyers, customs experts and logistics specialists, the expert group developed a company-wide Brexit guide within a short period of time, which now applies to all our sites. This means that not every single Liebherr subsidiary doing business with the UK has to clarify each time with experts what information has to be on the type plate according to the new regulations or what the obligatory “UK Declaration of Conformity” has to contain. This highly practical service has been very well received within the company.

How does such a concerted approach affect the development of alternative drives?

Before evaluating alternative drives, we first wanted to clarify the overall carbon footprint of construction machines. To this end, in collaboration with the economic advisor Frontier Economics we recently conducted a comprehensive life cycle analysis of the greenhouse gas emissions generated by typical construction machines. One and the same machine was equipped with different drive solutions and examined. This results showed that there is no superior, standard solution for selecting the right climate-neutral drives to be installed in construction machines. Again: Many roads lead to Rome. This is both confirmation and encouragement for the technology-open approach that Liebherr has chosen, in order to reduce emissions as efficiently as possible, depending on the machine and application, in an absolutely tailored and functional way.

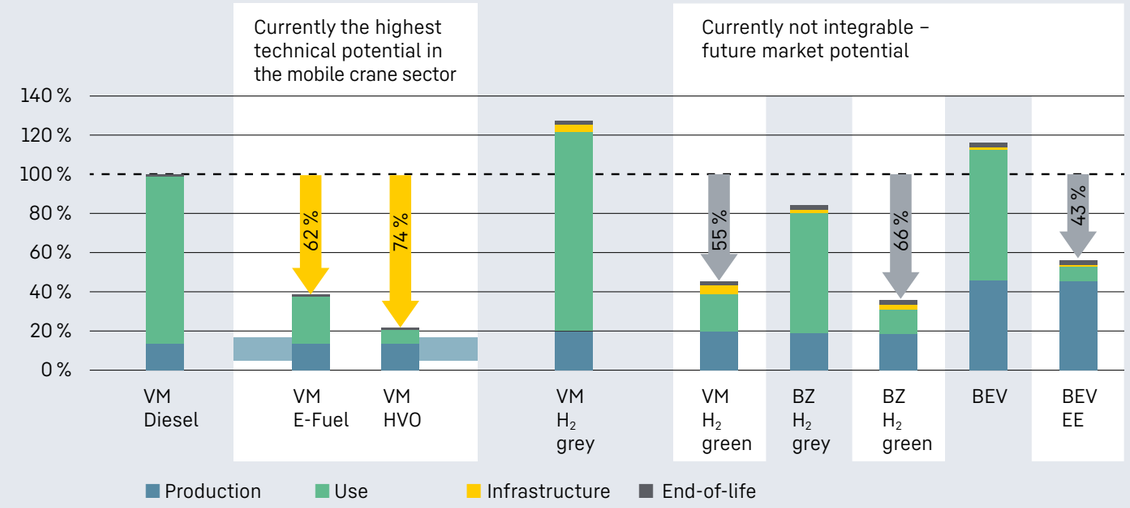
What does this mean for Liebherr’s culture of innovation?

Real innovation is not simply a box-ticking exercise. The study provides impressive evidence of this fact. At Liebherr, we have always been committed to open-ended research and development with a clear focus on the performance and cost-effectiveness of our machines. If necessary, we also involve partners who, for example as start-ups, are a little more agile and quicker than a large, globally operating group and can thus often contribute exciting impulses that lead to new solutions.

After all the experiences we have had so far: What do you personally think about a technology-open approach?

The Frontier Economics study proves how little sense it makes to align engineering with political or perhaps even ideological guidelines. Innovations must serve the user and not the other way round. That’s Liebherr-like. We will only achieve the targeted and necessary CO_2 reductions with a holistic view of the entire life cycle of a machine. This is not possible with technological blinkers. Instead, we need to focus on the fact that sustainable and climate-relevant innovations must ultimately be technologically representable in such a way that the customer can also work with them. I find it incredibly exciting and rewarding for everyone involved that there is not only one way to reach the goal.

Comparison of CO_2 emissions by various types of power units (using the LTM 1160-5.2 as an example)



VM = Internal combustion engine, BZ = Fuel cell and electric motor, BEV = Battey and electric motor, EE = Electricity from renewable sources

With the flow

Liebherr is testing a battery-powered wheel loader for its suitability for everyday use on an organic farm with a permanent camping site attached at the Wolfgangsee lake. Its technology and range of applications excite local people and animals alike.

The sun was shining brightly on this Wednesday morning in August. It bathes the mountains and meadows of the Salzkammergut district in its warm light, making the Wolfgangsee lake sparkle a Caribbean turquoise. On the south bank, in Farchen, there is a large farm that welcomes its visitors with a lime green sign: “Seegut EISL. Sheep’s cheese. Camping.”

Geraniums spill out of the flower boxes on the magnificent 500-year-old courtyard building. In front of the door, a small rooster with a loud voice is pecking away among the chickens. Nearby, a flock of sheep is grazing happily in the pasture. Towards the shore, there are a few caravans on a small campsite. The first early risers are greeting the morning. Almost unnoticed, a yellow wheel loader rolls along the gravel path with green cuttings in its shovel – with the whisper of an electric vehicle, as if it simply doesn’t want to disturb the lavish beauty of this idyllic nature and landscape.

The Eisl family is committed to ensuring that this picture perfect idyll can still be experienced tomorrow. For Sepp Eisl, sustainable agriculture, the strict use of renewable energies and the responsible use of natural resources are an essential part of generational responsibility. The family, now in its 22nd generation, has been farming here since 1490. And doing so in such a way that the farm will continue to feed the generations to come. “Our aim is to be grandchild-friendly. So my wife and I changed our farm from traditional dairy farming with cattle to sheep farming back in the 1980s,” explains Sepp Eisl. A bold step for a family with seven children.

“Dairy products from sheep were difficult to market at that time. We took the risk anyway, swam massively against the tide and were successful,” the farmer continues. At the same time, his eyes light up. Sepp Eisl likes to think about things in wider contexts and developed his “grandchild-friendly” concepts from this principle. Word soon spread. In 1997, Sepp Eisl received a call to the Salzburg provincial government, where he assumed responsibility as a provincial councillor – among other things for agriculture – for 16 years. “But there came a point when I just wanted to be a farmer again,” he says.

“Just a farmer” sounds very much like an understatement coming from Sepp Eisl, though. Because today, Seegut Eisl is a model company in terms of sustainability. Organic farming with more than 120 of its own sheep, its own renewable energy production with a photovoltaic installation of more than 1,000 square metres and a system for local heating

with wood chips and solar thermal energy, which, in addition to the farm and the campsite, also supplies the whole neighbourhood with hot water and domestic heating. In the meantime, all family and company vehicles are powered by electric drive systems – against the tide no longer. “Under your own power” is the motto on the farm estate today.

In front of the yard building, where the Seegut’s vans and cars are charged with green electricity at the chargers, the bright yellow work unit that is causing quite a stir at the yard is also “filling up”: a battery-electric wheel loader from Liebherr’s compact wheel loader segment. For almost three years, Seegut Eisl has been regularly participating in stages of a long-term test operation with a new, emission-free wheel loader drive concept that Liebherr is developing at its Bischofshofen plant. “The electric wheel loader perfectly suits our way of sheep dairy farming and the sustainable running of the campsite. Being able to carry out the work in the stables and on the campsite quietly and without any exhaust fumes is a real milestone,” Sepp Eisl adds. “And with no loss of performance compared to a diesel vehicle. On the contrary. The electric wheel loader has surprisingly high pulling power and playfully light, extremely sensitive controls for outstanding versatility in terms of application. Everyone likes working with it. This machine will definitely be part of our company in the future,” says Eisl.

Everyday life on the farm, with all its farm and production buildings, requires a high level of agility and dynamism from the working machines. “For us, everything on the farm revolves around quality. That’s where the multifunctional all-rounder scores. The electric wheel loader doesn’t need to warm up. The full performance capacity is available immediately, as soon as it starts,” Eisl explains. The compact lithium-ion battery supplies power both to the drive and to the working and steering hydraulics. “We manage with just one battery pack because on the farm, unlike in continuous use on a construction site, we can always quickly recharge during work breakes.”

> ***"The electric wheel loader has surprisingly high pulling power and smoothly running, extremely sensitive controls for absolute application versatility."***
>
> **Sepp Eisl**
> Farmer and owner of Seegut Eisl

Sepp Eisl is happy to contribute such practical experience to the gradual further development of the system. "During the field test, we set up a hotline to the Liebherr developers and technicians in Bischofshofen. If there are any questions or problems, the experts are here immediately," says Eisl. "We know and appreciate each other." He particularly likes the fact that "his" electric wheel loader has been developed from practical knowledge for practical use and refined step by step in this relationship of mutual trust. "We definitely want to be among the first when the electric wheel loader goes into series production and sales are launched about a year after the first major public presentation at Bauma."

The success of the battery-electric wheel loader is already certain for Sepp Eisl. This is guaranteed by the tried and tested features of Liebherr stereo loaders: the clear layout of the cab, the extremely manoeuvrable stereo steering with articulated pendulum joint and steered rear axle, as well as the the powerful lift mast, which can be used to move large loads and work with various attachments in the yard. Another factor is also of vital importance for Sepp Eisl: "For many children, including my grandchildren, our farm is like a big adventure playground. So I'm glad that Liebherr also attaches such great importance to safety. On the wheel loader we're testing, this is evident, for example, in the good visibility from the operator's cab and the reversing camera."

The operator's cab of the electric wheel loader offers a surprising degree of clarity, simple operation and comfort. The operator's seat, accelerator and brake pedals, steering wheel, a few switches, a touch display and a joystick – that's all. "After a brief introduction, almost all of our 20 employees can operate the electric wheel loader," says Sepp Eisl. "This is a real advantage for our jobs on the farm and campsite." The key to the simple, intuitive control of the wheel loader also lies in the software. "The touchscreen gives operators all the information they need for the tasks at hand, and they can operate the mast and attachment with the joystick very quickly, easily, sensitively and precisely. You don't have to be a digital expert to do that," the 58-year-old adds with a grin. "I belong to a generation that is better with mechanics. I want to be able to use and apply digital support, but I don't need to understand it down to the finest detail."

But now he has to get going. In the parking bay in front of the new farm shop, he wants to process another shovel of fine gravel. The wooden pavilion is nearing completion. The farm shop is part of the latest expansion stage of the Seegut. The shop is completely self-service, offering classic Seegut products such as sheep's cheese rolls, yoghurt, curd cheese and fruit whey, but also organic meat, oils and spices contributed by other farms in the area. And above all Eisl ice cream, with which the Seegut has been sweetening the summer for some time.

On a whim, Sepp Eisl reports, he added his own sheep's milk ice cream to the cheese production in 2017. "My son took an immediate liking to our experiments, did the relevant training and put out an exciting range." In addition to classics such as vanilla, strawberry and chocolate, the range includes artisan ice cream creations such as blueberry & rosemary, curd dumplings or coconut & physalis – and they have has been very well received. The Eisl ice cream business is flourishing. In Salzburg's old town, the Eisls now run Austria's first organic sheep's milk ice cream parlour. Customers include top restaurants and, using a sophisticated delivery system, online customers from all over Austria.

The ice cream is also a big seller in the farm shop. Some of the customers come from far away, so the small parking bay in front of the entrance also needs to look inviting. Sepp Eisl carefully tips the gravel out of the shovel and spreads it on the parking strip. Again and again, cyclists cross his path. Many of them are amazed at the surprisingly quiet and emission-free working machine on the side of the road and give an appreciative thumbs up. In no time at all, the parking bay is completely covered with gravel. The customers are now welcome to come. Sepp Eisl quickly puts up a small flag and sets up the board with today's specials. "Welcome to 'Cloud 9'". How lovely, just like this sunny day in August, at this very special place full of energy at lake Wolfgangsee.

Towards climate neutrality with HVO

Mobile cranes are a key player in climate change reversal, for example when building wind power plants or adapting infrastructure. With HVO fuel as a diesel alternative, they can also make their own contribution to climate neutrality, as the largest mobile crane rental company in the UK, Ainscough Crane Hire, has now impressively demonstrated.

Peter Gibbs
Chief executive officer
Ainscough Crane Hire Limited

When it comes to his conviction, Peter Gibbs can be very persistent. “That won’t work, it’s uneconomical and just a fanciful hope of some free spirits …” There was no lack of reservation and scepticism when, as CEO of the largest independent mobile crane hire company in the UK, he took a radical decision a year ago to convert the entire fleet of more than 400 mobile cranes to a green alternative to diesel. By adopting Hydrotreated Vegetable Oil (HVO), made from vegetable waste and utilised in much the same way as traditional diesel, Ainscough took a step into the unknown for the crane hire industry.

“The move away from fossil fuels is unavoidable for the energy transition. Legislators have already set the course for this, both nationally and internationally. ’With proof of delivery to reduce CO_2 now required, customers are placing more and more value on sustainability. The question therefore arises as to which technology path is most suitable for achieving the climate goals," explains Gibbs. “We didn’t want to wait and see what would happen, but rather find a solution that suits us, our tasks and our cranes. We don’t see climate protection as a restriction, but rather as an opportunity for our company, our employees and our customers.”

For Ainscough, HVO is the clear interim solution – a fuel that works like diesel, but uses purely vegetable energy from food waste, vegetable fats or vegetable waste instead of fossil energy. In the production process, the vegetable oil obtained is converted into hydrocarbons in a catalytic reaction with the addition of hydrogen, which can power an internal combustion engine and reduce CO_2 emissions by around 90 per cent. “The big advantage: diesel engines continue to function as before – but in a more climate-friendly way," explains Peter Gibbs. No adjustments are required on the crane. It is important that the infrastructure for the supply of HVO is built.

Alongside Liebherr’s trials, Ainscough conducted an operational trial of HVO in 2021, says Gibbs. “Following the success of this trial and in alignment with our values, in 2021 we decided to be demonstrably the first climate-neutral company in our industry by October 2023. This required us to take a holistic approach to the transition from the outset, converting our nationwide network of 30 sites with over 400 cranes and the UK’s largest heavy transport fleet to HVO.” This was completed for all operational equipment within the three months running up to April 2022.

Ainscough was helped by the fact that its fleet consists only of Liebherr mobile cranes. The two companies have worked together closely since as early as 2006. That’s how Peter Gibbs knew he would have a “reliable and proactive partner” in Liebherr regarding all the technical and infrastructural adjustments associated with HVO. And vice versa, says the tech-savvy CEO: “Our 70 Ainscough engineers have long since also become proven Liebherr experts with comprehensive system knowledge. This immediately brings a safe, reliable, high-quality and environmentally friendly service offering to our customers.”

As very heavy equipment, mobile cranes are amongst the highest CO_2 emitters on a construction site. The dimensions of such a crane alone make this obvious. The LTM 1230-5.1, the latest addition to the Ainscough fleet, has five axles, a 75-metre telescopic arm and a lifting capacity of up to 230 tonnes. It, too, now runs on HVO.

“Liebherr has always been very proactive and cooperative in identifying and developing solutions to reduce emissions, for example in single-engine technology, tyre pressure monitoring or the display of operating conditions on the LICCON monitor. When switching to HVO, it really helped us that Liebherr had already tested this fuel extensively and was able to contribute very meaningful documentation for our decision-making process. Liebherr played a real pioneering role here and made a difference,” says Gibbs.

“Another decisive factor for the success of our game-changing project was Liebherr’s readiness to get involved in the cooperation and invest time and money themselves to get the HVO solutions ready for the market. Liebherr is very much in line with our own corporate values, making it the partner of choice.”

The availability and production capacities of HVO are still limited, and there is always concern that biofuels will unintentionally begin competing with food if not only vegetable waste is used. Currently there are no UK-based refineries. “We source the fuel from a dedicated ‘Green HVO’ supplier who guarantees via independent auditing that we only use HVO from renewable sources," Gibbs emphasises. On this basis, Ainscough has now converted all its crane and truck filling stations from diesel to HVO, creating an HVO network of 30 sites – the first in the UK. This also arouses interest among customers.

“We have already had enquiries as to whether and how our UK HVO network could also cover their other fuel needs in the future.”

For Peter Gibbs, all this is both a confirmation and a demand for Ainscough to always be one step ahead. It’s fitting that the first major goal was achieved ahead of schedule. “In April 2022, the company were proud to announce a 96 per cent reduction (year on year) in CO_2 through HVO and some additional measures which, combined with a small compensation package, has enabled us to become the first national crane business in the world to achieve a 100 per cent carbon-neutral run rate. Persistence has paid off and is future-proofing our business.”

Striking the right tone

No exhaust fumes and only little noise on the construction site: More and more crawler cranes and deep foundation machines from Nenzing are being made available as unplugged versions. That means they can be used wirelessly with a battery – and that with the same power as with a conventional drive. Michael Flecker, head of sales crawler cranes, and Sascha Bechter, head of sales deep foundation machines and material handling equipment, know why both types of drive complement each other perfectly and why each has its own justification.

It might be said that Michael Flecker grew up with Liebherr crawler cranes. At the very least, they have had a massive influence on his professional life. He first came into contact with crawler cranes in 2005 when he started his career at Liebherr as an international fitter – and has remained loyal to them ever since. Since April 2022, the Vorarlberg native has been head of sales crawler cranes in Nenzing.

Flecker has previously seen a lot of the world and was, among other things, customer service manager at Liebherr USA in Houston for several years. There he helped to build up the crawler crane segment and continuously developed it with feedback from customers.
He was also up close when the first unplugged crawler cranes came onto the market at the end of 2020. The Liebherr unplugged machines were launched in 2019 with the LB 16 unplugged drilling rig – the world's first battery-powered drilling rig.

> ***"Five unplugged machines are as loud as one diesel-powered machine."***
>
> **Michael Flecker**
> Head of sales crawler cranes

There are now a total of nine models coming from Nenzing that are also available as unplugged versions.

"Demand for electric construction machines is particularly high among customers in northern Europe – led by the Scandinavian countries and Great Britain, which are pioneers in the field of zero emissions," Flecker explains. In the meantime, Liebherr unplugged machines are available in many other countries, for instance Germany, France and the USA. Cities such as Oslo, for example, have clearly defined climate targets. By 2030, CO_2 emissions there are to be reduced by 95 per cent compared with 2009 levels. This means that as early as 2025, only emission-free construction machinery will be used in urban areas.

Sascha Bechter (left) and Michael Flecker (right)

A clear advantage of the unplugged series is that the battery-powered units do not cause CO_2 emissions on the construction site. In addition, they are very quiet and therefore ideal for urban areas – an advantage for both residents and construction site workers. "Five unplugged machines are as loud as one diesel-powered machine," Flecker explains. The battery-powered machines achieve the same performance as the diesel versions and are identical in their operation. Another advantage of Liebherr products is the complete package of drive concept and machine, because unlike its competitors, Liebherr offers both from a single source.

The unplugged series also strikes the right tone with new customers. "Many customers choose our battery-powered machines because they believe in the technology and want to be the first to use it in their market," explains Flecker. "In some countries, this is actually a distinct competitive advantage."

> ***"Together with the customer, we decide individually which drive technology is right for the customer, the construction site and the application."***
>
> **Sascha Bechter**
> Head of sales deep foundation machines and material handling equipment

However, even though unplugged construction machines have many advantages, they are not best suited for every use or application. That's why all unplugged units in Nenzing remain available with conventional drives. "Together with the customer, we decide individually which drive technology is right for the customer, the construction site and the application," adds Sascha Bechter, head of sales deep foundation machines and material handling equipment. The 48-year-old is a true Liebherr veteran. He started his career at Liebherr more than 30 years ago as an operational electrician in Nenzing, before being drawn to Liebherr's international companies for many years. Whether in the USA, Great Britain, Italy or Singapore: "I have never worked for any company other than Liebherr," says Bechter.

That's why he knows Liebherr construction machines and their applications in the field particularly well – and can judge which drive type suits which customer. Construction sites in rural or remote areas, for example, are typical applications where conventional drives are more suitable. This is because these places do not usually have the infrastructure needed for electric machines. Diesel-powered machines are sometimes also more suitable in the early stages of a construction project or for short-term assignments, because the necessary charging infrastructure for the electric motors is often not available when a construction site is first set up. Flecker and Bechter agree that all types of drive have their justification. That's why Liebherr takes an approach that is open to technology, where every customer gets what is best suited to them and their construction site.

2019

With the LB 16 unplugged, Liebherr introduces the world's first large drilling rig with a battery-electric drive.

2020

World première: Liebherr launches the first battery-powered crawler cranes, the LR 1200.1 unplugged and LR 1250.1 unplugged.

2022

Another product area from Nenzing is electrified with the LRH 200 unplugged and LRH 100.1 unplugged piling rigs.

Giants under power

When it comes to reducing CO_2 emissions, the mining giants are also joining in. With their own power supply concept, Liebherr's heaviest mining trucks are now driving ahead with full electric power to reduce fuel consumption and lower emissions.

Standing in front of Liebherr's gigantic T 284 dump truck makes you feel tiny. This giant is eight metres high and can transport an impressive up to 375 tonnes of material. In Panama, the mining company First Quantum Minerals has as many as 38 of them in use. Here's the twist: these ultra-class giants are literally connected to the electrical network. With the help of Liebherr's innovative Trolley Assist System, they can drive without using diesel under certain conditions. The Trolley Assist System uses onboard pantographs to connect the trucks' drive system to overhead power lines on uphill haulage segments. These overhead lines stretch across the ramps between the digging and dumping zones. This not only saves fuel and reduces CO_2 emissions – the electric drive also increases productivity and thus the operating result.

The Liebherr Trolley Assist System is already in use in several mines around the world and the results are impressive. The example of the T 284 mining trucks shows that the loaded trucks go uphill at 25 kilometres per hour thanks to electrification which is almost two times faster than the standard version. Above all, the main goal of the Trolley Assist System is convincingly achieved: fuel consumption on the trolley segment can be decreased by up to 90 per cent.

"Currently direct electrification offers the greatest potential for reducing greenhouse gas emissions. It can also be achieved the fastest. For this reason, we have focused on the grid electrification of our entire range of dump trucks and excavators," explains Oliver Weiss, executive vice president R&D of Liebherr-Mining Equipment SAS.

That is why Liebherr Mining now offers a complete portfolio of low-CO_2 solutions for its fleet as part of its Zero Emission Program. In addition to the Trolley Assist System for mining trucks, all mining truck and excavator types are available with electric drive, with Liebherr also having developed its own cable reeler system for excavators. The electrification of Liebherr's entire mining range has been tested in practice and the results show a significant reduction in greenhouse gas emissions.

Fortescue Metals Group, a globally active mining company, recently announced a partnership with Liebherr. This partnership will see Liebherr integrate the zero emission drive systems developed by Fortescue Future Industries and Williams Advanced Engineering into the T 264 mining truck.

After a two-year joint development period, the climate-friendly giants will be ready for series production and delivery. Fortescue also sees the partnership as an important basis for achieving net zero emissions in its own company by 2030.

Oliver Weiss explains: "This project provides us with an excellent opportunity to accelerate the integration of alternative drive systems into our mining machines powered by clean energy. This supports our vision and strategy to offer zero emission machines with the most suitable drive technologies in the future. Along the way, we will support our customers in choosing the technology options from our wide range of products that are most suitable to them."

Oliver Weiss
Executive vice president R&D
Liebherr-Mining Equipment SAS

One of these technology options includes reducing greenhouse gas emissions by running combustion engines on renewable fuels. Thus, the drive with Hydrotreated Vegetable Oil (HVO) is now also available for most of Liebherr Mining's machines. Liebherr is working on the modularity of its large combustion engines for alternative fuels. Hydrogen, ammonia and methanol combustion processes are under development and will only be offered in series production depending on market demand.

Liebherr is also working on further climate-friendly developments for the mining industry with strategic partnerships. The cooperation with ENGIE is intended to improve the understanding of the entire energy value chain (well to wheel) of green hydrogen and the derivative fuels based on it in order to propose customers the best suited solution for their application to be able to advise customers about infrastructure requirements to set up Trolley systems, Liebherr is also working together with different Trolley infrastructure providers.

These partnerships are crucial to achieve zero emissions in the future. "We will offer proven solutions for all our mining machines that work completely without fossil fuels by 2030 at the latest," Oliver Weiss announces. "We are looking into ways of equipping our mining excavators, trucks, and dozers with various drive technologies. Depending on the type of machine and the application, this could include battery drive modules, H_2 fuel cell drive modules, or combustion engines with several other renewable fuel solutions."

Liebherr Mining aims to be able to make some of these innovations available to the wider industry as early as 2026. The heavyweights in the demanding mining industry will remain an exciting and spectacular topic, with further important milestones paving the way towards a sustainable future.

Construction site electricity from the powerbank

Electricity is becoming mobile. To work on construction sites without generating unwanted emissions, Liebherr uses the Liduro Power Port (LPO) to deploy the energy source exactly there where it is needed. This innovation is opening up entirely new perspectives for sustainable electrification on construction sites.

Navigating your way through an unknown city with your mobile phone is a fine thing. You don't need a city map and it's a good way to reliably avoid any traffic jams – at least as long as your battery holds out. When the battery sign lights up bright red, you really appreciate being able to recharge it quickly with your powerbank and thus reach your destination on schedule.

This type of forward-looking energy management is also increasingly becoming the focus of companies that plan and operate construction sites. This is particularly the case when it comes to "local zero emissions", which legislators and society are increasingly demanding for building projects in inner-city or ecologically sensitive areas. The electrification of the drive systems of even the heaviest construction machines such as crawler excavators, concrete mixers or mobile cranes is technologically well advanced. Whether and to what extent such all-electric or hybrid devices can be used depends, however, on a secure and, above all, continuous supply of energy. But electricity and power grids are not always available everywhere, for example when building bridges, tunnels or on construction sites in more rural areas, such as when erecting wind farms far away from housing developments.

Claus von Reibnitz
Managing director
Liebherr-Elektronik GmbH

Ulrich Geier
Manager electrical drive and control technology
Liebherr-Components Biberach GmbH

"Electricity is needed everywhere and at all times on an emission-free construction site: for mobile or fast-erecting cranes, for excavators or wheel loaders and also for on-site lighting or the computers and refrigerators in the construction site container," says Ulrich Geier, head of the electrical drive and control technology business unit in Biberach. Together with Claus von Reibnitz, managing director of Liebherr-Elektronik GmbH in Lindau, he has helped drive the development of the LPO energy storage system over the past two years. "However, because not all construction sites have a corresponding power supply and high-performance lines, we at Liebherr decided to look for our own ways of transporting electricity in high energy density to construction sites ourselves." Thus, machines with different power ranges and load peaks can be supplied with mobile power directly on-site with the LPO – or an existing power grid with too little capacity can also be supplemented.

When using fully electric or hybrid construction machines and their accompanying infrastructure, high load peaks and/or prolonged periods of very low power demand are common – such as for lighting or powering small pieces of equipment. "The mobile energy storage system supplies the required power at any time according to demand and without surplus, i.e. with an optimal price-performance ratio," explains Ulrich Geier. Compared to a diesel generator, which also requires fuel when no consumers are connected, the LPO delivers power with a significantly higher level of efficiency – especially at low loads – and without idle phases.

The MK 140 mobile construction crane achieves dimensions in terms of energy density that were previously only possible for equipment in higher axle classes, making the MK 140 the perfect reference crane when it comes to electrical power supply and energy management.

Available as of 2024
"The series product will be available as of 2024 in various power ranges with up to 130 kilowatts/kilowatts per hour," Claus von Reibnitz announces. LPOs can then be charged with 3 kilowatts (single-phase) up to 22 kilowatts (three-phase, AC) and deliver power to consumers via multiple, simultaneously usable connections – graded from 16 (single-/three-phase) to 125 amperes (three-phase). The advantage for users: when connected to a mains supply, the LPO can be charged and discharged simultaneously. Energy and status can be monitored via the local control system and also via a digital app available for smartphones and tablets.

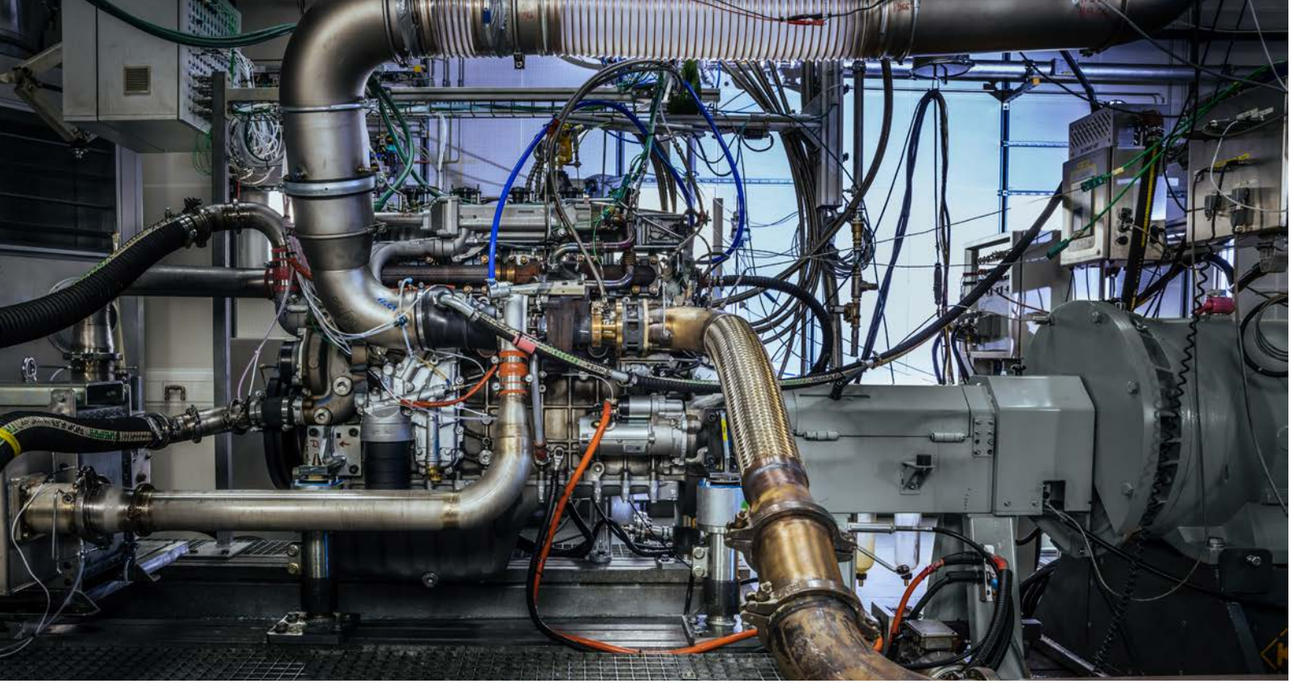
"Ease of use was just as important to us as the ability to transport the energy storage units without complications," Ulrich Geier emphasises. "Charging must be able to be done intuitively, without the need for specially trained electricians on-site." The user-friendly "plug & play" design of the LPO was feasible because at Liebherr nearly all competences within the company could be combined and perfectly complemented one another during development, including the switchgear, power electronics, converters, equipment, plant construction and service.

"In order to utilise as many synergies and existing proven components as possible, the LPO is based on lithium-ion technology, which is also predominantly used throughout the Liebherr Group," explains Claus von Reibnitz. "At the Liebherr Battery Competence Center, we developed the LI-ION battery system to great maturity. It has already proven itself in countless variants at both Liebherr and its customers. Being able to build on this at any time has proved to be a great advantage when developing the LPO".

The presentation of the LPO demonstrator, Claus von Reibnitz and Ulrich Geier emphasise, is not the finale, but an important interim stage of development. "We are not there yet. The feedback from the market will continue to guide us towards series production."

Perfect reference crane for electrical energy management
An MK 140 gets into position on Liebherr's test site in Biberach. Liebherr's mobile construction crane, a compact 5-axle model, is powered electrically when the crane is being operated. With its load capacity and boom length, the MK 140 has achieved dimensions in terms of performance that were previously only possible for equipment in higher axle classes. Due to its overall electrical concept, it can be operated with an integrated diesel generator or with external power and is therefore able to spontaneously call up its power as required during on-site use. This makes the MK 140 the perfect reference crane when it comes to electrical power supply and energy management.

On the test site, the crane has just placed a futuristic-looking 2.50-metre-long, 1.25-metre-wide and almost one-metre-high box near it. The 1.7-tonne, Lego-like Liebherr machine bears the inscription "LPO 80". After a while, the crane operator drives up and plugs in the 63-ampere power cable to the side of the mobile construction crane, which can now be operated locally and with zero emissions. The LPO 80 energy storage system tested in Biberach was designed and developed by Liebherr's electronics experts in Lindau together with their colleagues from the systems engineering department in Biberach. As a result, a mobile demonstration model was built in just 12 months in cooperation with Sigg Fahrzeugbau GmbH from Bad Wurzach and will make its first public appearance at Bauma 2022.



CO_2-free drive in off-road use

Construction sites at high altitudes, dusty air, strong shocks and vibrations push electrically powered construction machines and cranes to their limits. This is where hydrogen internal combustion engines (ICE) make it possible to work without CO_2 and achieve goals in line with the EU's commitment to global climate action under the Paris Agreement – even for heavy-duty applications. At Bauma 2022, Liebherr's latest hydrogen engine celebrates its world premiere in the R 9XX H_2 crawler excavator.

Hydrogen is a very special type of fuel: It is the most abundant chemical element in the universe, with a high energy density and is therefore a great hope on the road to reducing global carbon emissions. It is definitely worth a closer look. And that's exactly what the engine development team at Liebherr-Components is doing in the Swiss town of Bulle. At Test Bench 54 for diesel and H_2 engines, the team led by Dr Bouzid Seba, head of combustion engine pre-development, has carried out its latest project. It is a hydrogen ICE with direct H_2 injection, installed onto the test platform and connected to a tangle of cables, strings and hoses, which continuously send data on operating conditions, emissions and performance to the control station.

Hydrogen from renewable energy sources has long been seen as a beacon of hope for a climate-friendly, CO_2-neutral energy supply. “Again and again, hydrogen seemed to be on the verge of a breakthrough as an infinite source of energy, only to disappear again into oblivion," explains Dr Seba. However, the tables have turned in the meantime, which has led to a reassessment in the politics and especially in the construction machinery market. “Wherever batteries or fuel cells reach their limits, hydrogen ICEs can be the solution. This is primarily the case in applications where the engine is exposed to strong vibrations or where there is a lot of dust and dirt. This mainly concerns mobile construction machinery like crawler excavators, but also heavy-duty vehicles.”

The engine engineering team in Bulle is currently examining different injection and combustion technologies for hydrogen ICEs. Liebherr's decades of experience with diesel and gas engines boost the development: The mechanics, crankshafts, bearings and turbochargers do not have to be developed from scratch, a fact that greatly shortens the time prior to intensive field testing.

This becomes particularly obvious in the latest cooperation between Liebherr Machines Bulle SA and Liebherr-France SAS in Colmar for the development of the R 9XX H_2, a 50-tonne crawler excavator equipped with the hydrogen ICE. Henrik Weitze, project manager at Liebherr-France SAS, has worked closely with Dr Seba's team for many years. Weitze sees the newly designed hydrogen ICE for the R 9XX H_2 as predestined for use on construction sites at extremely high temperatures or under shocks and in particularly dust-intensive environments typical of earthmoving or quarries. “Like all our crawler excavators, the R 9XX H_2 with its alternative drive meets the highest quality standards under extreme conditions," explains Weitze. Keeping this in mind, the engineering team in Colmar designed the machine taking the latest, future-oriented crawler excavator Generation 8 as the basis. “The overall performance is in no way inferior to the diesel version, be it power output, engine dynamics or response during dynamic load changes," explains Henrik Weitze. The only difference is the refuelling process, special infrared communication between the excavator and the filling station makes it both fast and safe.

The hydrogen ICE developed for the R 9XX H_2 in Bulle is based on port fuel injection (PFI). “The accuracy and quantity of hydrogen injection is an essential requirement for heavy-duty ICEs," explains Dr Seba. “To align the performance of a H_2-engine to that of a diesel engine, the system has to be able to guarantee the different requirements in terms of flow and injection accuracy. Hydrogen gas has a low density, which requires large valve cross-sections in the injector. We were able to combine different components to control pressure and flow rates.”

Dr Bouzid Seba (left) and Henrik Weitze (right)

“The overall performance is in no way inferior to the diesel version, be it power output, engine dynamics or response during dynamic load changes.”

Henrik Weitze
Project manager

Following PFI, direct H_2 injection developed by Liebherr will be tested in terms of performance in particularly dynamic heavy-duty applications. “During our tests, we aim to gather large quantities of input data from the operating conditions of the H_2 engine," explains Dr Seba. On four monitors, the developers can follow the engine performance in real time and make adjustments and optimisations simultaneously. Thanks to digitalisation, the speed of development is significantly higher today than even a few years ago. “Before the engine even gets to the test bench, we can use simulations to evaluate it under different operating conditions and incorporate their effects into the engine architecture right away.”

Henrik Weitze thinks that Liebherr is on the right track towards making a relevant contribution to the climate goals. The “Green Deal”, with which the EU wishes to become climate-neutral by 2050, is also setting the course for the development team. As early as 2030, CO_2 emissions are to be reduced by at least 55 per cent as compared to 1990. Weitze is convinced: “That’s a tight deadline, but we will make it. Until then, it is important to never lose sight of the goal, even when things get tough along the way.” The engineering team in Bulle intends to start with the serial production of the H_2 engine by 2025.

Digitalising the construction industry

At your side when it comes to the future

The (r)evolution of the LICCON crane control system

The LTM 1110-5.2 and LTM 1100-5.3 will both be making their debut at Bauma. These five-axle all-terrain cranes are the first Liebherr mobile cranes to be launched with LICCON3, continuing the unique success story of LICCON crane control.

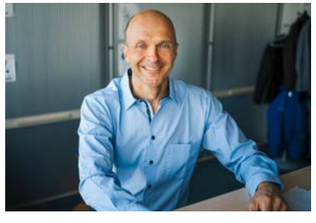
In the beginning there was card chaos
Order and clarity are basic requirements on a construction site. But about 45 years ago, the control of a crane was anything but simple, because at that time there was a wide range of hydraulic, electric and electronic controls. However,

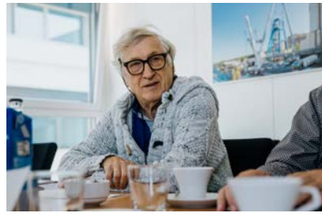
when electronics became more and more common in the operator's cab in the mid-80s, the consequences were thoroughly analogue. Plug-in cards were used to define the most important work steps – and new ones had to be developed for each new crane. Over time, there were around 100 plug-in cards for different functions. One crawler crane alone came up with up to 24 plug-in cards. Staying on top of things was an art in itself. For this reason, from 1985, Liebherr began to develop its own crane control system: the "Liebherr Computed Control", or LICCON for short. Everything should be centralised, simple and practical, without card chaos. The solution: a flexible control system with programmable digital plug-in cards that could easily be further developed in-house. Soon, only 20 plug-in cards controlled the entire range of cranes and with that, digital development took its course.

Think simple – the LICCON principle
When developing a programmable controller for complex tasks, Liebherr applies the principle: "Think simple!" In terms of hardware, the LICCON control system should only have three main components: a central unit with an exchangeable memory, a power supply unit with a memory and a monitor with operating unit. In the mid-80s, this idea was almost revolutionary considering the fact that the first PCs were only just coming onto the market at the time. At the same time, digital pioneers at Liebherr were already developing their own programming system with a simple PLC conversational language. Construction and administration now functioned using a generated parts list and a database. Connected to a commercial IT system, a straightforward exchange of data was now possible. What remained were two programmable plug-in cards and a display. There was no comparable system on the market. "We integrated hardware components into a control system whose logic we had designed and programmed ourselves," explains Erwin Morath, head of the control department at the time. "LICCON was thus unique and could not be copied by the competition." Series production began with the LTM 1120, which introduced the new LICCON control system at Bauma 1989.

Even more convenient operation
The development of new universal control units at the end of the 90s meant that all cranes could be standardised with shared components. They also formed the basis for the new LICCON2 control generation, which was introduced in 2007. This made cranes even more convenient to operate. Since then, the new BTT operating and display unit has made it possible to operate many work processes from the outside. With BTT, the crane is easily and safely rigged: Supporting, unhooking the hook block and mounting additional equipment – all this is now no problem with LICCON radio remote control. The only limiting factors: after some time, LICCON2 reached its first limits in terms of computer performance and memory.

Innovation as a permanent state
That is why Liebherr has continued developing and testing. The result: LICCON 3 – the next (r)evolution of Liebherr crane control. It is based on completely new software, a fast data bus, significantly more memory capacity and high computing power as well as improved security tools. These are all factors that run in the background but will revolutionise everyday work in practice in the long term. "The advances in microelectronics are immense. We'll stay on the ball and continue to develop our crane technology," explains Nikolaus Münch, head of the control department at Liebherr in Ehingen. "With LICCON3, we now have a solid and expandable technical platform on the basis of which innovation can become a permanent state. This is the foundation for a new generation of mobile cranes – which we are heralding with the LTM 1100-5.3 and the LTM 1110-5.2."


Nikolaus Münch


Erwin Morath

360° in one view

Automation, artificial intelligence and autonomisation: The digital construction site of tomorrow has many facets. Alexander Bertsch is responsible for the sensor technology product line at Liebherr-Elektronik GmbH in Lindau. He tells us how assistance systems and digital 360° surround view systems ensure more efficiency and convenience, and what all of this has to do with ethics.

Alexander Bertsch
Head of product line sensor technology
Liebherr-Elektronik GmbH

Mr Bertsch, how many years has Liebherr-Components been involved with digital camera technology? How has this knowledge impacted the development of your LiXplore™ Bird's Eye 360° surround view system?

We have been producing digital Ethernet cameras for mobile machines for more than ten years, today in the third generation. Our in-depth expertise in this field is based on the long-standing partnership with our customers and the insights we have been able to gain as a result. A major plus for our customers is certainly that we know the demanding conditions under which their mobile machines are used – large temperature differences, vibrations, changing light conditions, etc. very well. We use this knowledge to develop our products according to the demands placed on them in terms of robustness. Accordingly, the experience we have gained over the last few years has helped us a great deal in developing the Bird's Eye 360° surround view system. Basically, it is a digital camera-monitor system that provides operators with a reliable all-round view of the working environment of their machines. The intelligent algorithm behind the display controller creates the 360° view by combining the individual images from four digital cameras into a complete picture.

Difficult operating conditions in the field, such as dust, moisture or vibration, as well as a partially restricted field of vision, do not exactly make it easy for the operator. This starts with classic construction machines and stretches up to agricultural machines, e.g. during harvesting. Municipal and special-purpose vehicles also face this problem. In order to depict blind spots and thus avoid personal injury and damage to property, perfect visibility is indispensable. In concrete terms, operators who spend eight hours a day in their cabs have a limited attention span – just like the rest of us. It is obvious to use a system that makes work easier for humans: a win-win situation for everyone involved, the operators and the machine manufacturers. Fewer errors equal lower costs and greater efficiency.

Many machine manufacturers have been using cameras to monitor processes and increase efficiency for some time. What is the benefit of digital systems compared to analogue ones?

The answer is yes, it's possible, but it's no fun (laughs). You can think of it like a tube TV compared to a full HD LED TV. A digital camera has more power, a sharper image, richer contrasts and less distortion. In other words, it is an assistance system that actually gives operators greater convenience. And not only that: If you think about the future in terms of automation, connectivity and the autonomisation of machines, digital cameras do not only open up completely different functionalities, but are also a prerequisite for them. So it makes perfect sense to invest in the field with foresight. We would like to turn the "someday" into a "now", in order to remain competitive as a machine manufacturing company. However, investing in a digital surround view system is not entirely cost-effective.

Wouldn't it suffice to use a conventional surveillance camera and adapt it to the respective application?

Over the last few years, we have observed the following: Our customers know the challenging conditions in which their machines are used, and thus also the demands placed on the assistance systems. These include demanding environmental conditions in the field as well as changing light conditions. However, all these conditions must be taken into account when choosing a suitable visual aid. I believe that it is important to consider the total investment. If you include all the important factors in the decision, you save money and time as well as valuable nerves.

It has also been shown that the calibration process in particular poses major challenges for customers. If a machine manufacturer equips five machines with a surround view system, the calibration effort is still limited. However, if we are talking about several hundred machines, things look very different. Therefore, we wanted to develop a time-saving system that can be calibrated within a few minutes. This means that neither the calibration mats have to be placed exactly nor the distances to other objects have to be measured. Furthermore, our LiXplore™ Bird's Eye offers detailed views and customizable overlays for greater convenience.

How can you summarise the essence of your assistance systems?

The features of our assistance systems are the result of the extensive experience we have gained over the years with mobile machines in a wide range of industries. Our product is therefore "off the shelf", so to speak, but is, nevertheless, excellently suited for use in demanding environments. Due to our constant proximity to customers, we know the requirements for the components very well. We use this expertise to further develop our products and continue offering the greatest possible benefits.

"What is my personal conclusion from the past years of product development? Even if something doesn't run optimally, there are still upsides, as we learn from our mistakes."

Alexander Bertsch
Head of product line sensor technology

What does the future hold for camera-monitor systems and surround view solutions?

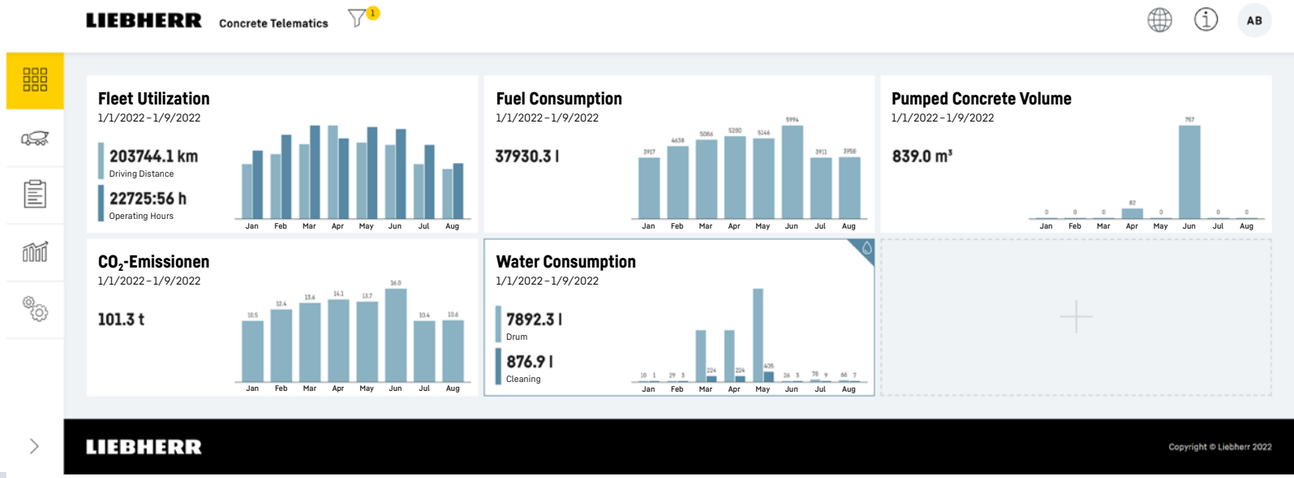
As in most other areas of life, we are moving towards a completely digital future. Digital image processing will soon find its way into even simple camera-monitor systems. Instead of several individual components that have to be linked, you get a complete solution with an additional assistance function that is already state-of-the-art. In the course of developing Bird's Eye, we kept asking ourselves the following questions: How can we achieve the greatest possible benefit for our customers? Which technologies that have proven successful in other industries offer enough potential for mobile machines? One example is collision warning, which is already being used in the automotive industry. Today's systems still have to cover these extended assistance functions via additional sensors. With digital technology, intelligent algorithms take over this task. It is a leaner system overall that reduces possible sources of error and takes comprehensive account of processes on the construction site. Moreover, there is the additional convenience.

Analogue cameras will continue to exist, but I see them more in simpler applications. For more complex requirements and larger machines, like harvesters, digital solutions will be essential. If we think about artificial intelligence and a networked, autonomously working construction site that has to process large amounts of data, digital cameras are a mandatory prerequisite. The way towards this goal is not far, the most important steps have already been taken – both in research and in practice. In Lindau, we create synergies between the two areas through joint projects with universities and research institutes.

However, there are still a few hurdles on the road ahead of us until we get there. Who is responsible if an autonomously driving machine causes personal injury or damage to property? In my opinion, this almost ethical issue is still a work in progress from a political standpoint. Assistance systems must, therefore, be developed in the future in such a way that they are able to compensate for malfunctions in automation and minimise risks in business operations. Striking a balance in this area of tension between artificial intelligence and functional safety will, in my view, still be a giant task.

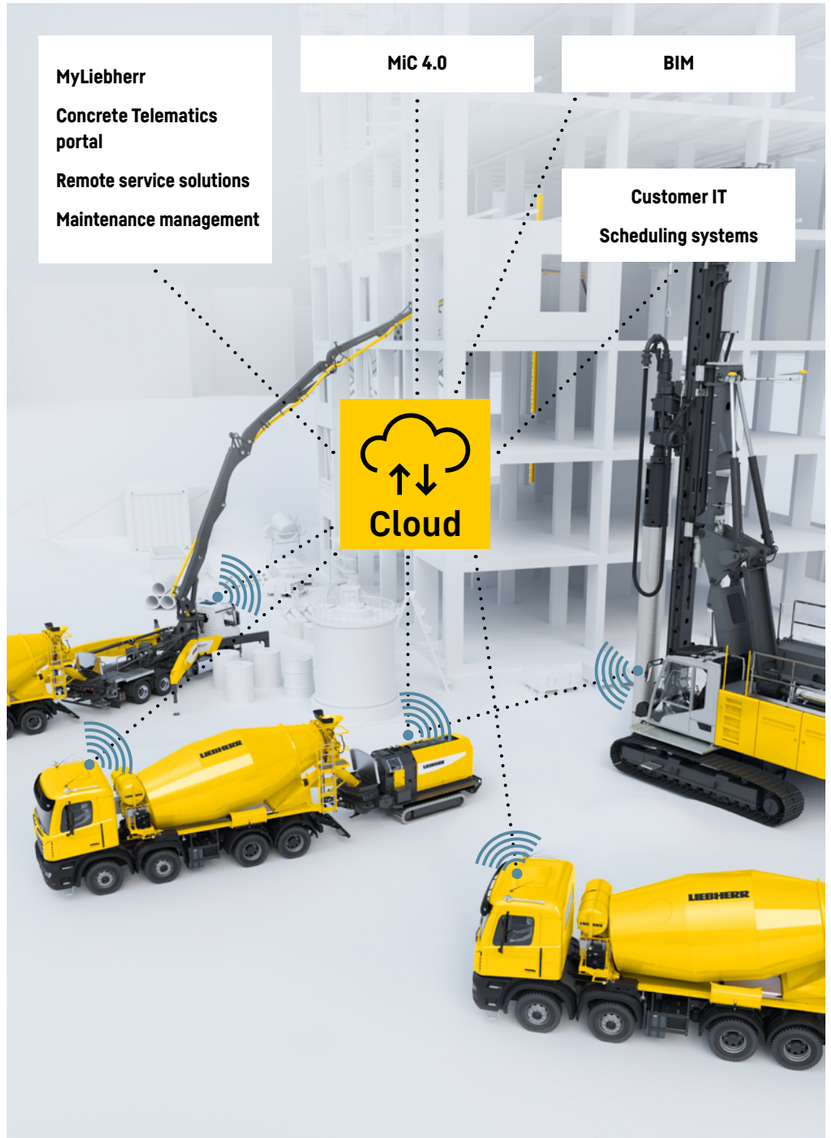
Telematics in concrete technology – added value from a single source

Whether networking, data analysis or visualisation, telematics is playing an increasingly key role in the world of construction machines. Liebherr is presenting its first telematics solution packages for the concrete technology product segment at Bauma 2022.



The whole is greater than the sum of its parts was a fact that Aristotle already recognised. Yet the philosopher and scientist could hardly have imagined the role that the opportunities presented by digitisation would play today.

On construction sites, Liebherr is now making the Aristotelian formula vividly tangible with telematics solutions specially designed for concrete technology. Above all, telematics solutions are being used to digitally monitor the overall quality of the concrete from the mixing process to its deployment on the construction site as well as to improve overall fleet management. Cost efficiency, safety for man and machine and connectivity to other digital systems are further essential added values.



In the focus of Liebherr concrete technology telematics:

1. Forward-looking fleet management
The customer has continuous access to the most important data relating to the truck mixer body and the concrete pumps in real time and can optimise fleet logistics accordingly, even with the basic package. Amongst other things, the system records fuel consumption, the distance travelled, relevant key performance figures (such as CO_2 emissions or the amount of concrete pumped), the current location and the status of individual vehicles. Displaying the operating hours with a maintenance message allows downtimes to be significantly reduced and adjusted according to the order situation. These advantages help to significantly increase value creation within the fleet.

2. Integration in the Liebherr Cloud
The data from the machines are sent to a cloud via a built-in telematics box with an integrated SIM module. The data are then prepared for visualisation in the web browser. In future, software interfaces will enable fleet and construction site data to be sent directly to the scheduling software of Liebherr customers.

3. Optimised processes
Telematics makes it possible to plan the arrival of the truck mixer at the construction site or mixing plant far more precisely in order to optimise, for example, the unloading of the truck mixer at the truck-mounted concrete pump. Telematics also allows the LWCS (Litronic Water Control System) – which was developed by Liebherr – to record and document the quantities of water consumed for each delivery. The scheduling department thus receives all the information in real time regarding the amount of water discharged into the drum, the drum speed and direction of rotation, and can immediately assign the data to the delivery.

4. Individualised data preparation
Liebherr has developed the “Concrete Telematics“ platform for the purpose of further processing and analysing the data. Every concrete technology customer will find the machines it has in operation here on the platform. The solution is integrated in the centralised MyLiebherr portal, making it very easy to use. Other digital products currently under development at Liebherr will also be available for use on this platform in the future.

Our animation video on telematics in concrete technology clearly demonstrates the added value offered by Liebherr's solution packages for networking, data analysis and visualisation.

TO THE VIDEO →

One for all

The proven Liebherr fast-erecting crane L1-32 will be even easier and safer to operate thanks to Liebherr's own control hardware and the Tower Crane OS software. In South Tyrol, an extensive field test is currently being carried out in cooperation with the Italian crane specialist Niederstätter. Expectations are high. And rightly so.

"It always feels a bit like Christmas," says Manuel Niederstätter. Together with his workshop manager Martin Steiner, the managing director of one of Italy's leading crane and construction machinery service companies greets an old friend at the company's Bolzano site: the L1-32. There's a surprise in the crane's interior that brings Christmas tingles: a new control system for next-level crane operations.

"Something we've examined from all angles in many theoretical conversations with Liebherr can now be experienced live for the first time. This is really exciting," says Martin Steiner, while the crane is unfolding step by step. "Construction always comes with a bit of scepticism towards innovations, especially among "old hands," explains Manuel Niederstätter. "Our technicians approach every innovation quite critically and don't allow themselves to be lured in by high-sounding advertising claims. But that is exactly what is needed if a test is to be successful."

Once the crane is up and Martin Steiner sets it in motion with the remote control, he's amazed. All movements are harmoniously coordinated – a textbook crane operation. "Everything's really easy," Martin Steiner notes. "What a successful surprise."

The latest generation of control software made by Liebherr, the new Tower Crane OS, makes the work significantly easier. The developers especially focus on continuous improvements for operating cranes. This also includes the assistance systems that have to prove themselves during Niederstätter's extensive practical use: the intelligent Sway Control, Sway Control Plus, Side Pull Control as well as the so-called Hook Carrier for a controlled, safe movement of the load hook.

When testing such tools, it's convenient that the Niederstätter employees have been familiar with Liebherr technology for quite some time. For almost half a century, the family-run company has supplied construction machines and provided services for construction companies. Its crane fleet is one of the biggest in all of Italy and is composed of only fast-erecting and tower cranes by Liebherr.

To Liebherr, Niederstätter is a highly experienced and competent partner in testing innovations. Together, they are working to ensure that the new technologies work efficiently in practice.

"The field test will take place at one of our customers in Brixen. The construction company is working on the renovation and extension of a residential building – a typical field of activity for a fast-erecting crane", says Manuel Niederstätter. "In such construction projects, the crane is often used by different trades: from bricklayers to carpenters to painters. The easier and less complicated the crane controls, the higher its handling capacity and the safer its operation."

What Martin Steiner found to be a "foolproof crane control" during the first trial run on the Niederstätter site could prove to be a real comfort and safety gain. The integrated "Sway Control" reduces and suppresses the pendulum movements of the hook and the load in slewing- and trolley travel direction. "This means that the lifts can be carried out safely and almost completely pendulum-free even with little crane experience after a brief instruction, and that with a high handling capacity," says Manuel Niederstätter. In the extended version Sway Control Plus, additional sensors measure the acceleration and angular velocity of the crane hook. The system completely eliminates any pendulum movements that occur. "This is high-tech, the likes of which have never been seen on a crane before," states Manuel Niederstätter.

The Side Pull Control System enables positioning the trolley directly above the load to be lifted. This facilitates the attachment and thus avoids an initial pendulum movement when lifting the load. "This is active accident prevention when lifting loads," says Martin Steiner.

Easy and uncomplicated handling of a lift is also the aim of the Hook Carrier. With this system, the user literally has the hook in their hand. Sensors convert the movement that the crane operator makes with the hook into control signals. This allows them to pull the hook to the place where, for example, a load is to be suspended without having to approach it with the control levers. "This makes it much easier for the operator to master complex and narrow passages," predicts Martin Steiner.

"The customers who work with the crane on their construction sites can best judge what the system actually achieves in everyday use", says Daniela Niederstätter, managing director of the second generation of the family-run company. "It's important to us that in the field test, the crane is used on everyday construction sites and not on spectacular out of the ordinary ones. In the coming weeks and months, together with Liebherr, our main concern will be to get honest feedback from the crane operators. This enables us to take their concerns into account in all upcoming innovations and further optimisations of the assistance systems." The test is intended to provide insightful answers to questions from the field: Will crane operators see these assistance systems as added value and want to work with them in the future? Are the assistance systems suitable for significantly further reducing the risk of accidents and damage on the construction site and counteracting the shortage of skilled workers?

As in previous field tests, Niederstätter has always found the cooperation with Liebherr in challenging development projects to be very trustworthy and mutually appreciative. "This leads almost automatically to a good, constructive exchange between the dealership and manufacturer," says Daniela Niederstätter. "This creates a win-win situation for everyone. Innovation topics are extremely important to our company. In order to keep our consulting and service quality at a high level, we want our technicians to always be up to date and know the latest technology inside out. And we want to make the Liebherr-quality on the crane available to our customers, because it can offer real added value and additional safety."

Manuel Niederstätter points out that innovations are not an automatic success: "New technologies first have to prove and assert themselves." For example, there are often reservations about the possible risk of failure of additional electronics. "And then it's always also about the crane operator's honour and the conviction that a software can never be as good as one's own many years of experience. But experience shows: Once you get used to it, you don't want to do without it." He also expects this to happen with the digitally improved the L1-32 prototype. With the assistance systems in the field test, the crane operator remains the "boss in the ring": "To get the operators' acceptance, it is of great importance that the autonomously performed movements must always be actively released."

"It's a pity that the L1-32 is leaving again so soon to take up its duties in Brixen," says Martin Steiner, Niederstätter AG's workshop manager. "The feeling you get when a crane operation is perfect is simply uplifting. Maybe we should also ask in the test how happy they're feeling," he says with a wink. Martin Steiner and Manuel Niederstätter would probably already know which box to tick.

Martin Steiner and Daniela Niederstätter

MyLiebherr

Up to date: New look and new features for MyLiebherr

The MyLiebherr online portal is the central contact and access point for customers and service partners of the Liebherr Group. The platform is being continually developed and has recently been given a more user-friendly design update as well as additional functions.

The fundamental overhaul of the portal design focused on user-friendliness. The result is a clearly structured, intuitive user interface that makes effective work possible. Among other things, the old navigation system has been replaced by the “Apps” section, so that users can now immediately access the most important portal applications such as the spare parts shop, spare parts catalogue or product documents – a click on the corresponding tile is enough. Another advantage is the extended information, for example on the status of sent requests, which provides users with direct information when interacting with the portal.

Everything stays the same – just a little different
A wide range of information and services becomes available as soon as users log in on www.myliebherr.com with their login data. The newly structured start page allows them to jump directly to the “Personal Data” and “Business Relationships” sections. In addition, users are prominently shown the licence managers and administrators assigned to them in their company as well as their contact details.

Company administrators and product managers now have the option of storing so-called keywords for each product, allowing more effective management of the machine park. In this way, products can be assigned to corresponding topic clusters and found again more quickly when needed. Profile management has also been improved. In the “address book”, company administrators can now create and manage addresses that are available either to themselves or to all users in their company. This means, for example, that order forms can be completed in a matter of seconds with the appropriate (delivery) address.

Added value at the click of a mouse
Naturally, all important functions can also be quickly and reliably accessed at the click of a mouse in the revised version of the MyLiebherr portal. Machine and spare parts documentation, manuals or operating instructions can be viewed and conveniently downloaded at any time – allowing users to find everything concentrated in one place. In the “Licences” section, users can purchase different types of licences, which can be used, for example, to simply and directly increase the range of functions of Liebherr applications or machines.

New functions in the pipeline
While users discover the new advantages of the platform, Liebherr is already working on further new ideas and functions for MyLiebherr. A new online shop for spare parts is currently being developed. The online shop has been fundamentally revamped and should be launched by mid-2023. It will unite the range of all product segments under one roof. At the same time, the new spare parts shop will once again redefine standards in terms of operation and user-friendliness. Until then, spare parts, operating materials and accessories can be ordered as usual in the online shop on the MyLiebherr platform – reliably and at any time.

Click here to go to the online portal.

MYLIEBHERR.COM →

In a nutshell – the advantages of MyLiebherr:
- Central access to numerous digital applications and offers such as spare parts shop and catalogue, product documents or licences
- Maximum transparency thanks to up-to-date information available at all times
- Clearly structured, neat and intuitive user interface
- Fast and effective work thanks to simple processes
- Direct contact with Liebherr and its service partners

Dream team on a solid foundation

Faster, safer, more effective: This is how the digitally orchestrated special civil engineering construction site presents itself. Liebherr is bringing its technologies even closer together by networking a drilling rig with a tracked concrete pump. This means that both construction machines can build demanding, deep pile foundations in perfect coordination with each other – and with considerable time and efficiency gains.

They lead a hidden existence and yet are beacons of the high art of special civil engineering: the concrete piles that distribute the loads of load-bearing structures in deeper, load-bearing soil layers in deep foundations and thus provide secure support for the foundations of buildings and other facilities. For this purpose, pile drivers and drilling equipment are often used to go many metres deep into the building ground until suitable soil or rock layers are reached and the boreholes are filled with concrete and reinforcement. The dimension of these pile foundations can be guessed at when the huge pile-driving and drilling rigs and the concrete pumps approach on their crawler tracks – visible from afar and so not at all hidden as the result of their collaboration.

Liebherr is the only supplier in the industry that manufactures both machines and digitally networks the duo as a "dream team". This sets completely new standards for pile foundations in terms of safety, reliability and efficiency of the entire process. Classically, the division of labour for such pile foundations is regulated in this way: A surveyor determines the position of each individual pile on site, the drilling or pile-driving rig moves in, works its way down according to the survey specifications until the concrete pump then gets the signal to fill the borehole with concrete as it is pulled up. This process can take weeks for hundreds of piles, as is the norm for large commercial buildings, for example. When tracked machines, excavators and construction machines have driven over the pile field several times, it is often no longer possible to determine the exact position of the piles.

In order to optimise this literally fundamental process in special civil engineering and to use the equipment and material as efficiently and cost-effectively as possible, Liebherr has networked its machines. For this purpose, the individual work steps of a pile-driving and drilling rig as well as a tracked concrete pump are orchestrated in a unique way via digital control and linked with extensive data analysis. The units also communicate with each other during the recurring processes of drilling, extracting and concrete pumping. The operator of the drilling rig can start and stop the pumping process from his cabin, accurate to the second. The result: significantly simplified work processes, fewer people on the construction site and, in particular, considerable time savings.

PST Spezialtiefbau Süd, for example, recently benefited from this. The company was contracted to anchor 800 piles with diameters of 750 to 880 mm and depths of up to 18 metres in the subsoil at a construction site. The Liebherr LRB 355 pile-driving and drilling rig was deployed for this purpose, using in the double-head drilling method. "The challenge was both the large number of piles that had to be installed in the specified time with only one drilling rig and the exact compliance with the positioning and quality requirements," reports Philipp Müller, project manager at PST Spezialtiefbau Süd GmbH. "Thanks to the networking of the drilling rig and the tracked concrete pump, it only took 14 minutes to complete a pile, including concreting, under optimal conditions."

The LIPOS satellite-based positioning system developed by Liebherr plays a key role in this optimised process. It integrates existing machine control systems into the process data acquisition PDE and reporting of Liebherr special civil engineering equipment. The digital drilling plan is transferred to the corresponding drilling and concreting machines for the precise execution of the drilling and pile-driving work as well as the concreting. "The construction site personnel thus always have reassurance that there are no gross surveying errors and also have visual control of which piles have already been produced," says Philipp Müller, summing up the advantages of LIPOS in everyday work. In addition, all the data would be transferred to Liebherr's MyJobsite application for further visualisation and analysis. This automatically records all relevant process, machine, construction site, weather and position data. In addition, important information can also be added manually by entering construction site events.

All this collected data is processed, analysed and stored by the system according to the highest security standards. For Müller, this results in tangible advantages on the construction site: "Personally, I have the expectation that the LIPOS system will relieve the foreman on site, as the system gives the equipment operator more security and clarity about pile numbers and drilling depth."

Robl Spezialtiefbau GmbH also had a similar experience when it recently had to install over 900 full displacement piles for a new production facility in just three weeks with a diameter of 320 millimetres and a length of between five and eight metres – a job that had to be completed in just three weeks. For this purpose, the company was assisted by two Liebherr LRB 16 and LRB 18 piling and drilling rigs and a Liebherr THS 80 D-K concrete pump.

For Martin Robl, chief executive officer of Robl Spezialtiefbau GmbH, the use of LIPOS and MyJobsite proved its worth in this extremely demanding project: "Because the interaction of the two Liebherr pile-driving and drilling rigs, including accessories, worked perfectly, the planned execution time was undercut by about a week." The reason: Thanks to the unique networking, the machines would always have worked "hand in hand", without delay and always exactly according to plan. "Thanks to LIPOS, we didn't have to make any additional appointments with the surveyor and were able to make full use of every working day," says Robl. He always had an overview of all the site data via the MyJobsite software solution.

"All the key parameters can be viewed in real time on a laptop, tablet or mobile phone. This way, you always have an overview of which piles have already been completed and which still need to be done," says the Robl CEO happily. The approach to each individual pile becomes child's play, without having to pay attention to colour markings or pegs. This boosts the quality of the entire process for all involved. "We are thus experiencing special civil engineering in completely new dimensions right now thanks to digital networking."

The construction site of the future

New LICCON control system
The new generation of crane controls comes with faster data bus, larger memory and is prepared for fleet management and telemetry as standard. LICCON3 remains familiar but is made for the future.

First hydrogen engine
The crawler excavator R 9XX H_2 is equipped with the first Liebherr hydrogen engine H966. It convinces with very low No_x emissions and delivers the same overall performance as the version with diesel engine, both in terms of power output as well as engine dynamics and responsiveness.

Zero local emissions
The battery-based power storage system Liduro Power Port (LPO) enables electrified machines to be powered and charged locally emission free and thus helps reduce total emissions in cities.

Emission-free crane operation
In addition to a combustion engine, the compact all-terrain crane LTC 1050- 3.1E comes with an optional electric motor and can thus operate CO_2 emission-free in crane operation.

New control concept
The EC-B can be operated from a distance via teleoperation. In combination with new assistance systems, the crane operator works even safer, faster, and easier.

Quiet and low in emissions
The unplugged versions of the LB 30 drilling rig, the LRH 200 piling and drilling rig as well as the LR 1130.1 crawler crane can be operated with battery or construction site power. Thus, they not only pave the way towards emission-free construction sites but also contribute to a significant reduction in noise.

Three low-emission alternative drives
The universal platform of Liebherr's telescopic handlers is suitable for three different drive variants. They range from the operation with hydrotreated vegetable oils (HVO) to zero local emission battery-electric drives to the hybrid variant which combines the two drive variants. This combination offers numerous benefits, such as a boost mode and energy recovery.

All-round talent
Encased in an appealing design, the 36 XXT truck mounted concrete pump combines the benefits of the 5-part multi-fold distribution boom with the unique Powerbloc pump drive unit with the patented semi-closed oil circuit HCC. Its compact assembly with no boom overhang at the rear ensures high manoeuvrability in confined spaces. The XXT support system ensures perfect stability. The pivoting XXT support is particularly versatile when supporting in tight spaces.

Reducing CO_2 emissions
The LR 11000 crawler crane can fully run on HVO and can thus save up to 90% of CO_2 emissions in operation.

Powerful and silent
The battery electric wheel loader convinces with dynamics and maximum performance. It's as quiet as a mouse and produces no local emissions. Its efficient charging options and intuitive operating concept ensure the highest level of comfort.

Zero local emissions and significant noise reduction
The electric truck mixer series (ETM) is the answer to the changing requirements for climate protection, resource conservation and noise emissions – with the sameperformance and availability as a conventional drive.

Long-standing experience
Equipped with a pantograph for connecting its AC drive system to the electrical network, the T 274 mining truck with a payload of 305 t offers a solution for a significant reduction in CO_2 emissions in the mining industry.

From planning, to operation, analysis, and finalisation – from the start, we are always at our customers' sides with our digital solutions.

Planning
With our operative planning tools, we support our customers with site management. This begins even before the purchase with the selection of the right machine. It's also possible to plan the operation on site with the help of a planning software.

Operation
Our assistance systems make operations on the construction site easier and safer. Condition monitoring gives detailed information on the status of our machines from a distance, thus reducing downtimes. And with the help of teleoperations, some of our machines can even be operated from a distance – for an even safer working environment.

Analysis
Following on-site operations, we use the obtained machine- and process data for analysis and documentation of the operation and optimisation for future projects.

Become part of our family

Liebherr-Shop

LIEBHERR

Liebherr-Purchasing Services GmbH

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Product segments

At your side when it comes to needs of our customers

Mining

Electrified giants

120 km west of Panama's capital is one of the largest copper mines in the world. It's not just the mine itself that's big – 38 Liebherr T 284 mining trucks are at work there, each capable of loading 363 t. And the giants are not alone: the Liebherr Trolley System provides powerful support. Better work cycles, lower CO_2 emissions, and a smaller fleet requirement – Liebherr trucks and the Trolley System are an absolute dream team.

Mining

Zero Emission

The global mining industry has demonstrated its commitment to cut greenhouse gas (GHG) emissions, which has accelerated the implementation of Liebherr's existing low-carbon solutions and triggered future projects to offer completely fossil fuel-free mining equipment options. Liebherr strives for long-term sustainable solutions, investigating different options centred on environmental sustainability, safety, cost, flexibility and maintainability. As a first step, the Liebherr mining product segment already offers low-carbon solutions for the full range of hydralic excavators and off-highway trucks to customers to help reduce emissions. As a next step, the company intends to offer completely fossil fuel-free mining equipment for hauling, digging, and dozing by 2030.

Trolley
The Liebherr Trolley Assist System is an effective first step on the road to zero-emission mine sites of the future. Utilising an overhead pantograph or trolley bars to connect the electric drive system to the electrical network, the Trolley Assist System offers increased truck fleet productivity or reductions in fleet size, while maintaining annual production when compared with standard trucks. A significant reduction of diesel fuel consumption is also made possible with the Trolley Assist System along with a reduction of the truck fleet's CO_2 emissions. However, this of course depends on the per centage of renewable energy content in the power supplied by the grid.

Liebherr's partnership with Fortescue
Fortescue Metals Group Ltd (Fortescue) and Liebherr recently announced a partnership to develop and supply green mining haul trucks. This partnership tackles the challenge of decarbonising heavy mobile equipment in the mining industry by integrating zero-emission power system technologies being developed by Fortescue Future Industries (FFI) and Williams Advanced Engineering (WAE). The phased supply of haul trucks is anticipated to commence following a two-year joint development period enabling the development and integration of Fortescue proprietary battery-electric and fuel cell-electric power systems into Liebherr's base truck. To achieve the target, Liebherr will use its vast OEM expertise in the design and manufacturing of machinery and machinery core technology to engineer, manufacture and supply the new mining haul trucks in accordance with Fortescue's requirements.

Technology portfolio

Enhanced safety and overall equipment effectiveness with Liebherr Mining technology solutions
The Liebherr Mining Technology Product portfolio defines the company's interoperable and scalable approach to its equipment, technology, and service product offerings. The portfolio includes Digital Services, Assistance Systems and On-board Analytics, and Machine Automation product lines, providing customers with a flexible range of supply solutions to increase safety and boost operational effectiveness.

Together, these products improve operator performance, optimise diagnostic processes and automate machine functions, whilst integrating machine data and OEM expertise within the customer's chosen technology landscapes.

Liebherr Mining's Digital Services are connectivity-enabled services that utilise data generated on the machine to provide customers with rich data and insights required to drive fleet performance, increase utilisation, enhance machine health and availability and improve the customer's service journey. Digital Services also enable remote monitoring of mining operations, reducing the time and costs related to manual data gathering, and allow mine management to focus on maximising overall mine performance. Beyond this, Digital Services enable the integration of Liebherr's technology, engineering knowledge, and mining expertise with customer's technology landscapes to maximise the value generated from machine data.

The Liebherr Assistance Systems are advanced products and applications designed to help operators become more efficient through analytics. The solutions further assist site operations to achieve a high level in safety, maintenance, and overall equipment effectiveness.

By developing its Assistance Systems and On-Board Analytics, Liebherr Mining continues to add value to customers' new equipment and existing fleets through available retrofittable solutions. This equipment-embedded technology also supports Liebherr Digital Services with the on-board generated and processed data, providing further customer added value by combining it with other Liebherr data and information.

Customer Service

Liebherr strives to meet the highest expectations of its customers by providing an exceptional level of service and support. To further support customers in terms of equipment performance and maintenance, Liebherr Mining has developed a suite of data-driven digital services.

Advanced support with the updated Troubleshoot Advisor
After several years of continuous improvement, a new version of the Liebherr Troubleshoot Advisor (TSA) is now available. The TSA is an intuitive platform that provides access to detailed troubleshooting instructions for common technical problems, enabling customer's on-site technicians to troubleshoot their equipment as a Liebherr expert would.

The new TSA portal has integrated several updates to improve the user experience. The new interface offers users an easy-to-follow, step-by-step process, easily navigating machine selection, symptom identification, and resolution instructions. To complement the web portal version of the TSA, a new offline mobile application now offers the possibility to store all the necessary information on a smartphone that can be accessed without network connection. The mobile application automatically synchronises new information once connectivity is re-established. The updated version of the TSA also simplifies the administrative process for customers by using MyLiebherr to manage licences.

The TSA is also intrinsically linked to the new Content Delivery Portal (CDP), with the ability to launch guides from the Troubleshoot Advisor directly through the CDP. The Liebherr Content Delivery Portal is a user-centric, intelligent search database comprising all Liebherr Mining technical documentation from operating manuals to assembly instructions, enabling users to locate relevant information quickly and precisely. By using both the CDP and Troubleshoot Advisor as well as the other Liebherr Mining Digital Services, maintenance teams can accelerate the execution of jobs to minimise downtime of mining equipment.

R 9300: Liebherr Mining's latest addition unveiled

Liebherr Mining's new mid-size class excavator, the R 9300, is the latest addition to the hydraulic excavator range for mining applications. Belonging to Generation 8, the excavator is part of the company's most technologically advanced generation of machines. Liebherr Mining's latest innovations, technological features, design optimisations and manufacturing processes were all duly considered and implemented in the machine. In 2024, this new model will replace the R 9250 and become the new Liebherr Mining flagship for the 250-tonne (275 tons) class. It comes equipped with a proven Cummins engine and is the ideal loader for large articulated haulers and rigid 100-tonne to 150-tonne (110 to 165 tons) trucks with its 16.5 m³ (21.6 yd³) bucket/shovel. It offers a wide array of uses and grants optimal cycle times while achieving highest excavating forces.

The new hydraulic excavator also includes the latest technological innovations developed by Liebherr Mining. It comes with the new Liebherr Mining electronic architecture connected to Liebherr's smart components and features the serial implementation of all Liebherr Power Efficiency solutions. Depending on the licence, the R 9300 also comes with the Liebherr Assistance Systems and the semi-automatic Bucket Filling Assistant.

The attachment of the R 9300 follows the same design philosophy as its big brothers, the R 9600 and R 9800. Thanks to smart component design, Liebherr engineers managed to reduce the weight of the attachment, increase the machine's digging forces and bucket size, and consequently improve the cost per tonne.

Further configurations of the R 9300 G8 such as face shovel, Tier 4, and electric drive will follow soon.

Tower cranes

Four towers for Frankfurt

Frankfurt (Germany): Reside, work, live – the new “FOUR” district will shape the skyline of the Main metropolis. Up to nine HC-L cranes are working on the skyscraper quartet, whose futuristic towers rise up to 230 m into the sky. Inside and outside climbing cranes as well as many load hooks mark the confined space: Liebherr‘s Tower Crane Solutions project department accompanies the construction from planning to dismantling of the last piece of equipment.

Tower cranes

Even more power: The new Fibre cranes

”Faster, Higher, Stronger“: What does the Olympic motto have in common with Liebherr‘s Fibre cranes? Liebherr presented the high-strength fibre rope for the first time at Bauma 2016. Three years later, the first Fibre cranes of the EC-B series followed. Now, at Bauma 2022, things are going even higher: Liebherr presents its first large cranes with Fibre technology.

Especially with these machines, the advantages of the fibre rope become even more apparent because the significantly lower rope weight becomes noticeable as the hook height increases. The 258 HC-L 10/18 Fibre variable jib crane, the 1188 EC-H 40 Fibre high-top crane, which is primarily used in plant and power station construction, and the 520 EC-B 20 Fibre and 370 EC-B 16 Fibre flat-top cranes are new to the market. They are all predestined for particularly demanding hook heights and lifts.

Greater hook height, less wear

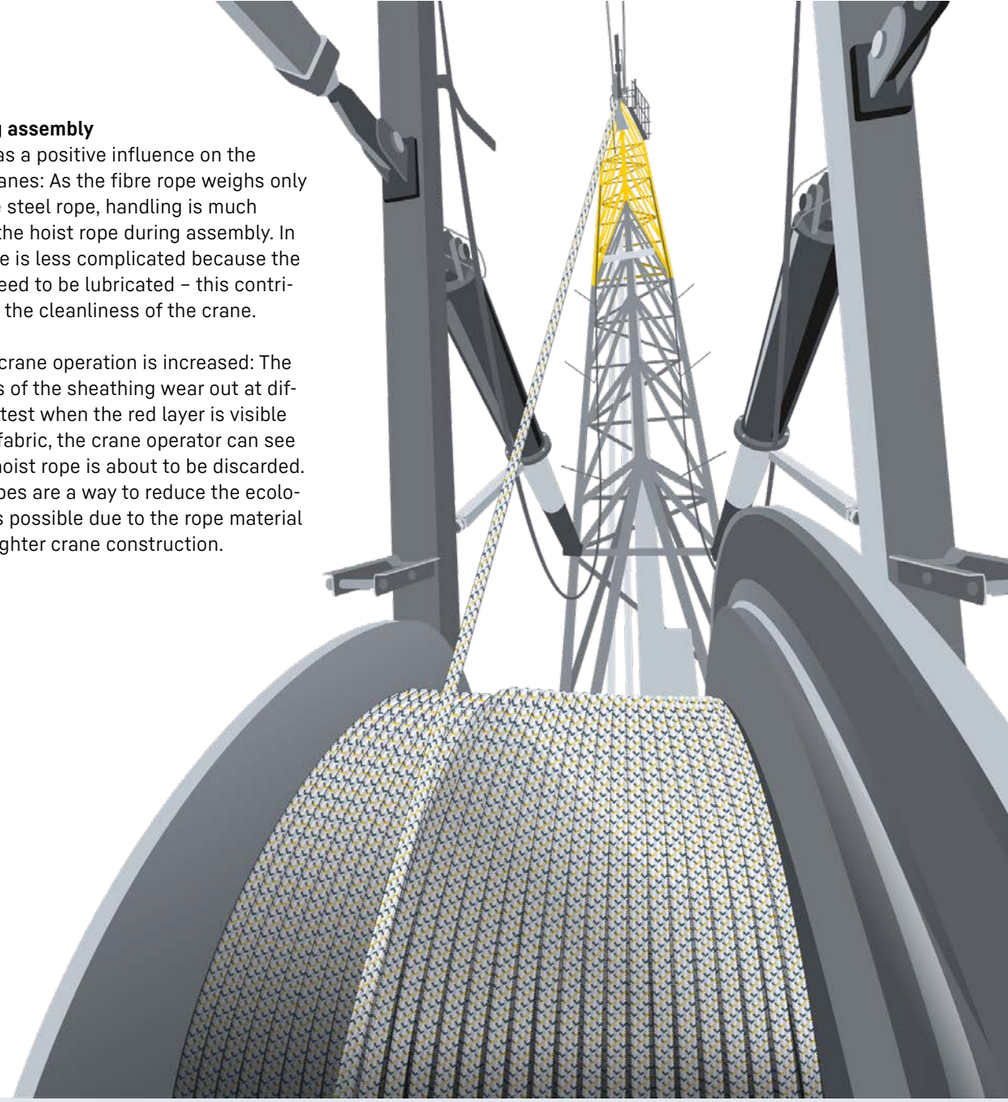
The high-strength fibre rope for a hoist of up to ten t has a diameter of 25 mm (previous versions: 20 and 22 mm). The significant difference in weight between this fibre rope and a 25 mm steel rope enables the new Fibre cranes, for example, to advance the construction of skyscrapers, industrial plants and larger building complexes even more efficiently.

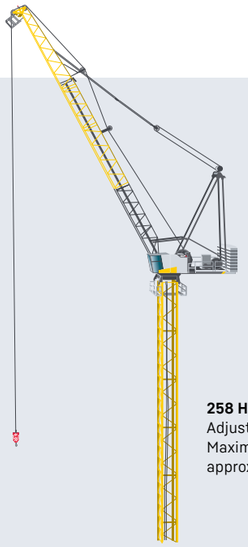
The lighter fibre rope is particularly noticeable on the specialists for high hook heights, the HC-L cranes: The use of the fibre rope, which was the result of ten years of development work by Liebherr and the rope manufacturer Teufelberger, allows the maximum load capacity to be increased by up to 43 % compared to the steel rope variants. In addition, the fibre rope has a significantly longer service life than a steel rope. This means less frequent rope changes and thus lower follow-up costs and downtimes.

Easy handling during assembly

The fibre rope also has a positive influence on the assembly of tower cranes: As the fibre rope weighs only about one fifth of the steel rope, handling is much easier when reeving the hoist rope during assembly. In addition, maintenance is less complicated because the fibre rope does not need to be lubricated – this contributes significantly to the cleanliness of the crane.

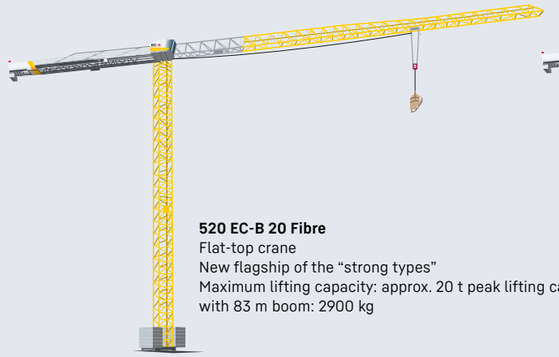
In addition, safety in crane operation is increased: The different components of the sheathing wear out at different rates. At the latest when the red layer is visible under the sheathing fabric, the crane operator can see at a glance that the hoist rope is about to be discarded. Furthermore, fibre ropes are a way to reduce the ecological footprint. This is possible due to the rope material and also by using a lighter crane construction.



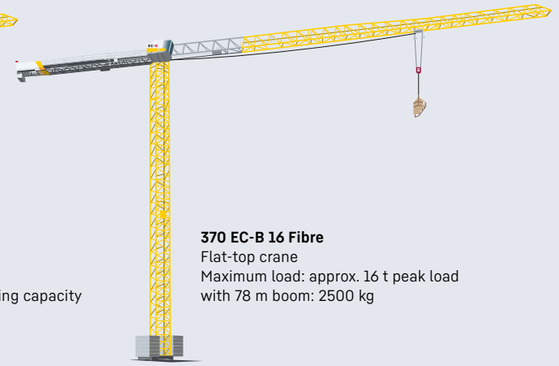


258 HC-L 10/18 Fibre
Adjustable jib crane
Maximum load capacity: 18 t peak load with approx. 60 m boom: 2500 kg

1188 EC-H 40 Fibre
High-top crane
Strongest series-produced crane from Liebherr
Maximum load capacity: 40 t peak load with approx. 80 m boom: 13,100 kg



520 EC-B 20 Fibre
Flat-top crane
New flagship of the “strong types”
Maximum lifting capacity: approx. 20 t peak lifting capacity with 83 m boom: 2900 kg

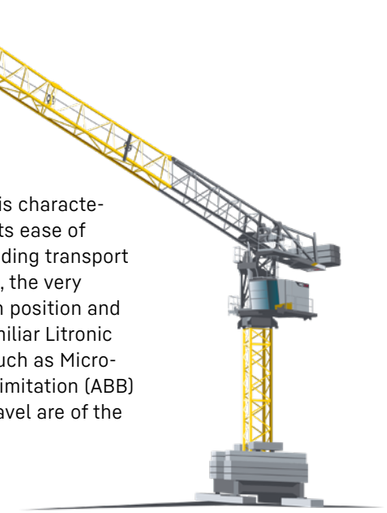


370 EC-B 16 Fibre
Flat-top crane
Maximum load: approx. 16 t peak load with 78 m boom: 2500 kg

Unique complete package: First hydraulic adjustable jib crane from Liebherr

With its first hydraulic adjustable jib crane, Liebherr is enhancing its profile as a crane manufacturer for all size classes. The 195 HC-LH 6/12 is particularly suitable for inner-city construction sites with constricted space. At maximum jib length, the crane lifts up to 2550 kg at the tip.

These strong values are achieved by the hydraulic adjustable jib crane in combination with the climbable 16 EC tower system, which with its dimensions of 1.6 x 1.6 m requires little space and can be effortlessly transported to its destination by truck or container. A slim and climbable tower system, large lifting heights and high performance – this complete package makes the 195 HC-LH 6/12 from Liebherr unique.



In addition, the crane is characterised in particular by its ease of assembly and outstanding transport properties. In addition, the very small out-of-operation position and operation with the familiar Litronic assistance systems such as Micromove, working range limitation (ABB) and horizontal load travel are of the highest standard.

Sustainable hybrid power concept: The MK 140-5.1 gets a facelift

The MK 140 can look forward to a number of optimisations, which the public will be able to see for themselves at Bauma. Liebherr's strongest mobile construction crane offers lifting capacities of up to 8000 kg. What makes it special, in addition to its normal use as a trolley jib crane, is the VarioJib: This enables operations in luffing mode and up to 65 m jib length.

The ecological and future-proof hybrid power concept enables all-electric crane operation with site power or another external power source. As a result, the crane works particularly quietly. If there is no external power source, an efficient diesel generator ensures self-sufficient operation. Both the drive for the superstructure and the undercarriage of these cranes can be operated with HVO. By using Hydrotreated Vegetable Oils, emission-free crane operation is made possible. Since January 2022, MKs will be delivered from the factory filled with this fuel.

MK cranes are primarily designed for short operations with high handling rates. Only one person is needed for transport, assembly and operation. Additional transport vehicles are not required. Thanks to its vertical tower, the taxi crane can work directly on the building, takes up little space and achieves wide working radii with great efficiency.

The MK 73-3.1 can be experienced on the Test & Drive site. The crane offers a lifting capacity of up to 6000 kg and is extremely manoeuvrable due to its compact dimensions.

Easier to use: L1 series with improved software and hardware

Lift heavy loads while taking up little space: Liebherr's L1 series hydraulic fast-erecting cranes are compact, powerful and flexible. Now the series is getting a facelift for even easier and smarter operation.

With the second version of the operating system for tower cranes, the Tower Crane Operating System, there are significant innovations. In combination with the new safety-oriented Liebherr control system, the future normative regulations are already fulfilled. The facelift is also noticeable in the hardware area: More common parts in the L1 machines and the use of established control hardware from the Liebherr Group, for example, make servicing easier.

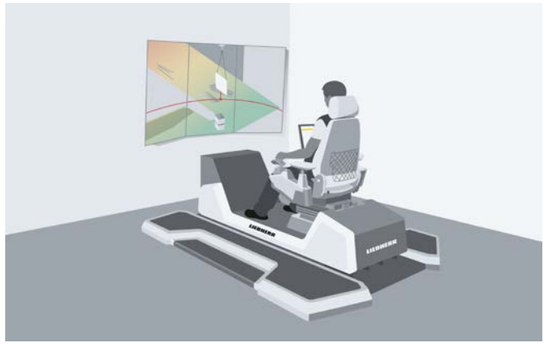
New assistance systems for even more safety
The new Tower Crane OS also enables further intelligent and future-oriented assistance systems. Liebherr will be providing an interactive insight into what the new developments can do at Bauma. The assistance systems actively counteract dangerous situations, such as excessive swaying of the load.

More efficient processes: Digital solutions for modern construction site management

The construction site of the future not only needs powerful equipment, but also intelligent digital solutions for all aspects of crane operation. From planning to implementation to data analysis – digitisation opens up completely new possibilities.

Liebherr is working on new planning tools. With them, construction sites can be planned in detail and the equipment can be selected to fit exactly. Liebherr's Tower Crane Solutions project department also provides support in the economic planning of a construction site with its decades of experience. The focus is also on further improvements to crane operation. On the one hand through an intuitive user interface, on the other hand through the LiReCon tele-operation unit for tower cranes. Thanks to the new Tower Crane OS user interface, which can already be found in many cranes, crane operators and service technicians navigate through a needs-based menu structure via touch display. With tele-operation, the crane operator will in future be able to control the machine outside the cab.

Every construction site is different – and yet lessons can be learned from the processes for subsequent projects. This is where Liebherr's digital solution "Site Monitoring" comes in: Relevant crane data can be easily collected, displayed and analysed. At the same time, this information provides foremen and construction planners with a reliable overview of efficiency and construction progress.



Earthmoving

Stony operation

In a quarry in Wertach (Germany), a R 930 crawler excavator of the new Generation 8 loads gravel onto an articulated dump truck TA 230, which was developed for the toughest off-road applications – a perfect duo even for stony affairs. A payload of up to 28 t can be moved with the large and robustly designed body – the straight front and low loading edge ensure fast and efficient loading and unloading.

Earthmoving

A 922 Rail Litronic – with hydrostatic drive concept and new fully hydraulic quick coupling system LIKUFIX®

Liebherr has been developing and producing road-rail excavators for track construction since 1967. At Bauma, the company presents the A 922 Rail Litronic for the first time with a hydrostatic drive concept and new LIKUFIX® quick coupling system.

Whether rail or road – the road-rail excavator A 922 Rail masters both reliably. The hydrostatic rail undercarriage of the A 922 Rail is new: Two drive motors drive the road-rail excavator directly in the rail axle. This results in less tyre wear as there is no direct rail contact. The A 922 Rail weighs around 23,000 kg and achieves high working speeds thanks to its 120 kW / 163 hp engine, which meets the requirements of exhaust emissions Stage V. The optimally matched hydraulic system with a Liebherr 2x220 l/min variable displacement double pump and independent control circuits ensures the usual fluid movement of the hydraulic attachments – independent of the working and travel movements of the machine.

Quick tool change from the cab

A highlight of the A 922 Rail is the new LIKUFIX® 33-9 quick coupling system with integrated second high-pressure circuit and leakage oil and lubrication line. This means that machine operators can now also change attachments such as tamping units, mulchers with flaps or Liebherr stick extensions quickly and easily from the operator's cab. LIKUFIX® 33-9 is backwards compatible, meaning attachments equipped with the current quick coupling system LIKUFIX ® 33 can also be changed.

Intelligent handling of attachments: Outlook of possible solutions

The new tracker-based and intelligent attachment recognition system from Liebherr will be presented on the A 922 Rail exhibit at the exhibition. In addition to displaying tool, application and location information, the solution recognises the respective Liebherr attachment and automatically adjusts it to the machine. In addition, the A 922 Rail is equipped with a MIC 4.0 interface at the exhibition. It represents a cross-manufacturer standard in communication and enables significantly simplified integration and control of a wide range of attachments in combination with Liebherr machines.

Powerful performer for off-road applications – the TA 230 Litronic

The TA 230 Litronic articulated dump truck will be presented at an international exhibition for the first time. With it, Liebherr has developed a robust, powerful machine for demanding off-road applications.

Transporting excavated materials, the extraction industry or larger infrastructure projects and special applications such as tunnel construction are its world: The TA 230 Litronic articulated dump truck performs robustly and reliably on all terrains. This is made possible, among other things, by the power-efficient drive train, the permanent 6 x 6 all-wheel drive, the automatic traction control and massive axle suspensions. The power pack has an operating weight of 24,600 kg and is equipped with a 265 kW / 360 hp 6-cylinder construction machine engine with a capacity of 12 l, which in combination with the exhaust gas aftertreatment system fulfils the specifications of exhaust emissions Stage V.

With its large and robustly designed trough, the dump truck transports up to 28,000 kg of material. The trough volume can be additionally increased with the aid of the tailgate. A major advantage of the dump truck becomes apparent during frequent construction site changes: With wide tyres, tailgate and the side mirrors that fold in without tools, it has an overall width of less than 3 m – which makes for quick, easy transport.

Best visibility at any time of day or night

In addition to its working power, the Liebherr dump truck is also distinguished by its innovative visibility and lighting concept. The generously designed operator's cab offers an unobstructed view of the machine's driving, working and articulation areas thanks to all-round glazing with no obstructing struts and the short, sloping engine bonnet. Optimal visibility is ensured, even in twilight and darkness: The LED low beam headlights with integrated high beam optimally illuminate travel paths – and in combination with the optionally available extra-strong LED headlight on the front of the cab, also the entire working area. The lighting at the rear of the trough and on the mudguards ensures that the manoeuvring areas are illuminated.

No application is too challenging: See for yourself how the new TA 230 Litronic articulated dump truck is tested to the ultimate limit.

TO THE VIDEO →

Reliable helpers in the right size: the new compact loader series

For around ten years, Liebherr‘s compact loaders have been proving that they are safe and reliable heavy-duty workers in a wide range of industries. The new L 504 is another model in the series: The „smallest member“ of the compact wheel loader family convinces – in addition to the typical qualities of the series – also with a favourable price-performance ratio.

Modern, functional and dynamic, compact, stable and comfortable: With the larger, wider L 508, the under 2.50 m high L 506 and the new L 504, three ideally matched models now belong to Liebherr‘s compact loader series. All three wheel loaders have a robust lift arm with a z-bar linkage, which – depending on the task – enables the use of a wide range of attachments. Be it material transport with bucket or loading forks, earthworks with 4-in-1 bucket, cleaning work with a sweeper or winter service with a snow blade. For operation with a loading fork – for example when transporting pallets – the Liebherr engineers have optimised the parallel guidance.

In addition to the hydraulic quick coupling unit, the fully automatic LIKUFIX® quick coupling system ensures a fast and safe change of attachments. This allows the machine operator to switch between the desired mechanical and hydraulic attachments from the cab in seconds at the touch of a button. Other innovations: The models L 506 and L 508 can be equipped with the extended “High Lift“ arm variant. In addition, these two models are also available for the first time as “speeder“ models with a top speed of 30 km/h on request.

Clear view and more comfort
One of the most important innovations in the compact loader series is the newly designed operator‘s cab, which, thanks to enlarged glass surfaces on all sides, gives the machine operator the best possible view of the work equipment, the load and what is happening in the immediate vicinity – for example, in the articulated area of the wheel loader.

Clearly arranged controls and practical storage areas provide more comfort. Operating the compact loaders is also simple and intuitive thanks to the tried-and-tested Liebherr operating lever for the lift arm and attachment. A mini joystick for controlling additional hydraulic functions is available as an option. For even more safety when reversing, a reversing camera is also optionally available.

New wheel loader trio: Robust all-rounders

Liebherr has redeveloped and fundamentally revised its range of medium-sized wheel loaders. The newly designed lift arms ensures maximum breakout, holding and return forces. It has optimised z-bar linkage and improved working hydraulics. Increases in engine power and tipping loads prepare the wheel loaders for demanding operations in various industries, such as extraction, recycling or the timber industry.

The three models of the latest Generation 8 have bucket sizes between 2.2 and 3.0 m³ in the standard version and are characterised by a significant performance boost compared to the previous generation. The new L 526, for example, has around 20 % more engine power and over 20 % higher breakout forces than its predecessor. The L 538 and L 546 models also impress with performance improvements in all areas.

Powerful and intelligent
In addition to the new lift arms, the optimisation of the hydrostatic travel drive contributes to the increased productivity of the wheel loaders. The new, more powerful engines feature higher maximum torque at a lower nominal speed. This allows performance and efficiency to be increased while maintaining low fuel consumption. More powerful hydraulic components, such as enlarged travel motors and travel pumps, ensure greater traction in all three models and thus powerful bucket filling.

Intelligent equipment is also part of the overall package of the new wheel loaders. Examples here include the new automatic functions for the lift arm or the active person recognition with brake assistant. This optional assistance system warns the machine operator of hazards in the rear area of the wheel loader. For a targeted warning of imminent personal injury, the system uses sensors and artificial intelligence to automatically distinguish between people and objects.

This intelligent classification reduces the number of unnecessary warning signals and thus the burden on the machine operator. In addition, the brake assistant automatically decelerates the wheel loader‘s speed as soon as the sensors detect a source of danger. This shortens the stopping distance by important metres, further reducing the frequency and intensity of potential accidents.

New crawler excavators: More power, less consumption

The crawler excavators of the generations 5.2 and 6.2 with a weight of 70 to 100 t enjoy numerous improvements. In addition to productive and comfortable working, the main focus of the new development was on reducing fuel consumption.

The Liebherr Power Efficiency (LPE) system, which regulates all power management processes, ensures that the new crawler excavators consume less fuel: Proactive intervention in the engine control, changing the swivel angle of the hydraulic pump and adjusting the engine speed lead to optimum efficiency of the drive components in every working situation. This allows you to get the maximum performance out of every drop of fuel – the new machines consume up to 15 % less compared to the previous models.

Greater perception in every respect
A step towards excavator automation is provided by the integrated Bucket Fill Assistant: The adaptive digging aid ensures faster filling of the bucket even in the most difficult conditions with a constant filling factor. The anti-stalling mode prevents the bucket from blocking during penetration into the excavated material. In this way, the system enables higher overall productivity while reducing vibrations, resulting in less fatigue for people and materials.

For the perfect adaptation of the machine to its application, the Modetronic function allows the hydraulic characteristics to be adjusted to the respective application or the preferences of the operator. The operator can choose between four working modes via touchscreen and control each movement individually.

The design and technically innovative equipment of the new crawler excavators emphasise the relationship to the Generation 8 models. These include numerous further developments in the cab area that increase safety and comfort.

Efficiency advantage in extraction: New PR 766 G8 crawler tractor

Liebherr's fleet of Generation 8 earthmovers has a new addition: the PR 766 G8. With an operating weight of up to 55 t, it is also conquering the mining sector thanks to its "high drive".

Whether in material handling or mining: The multifunctional PR 766 G8 crawler tractor has enormous potential. Powered by an 8-cylinder diesel engine with a maximum output of 360 kW, it meets Stage V and Tier 4f emissions standards. A resource-saving powerhouse, because the drive components and the intelligent Liebherr engine management system are so perfectly matched that the diesel engine speed is constantly kept in the economically optimal range by the hydrostatic drive. In addition, the standard ECO function allows the operator to choose between high performance – including automatic Power Boost – and maximum economy, saving further fuel in light to medium-duty applications.

Optimised drive concept for heavy extraction operations
To make the PR 766 G8 fit for rocky terrain, Liebherr engineers have adopted the undercarriage concept of the larger 70-tonne crawler tractor. The oscillating idlers and rollers absorb shocks and provide very good traction for the track chains. Another plus: The raised position of the final drive. This "high drive" reduces wear on sprocket segments (Turas) and bearing bushes, and also protects the drive and seals from damage and contamination.

Intuitive operation with the best visibility
Operators find their way intuitively in the specially designed operator's cab: Driving and steering movements can be controlled using the joystick; the 9-inch touch display can be used to read all important machine parameters, conveniently set operating modes and operate safety functions such as the reversing camera.

Edges sloping to all sides, the panoramic glazing as well as the rockfall and cab protection (ROPS/FOPS) integrated directly into the cab structure provide an optimal all-round view of the terrain, the two available blades and the rear ripper. The modular lighting concept also ensures the best possible visibility with auxiliary headlights and 4,200-lumen high-performance LEDs.

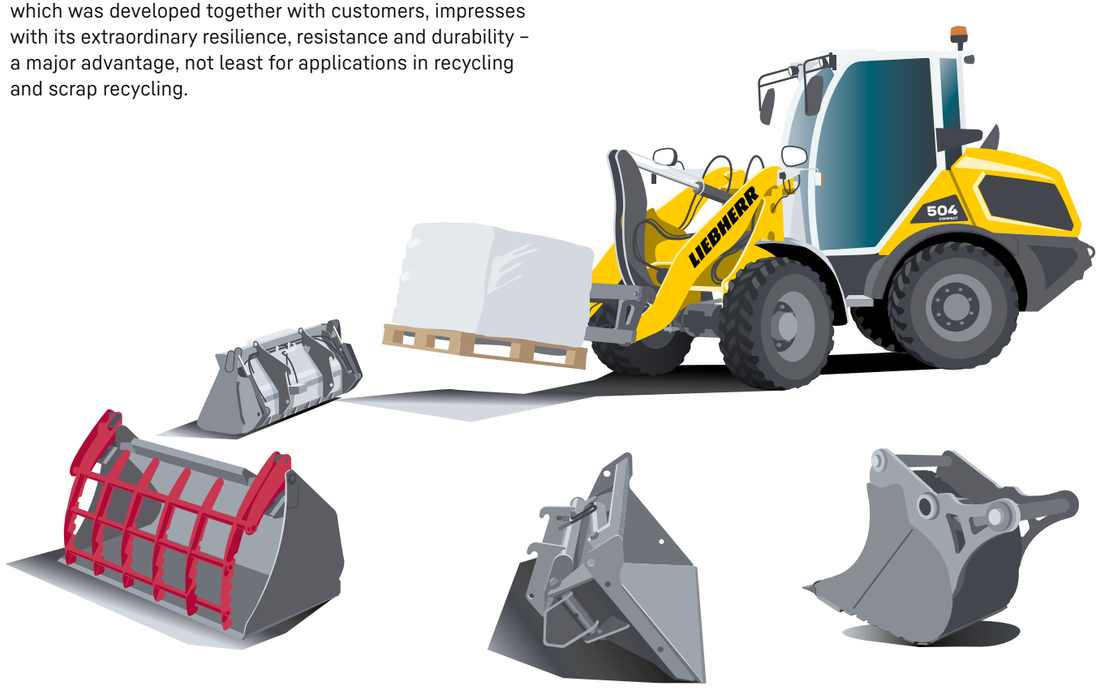
Clever solutions for the most diverse requirements – attachments and quick coupling systems

Innovative, diverse, top quality: The Liebherr Group will showcase its extensive product portfolio in the field of attachments and quick coupling systems at Bauma 2022 at its own booth in Hall B5 booth 439.

For civil engineering applications, Liebherr presents the TR 20B, among others, which, with its new cast housing and steel bushings, represents a new, even more durable generation of tilt rotators. Also on show is the Liebherr 2-in-1 bucket, which combines a backhoe bucket and face shovel attachment in one product. In the latter, the opening angle has been optimised so that the bucket can be fully used with all its advantages.

Liebherr engineers have developed a new multi-tine grab for the industrial material handling sector. The GMM 35-5 is equipped with the fully automatic coupling system MH 40C LIKUFIX® for quick attachment changes. The five-tine-grab, which was developed together with customers, impresses with its extraordinary resilience, resistance and durability – a major advantage, not least for applications in recycling and scrap recycling.

Quick and safe coupling – thanks to LIKUFIX®
Further information on the fully hydraulic Liebherr LIKUFIX® quick coupling system will also be available at the hall booth. In addition to the new LIKUFIX® 33-9, the company is using the example of the L 504 Compact to show how widely available LIKUFIX® has become: The fully hydraulic quick coupling system has successfully gone into series production for a majority of the wheel loader models.



Tailor-made for diverse markets

Liebherr has been offering a customised wheel loader series for markets outside Europe and North America since 2010. The L 550, L 566 and L 580, the three largest models in the range, have now been overhauled – they feature larger tipping loads and buckets, stronger engine power and a new electro-hydraulic pilot control. Together with the Liebherr crawler excavators, which are also available in these markets, they perform reliably for customers worldwide.

The three new wheel loaders are equipped with the efficient Liebherr hydrostatic travel drive. On the L 550, for example, the engineers have increased the engine output by 17%. This makes the machine even more powerful while maintaining low consumption. Liebherr installs the diesel engine in the rear, where it acts as a counterweight to help increase the wheel loader's tipping load.

Three lift arm variants are available for the new models: The z-bar linkage for high breakout forces, the industrial kinematics for working with heavy attachments such as high-tipping buckets or timber grabs, and the High Lift arm for loading operations that require high lift heights or more reach. Thanks to the new electro-hydraulic pilot control, all lift arm variants can be moved responsively, regardless of size and weight.

Clearly designed interior and exterior
The modern design language of the L 550, L 566 and L 580 has many functional advantages: The clean lines at the rear and large glass areas at the cab provide good all-round visibility; the new reversing camera allows an overview of the rear area. The height-adjustable high-resolution 9-inch touch display, which shows all information about the operation, is also clearly arranged. The Liebherr operating lever, in turn, enables delicate work movements. Hydraulic attachments can also be controlled precisely with the optional mini joystick.

Crawler excavators for all requirements
Liebherr also offers a wide range of crawler excavators with 30 different models to meet the specific requirements of the less and non-regulated markets. Either for demolition work, tunnel operations, earthmoving or quarrying, Liebherr crawler excavators are broadly adapted to all markets. These machines are based on the new generations of excavators, which have been completely redesigned with comfort, safety, ergonomics and productivity in mind.

One example of this is the R 928 from Generation 8 at the Liebherr booth. The R 928 G8 crawler excavator features high traction, excellent lifting capacity and a large backhoe bucket. The operating weight of less than 30 t was optimised with the aim of making transport logistics between operating sites as simple as possible.

At the Liebherr booth, the R 992 with its modernised appearance is once again a typical representative of Generation 6.2, which is distinguished by its lower diesel consumption, among other things. The new Liebherr crawler excavators R 972, R 978 SME, R 992 and R 998 SME replace the models R 966, R 970 SME, R 976 and R 980 SME. The new designation is directly related to the operating weight of the machines. A modernisation of the design language accompanies the renaming and underlines the relationship to the upcoming Generation 8 crawler excavators.

Material handling technology

Powerful duo

Grossarl (Austria): In the sawmill in front of the impressive Salzburg mountains, the L 546 wheel loader and the LH 35 M Timber material handling machine have only one thing on their minds: Maximum productivity when handling logs at the timber yard! For powerful operation with a timber grab, the new Generation 8 L 546 medium-sized wheel loader is equipped with a new lift mast with optimised Z-kinematics. The LH 35 M Timber also has equipment specially developed for timber handling that enables high payloads and long reaches.

Material handling technology

Material handling machines for a wide range of applications

Efficient material handling – in tree care, recycling as well as port handling operations.

Tree care and timber management with the LH 22 M Industry Litronic
Whether for maintaining forest roads, working on embankments, clearing roads or felling problem trees, Liebherr material handling machines can be optimally used in tree care and timber management in combination with the right attachments. One representative to be presented at Bauma is the LH 22 M with a wide range of matching attachments from both Liebherr and its cooperation partner Westtech. Equipped with the fully hydraulic LUKUFIX® quick coupling system, both Liebherr and Westtech attachments can be changed quickly, conveniently and safely from the operator's cab. The Liebherr SG 25 sorting grapple, which is also shown at the exhibition, can be used to remove cuttings, for example, or the machine can be used for other applications in typical recycling regardless of seasonal felling and cutting bans between March and October.

Liebherr LH 26 M Industry E electric material handling machine with battery-powered Mobility Kit
In addition to scrap handling, the LH 26 M Industry E electric material handling machine is also particularly suitable for recycling applications such as the handling, unloading or sorting of waste paper, waste wood, and waste materials. The innovative recycling package ensures high machine availability: The included reversible fan increases productive working time by allowing the cooler and protective grille to be blown clear by reversing the direction of the fan rotation. The separate position of the A/C condenser maximises airflow in the cooler and fan unit, ensuring high reliability even under extreme dust loads. The machine combines proven technology with a new electric drive concept: low-maintenance, low-noise and independent of statutory exhaust emission requirements. At its heart is the 90 kW electric motor. It enables powerful, dynamic working movements with low maintenance costs and low noise emissions. Furthermore, the drive concept includes an additional electric motor for auxiliary consumers, which ensures conscious energy distribution as well as maximum energy efficiency. For temporary, mains-independent operations, the machine is equipped with a battery-powered Mobility Kit.

LH 150 M Port E with new mobile gantry portal undercarriage
The machine was specially designed for handling bulk and general cargo in ports. With its electric drive and an operating weight of around 165 t, it impresses with its enormous performance and sets new standards in terms of economic efficiency. With the ERC system and a 400 kW electric motor, it can reach a total system output of 614 kW. One highlight is the new, mobile gantry portal undercarriage: Not only can it be used to efficiently load and unload trucks or wagons passing through, it also allows the material handling machine to be moved easily and quickly. Various steering modes enable a high degree of manoeuvrability.

Efficient and environmentally friendly

Low-emission drives for Liebherr telescopic handlers

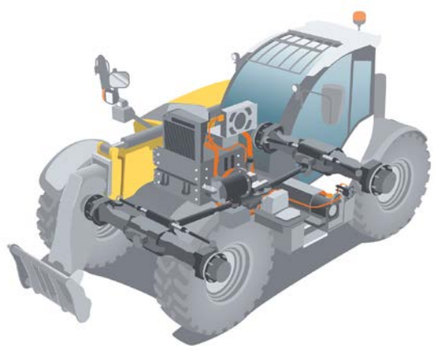
There is hardly any other product in Liebherr's earthmoving product segment for which the portfolio of international customer applications is as broad as that of the telescopic handler. Accordingly, local legal and infrastructural conditions make it difficult to provide a low-emission standard drive. At Bauma 2022, Liebherr presents three application- and market-optimised drive concepts for telescopic handlers.

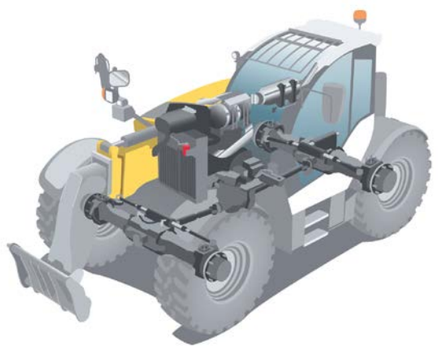
Telescopic handlers offer customers worldwide the greatest possible flexibility in lifting and transporting a wide variety of loads. Until now, the choice of the right model has been based primarily on the type of use. With growing demands on the environmental compatibility of the machines, new parameters come into view with the respective environmental regulations, the availability of fuels and infrastructures.

Same power, environmentally friendly fuel
Hydrotreated Vegetable Oil (HVO) is the first commercial fuel with which internal combustion engines can be operated in an almost climate-neutral manner, provided that the electricity for their production is generated from renewable energy sources. In addition to lower emissions, HVO offers good compatibility with all engine components and can also be blended with fossil diesel. A change is possible without new investments and even during ongoing telescopic loader operations – the drive concept remains without any loss of performance and requires no changes for technology and maintenance.

Local zero emissions with battery drive
A modular high-voltage battery concept with electric drive will be presented as part of the showcase. It is equipped with onboard charging electronics and is scalable depending on the application. Particularly suitable for indoor applications, the drive impresses with low noise emissions and vibration. Charging is possible without a special "power charger" and thus at any operation site – the overall efficiency can be further increased by energy recovery.

Liebherr hybrid concept guarantees range
The presented concept of a serial hybrid drive with "plug in" is intended to prove itself above all in industrial indoor/outdoor mixed operation. In addition to the advantages of battery operation, it guarantees higher performance ("boost") and more range because it accesses two parallel energy sources. Fuel savings of more than 20 % will be achievable due to the high overall efficiency as well as the energy recovery capability during braking and lowering of the boom.





Deep foundation machines

Shake it!

On a construction site in Eging am See (Germany), an LB 20.1 shows full commitment in the construction of bored piles. With full power, the Kelly auger penetrates the loamy soil and makes it dance wildly as it is shaken off. The LB 20.1 may be one of the smaller Liebherr drilling rigs, but it shines with its wide range of applications and high performance.

Deep foundation machines

A dexterous powerhouse

High torque, wide range of applications, helpful assistance systems: The LRB 23 piling and drilling rig proves to be a new multi-talent in deep foundation engineering. Its compact design allows it to be trans-ported in one piece, making it easy to move between construction sites.

With an impressive engine power of 600 kW, the LRB 23 delivers the capacity for all common deep foundation engineering applications, such as drilling with double rotary head, full displacement and continuous flight auger drilling, soil mixing or tasks with vibrators and hydraulic hammers. Since the all-rounder can withstand high torques of up to 300 kNm, even Kelly drilling is possible – a process that is so far unique for a device in this size class.

Assistants for more efficiency and safety
One challenge in Kelly drilling is the correct locking of the drill rod, the so-called Kelly bar. On the LRB 23, a real-time display on the cab monitor ensures that machine operators know the actual distance from the next locking pocket. A colour change signals when they can lock the bar and the numbering shows which locking pocket is next. If the Kelly bar is in the wrong position during the shaking off process, a warning signal appears. The Kelly visualisation also works for telescopic Kelly bars with multiple segments. With the help of the automatic shake-off system, the emptying process is triggered at the push of a button. The number and intensity of the left-right movements can be preset. This protects both people and the machine.

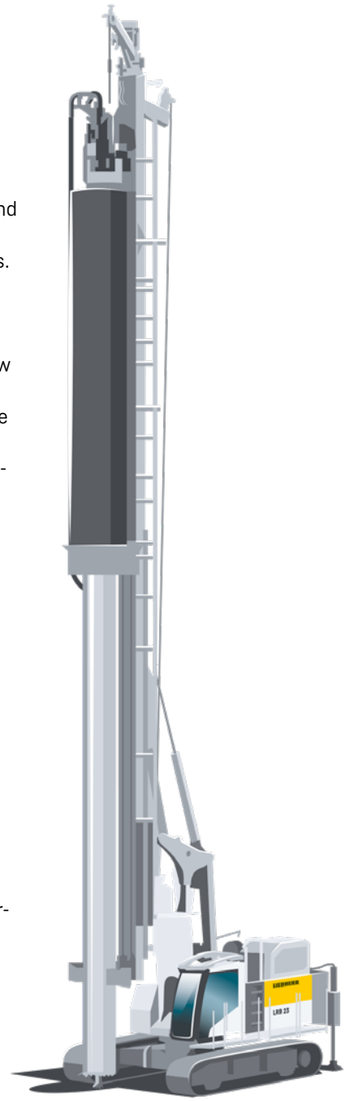
When loading the LRB 23, a remote control offers more safety: Because the operator can move around outside the cab, they have a better overview when manoeuvring. The view of possible collision points also makes it easier to raise and lower the leader.

The integrated drilling assistant regulates the thrust and speed of the feed system during drilling and matches them to the speed and torque of the drill drive. When pulling and concreting at the same time, the automatic control ensures that the optimum amount of material flows in.

The ground pressure display of the LRB 23 calculates the current ground pressure in real time and compares it with predefined safety limits of the respective construction site. The ground pressure is displayed in the operator's cab. This way the equipment operator knows at all times whether they are in or are approaching a critical range. With its high performance and tailor-made assistance systems, the LRB 23 stands for maximum precision, availability and safety in use.

Our application video shows why the LRB 23 is rightly called the new all-rounder in deep foundation engineering.

TO THE VIDEO →



Emission-free deep foundation engineering with four new unplugged models

Liebherr is expanding its range of electrified unplugged models with two new models each in the pile driving and drilling areas.

Since the alternative drive of the LB 16 unplugged quickly established itself as a game-changer in the market, the concept was transferred to other product areas. Today, crawler cranes, piling- and drilling rigs make up the electrified unplugged range.

All new unplugged models are available in both conventional and battery-powered versions and have identical performance data. The batteries are charged using conventional site power. During the charging process, operation can continue as usual. To enter battery mode, only the plug has to be pulled out, hence: "unplugged". Whether plugged in or unplugged, the performance and range of applications remain unchanged.

Pile driving: LRH 100.1 unplugged and LRH 200 unplugged
In the two new additions, the LRH 100.1 unplugged and LHR 200 unplugged, a battery pack with 200 kWh enables an average pile-driving operation of four to five hours. It can be optionally upgraded to eight to ten hours of battery operation. In addition to pile driving, the new concept of the LRH 200 also extends its range of applications to drilling operations with continuous flight auger, full displacement equipment or down-the-hole hammer as well as wet mixing. A torque of 250 kNm provides the necessary power.

Drilling: LB 25 unplugged and LB 30 unplugged
The proven LB 25 and LB 30 drilling rigs are now also available as unplugged versions – with the identical performance data and application possibilities in deep foundation engineering, whether in battery or cable operation. The battery is designed for a working time of four hours in Kelly use.

The optional extension of the drilling axis allows the machines to be used for drilling diameters of up to 3.4 m. The optional rear support and the new design of the modular rear ballast provide more stability and a longer service life. Both units are available with a total height of 14.1 m as Low Head or only 7.7 m as Ultra Low Head, in addition to the standard configuration.

Zero emission – powerful and quiet
The battery-powered Unplugged machines do not produce any exhaust gases and are very quiet. This makes them particularly appealing to construction site personnel and residents in noise-sensitive regions. The concept is already being successfully implemented in large cities such as London, Paris or Oslo.

Mobile and crawler cranes

Alpine crane job

Not far from the sophisticated St. Moritz (Switzerland), an LR 11000 is in use for the replacement of a total of three railway bridges. Before the new steel structure can be placed, the old, around 100-year-old truss construction must first be removed. A particular challenge: the cramped space conditions at the first bridge structure. But the crawler crane defies the odds and proves that it can master any job.

The crane of the future is already here: the LTM 1110-5.2 with LICCON3 control system

In the LTM 1110-5.2, Liebherr combines numerous innovations into a completely redesigned mobile crane concept. In addition to a simple, intuitively operated new control system, this includes numerous innovations for more safety and comfort. Smart technology in the undercarriage rounds off the overall concept and makes it what it is: the crane of the future.

The LTM 1110-5.2 represents the future of the all-terrain series – with a new crane control, new cab and new transmission. The LTM 1110-5.1 was presented at Bauma 2019. Now this crane is already available as a LICCON3 crane with the name LTM 1110-5.2 and is the first Liebherr model to feature the new LICCON3 crane control system, a design award-winning cab and the innovative TraXon DynamicPerform transmission.

LICCON3 control system – still familiar but made for the future
At first, crane operators will not notice any great difference in the functions of the crane control, because in the development of the third generation of the LICCON control (Liebherr Computed Control), the developers also relied on the proven operation and a high recognition value. At the same time, it scores with a faster data bus, significantly more memory and higher computer performance. This means it meets the requirements of the future. LICCON3 cranes are prepared for telemetry and fleet management as standard. In future, all relevant data can be viewed and evaluated via the MyLiebherr customer portal.

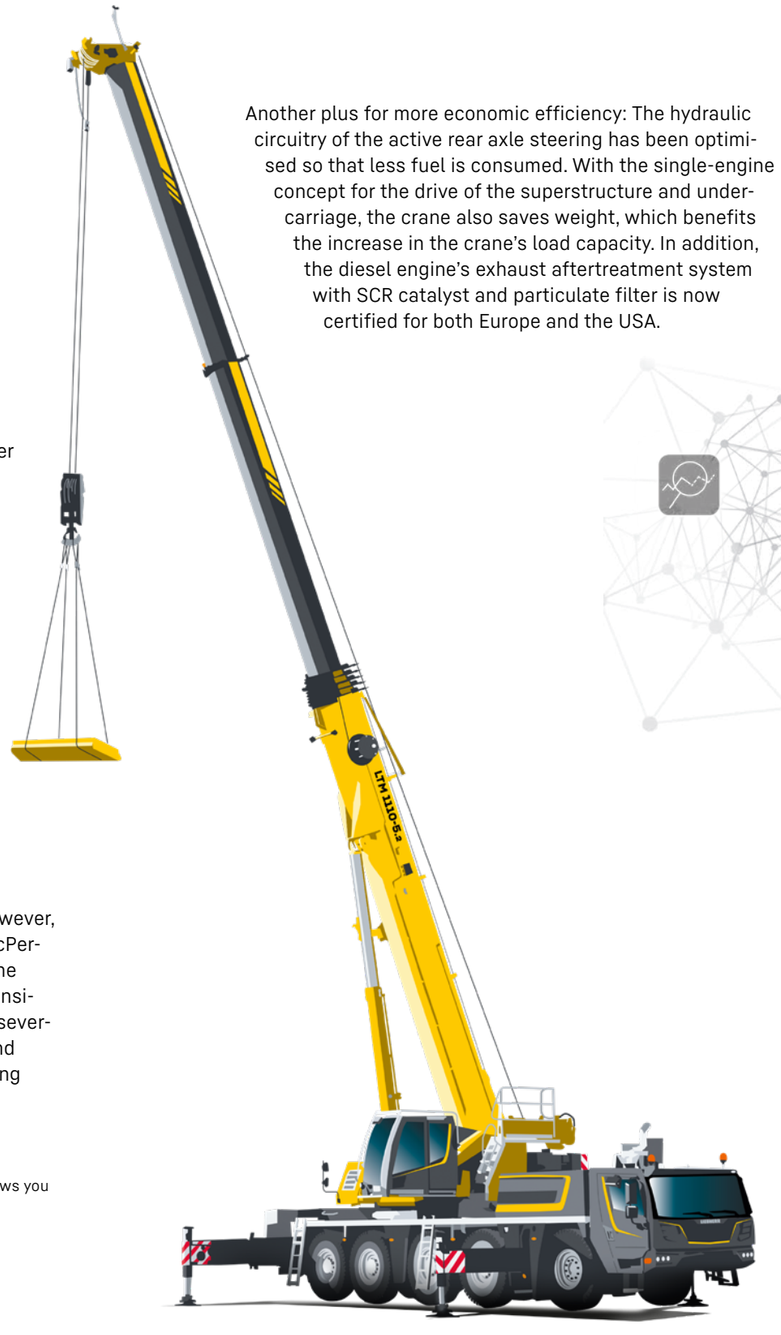
Feel-good cabin for everyone
The most obvious element of the new control system in the upper cabin is the new large display with touch function. This offers the possibility of even easier and more comfortable crane operations without having to change the seat position. In addition, more information is available in the operating and display units on self-explanatory symbols. The holders and USB charging options for tablets and smartphones are also practical. The design of the cab is characterised by a combination of functionality and comfort – including a drinks cooler – and was already rewarded with the renowned American GOOD DESIGN® Award in 2020. In the process, after the presentation of the cab prototype at Bauma 2019, numerous suggestions for improvement from visitors and customers were incorporated into the series model. A new automatic heating and air-conditioning system provides a pleasant feel-good climate at the touch of a button – in summer and winter – and the radio-controlled central locking system and integrated access lighting on the ascent to the upper carriage ensure safety. Another plus for work safety is the optional LED lighting, which illuminates the crane and its surroundings very well in the dark.

VarioBase® Plus, ECOmode, Hillstart-Aid and the new TraXon gearbox
Pioneering technology was also used in the chassis: VarioBase® Plus – a combination of VarioBase® technology and the crane's steel construction – ensures even higher load capacities, especially over the rear outriggers. ECOmode and ECOdrive minimise fuel consumption and noise emissions when operating the crane superstructure and on the move. And Hillstart-Aid makes hill starts easier.

The main innovation in the LTM 1110-5.2's driveline, however, is the use of the TraXon gearbox with the new DynamicPerform clutch module. A new feature of this gearbox is the oil-cooled multi-plate clutch, which has now been intensively tested and is ready for series production. With it, several starting processes are possible, even on inclines, and permanent manoeuvring is possible without overheating and wear of the clutch.

The LTM 1110-5.2 comes with numerous innovations – our video allows you to experience the crane of the future up close.

TO THE VIDEO →



Another plus for more economic efficiency: The hydraulic circuitry of the active rear axle steering has been optimised so that less fuel is consumed. With the single-engine concept for the drive of the superstructure and undercarriage, the crane also saves weight, which benefits the increase in the crane's load capacity. In addition, the diesel engine's exhaust aftertreatment system with SCR catalyst and particulate filter is now certified for both Europe and the USA.

New: Liebherr fleet management for mobile and crawler cranes

ZAt Bauma 2022, Liebherr will present its fleet management solution for mobile and crawler cranes – with live data and reports on location, diesel consumption, CO_2 emissions or even the current load on the hook and the wind speed on site. Many new cranes will receive this equipment as standard with immediate effect, while Liebherr is also working on retrofit solutions for cranes in the field. And best of all: Liebherr covers the telecommunications costs. It could hardly be easier to enter the world of telemetry.

The Liebherr fleet management solution allows customers retreive data on their machines at any time. This makes it possible to quickly determine where they are at the moment, whether the wind conditions there allow safe working and how high the fill level and the consumption of fuel and AdBlue are. If the level falls below certain limits, the system informs the user.

Fast construction site reports – thanks to geofencing and MyLiebherr
It was important to the developers to offer exactly the data with which customers can manage their machine fleet sensibly and operate it economically. So-called geofencing allows certain areas to be defined on a map, for example a construction site. As soon as a crane is located there, all data is assigned to this area. The subsequent analysis of operating hours, diesel consumption or CO_2 emissions serve to considerably simplify the billing of operations and the creation of certain reports.

The whole system is based on the proven customer portal “MyLiebherr”. It has been fundamentally modernised and will be successively made available to all customers with the new functions from 2023. All the machines in the fleet will then be clearly listed on the start page. All in all, the “Performance” area now forms a comprehensive fleet management system.

The right solution for every crane
Liebherr cranes will in future have the mobile modem required for telemetry as standard. For models built up to ten years ago, Liebherr will in future offer retrofit solutions so that they can also be integrated into the fleet management system.

An easy start – without telecommunication costs
With the new Performance World, Liebherr offers an all-round carefree package from the modem to data transmission and display. To make it easy to get started, Liebherr equips all of its modems with a data SIM card – and covers the costs, regardless of the country in which the crane is operated. Expensive surprises due to roaming are thus ruled out for Liebherr customers.

New champion in its weight class

The latest member of the Liebherr LR 1400 SX crawler crane series is a 400 t capacity crane specially designed as a multipurpose crawler crane. The diversity of its range of applications and its flexibility are as great as its stature.

Thanks to its compact design and a transport weight of the superstructure of around 46 t, the crane can be easily moved between construction sites. The platforms and railings remain mounted on the superstructure during road transport and only need to be folded in or out – the maximum transport width is just 3 m. The possibility of track adjustment simplifies access on narrow paths. The crane also shows how flexible and mobile it is in the tightest of spaces: The four drive motors of the crawler carriers make it easier for the LR 1400 SX to manoeuvre on construction sites with little space.

With a wide range of boom systems and configurations, the crawler crane is ready for use on a wide variety of construction sites. The self-assembly system, which can be operated via remote control, enables safe and quick assembly and disassembly of all main components, such as the crawler, the central and rear counterweight as well as the two hoisting winches and the boom elements.

You can also see which features particularly characterise the LR 1400 SX in our animation video about the new champion in its weight class.

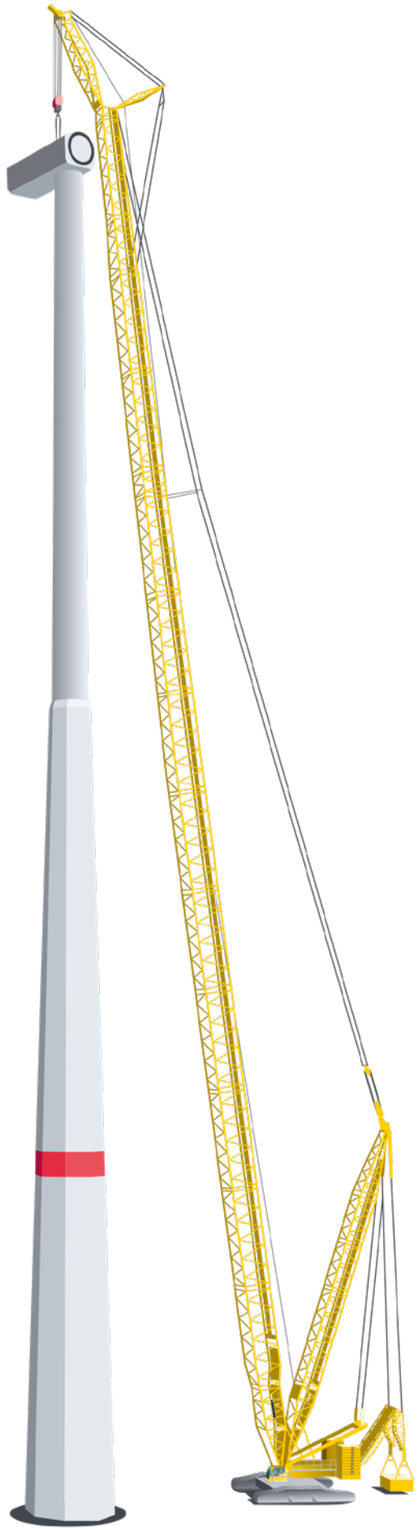
TO THE VIDEO →

Safe in all circumstances
The crane’s developers paid special attention to the safety concept. The “Gradient Travel Aid“ assistance system helps to navigate slopes and inclines. It automatically calculates the machine’s centre of gravity and warns the operator before they leave the safe area.

For changing wind speeds, the appropriate and approved load curve can be selected at the touch of a button on the monitor. The control system also automatically assigns an appropriate load curve for different driving speeds, operating modes or bar inclinations.

The ground pressure display of the LR 1400 SX calculates the current ground pressure in real time depending on the position and configuration of the crane and compares it with predefined safety limits of the respective construction site. This makes it clear at all times whether the crane is in a critical area or approaching one. With the help of the new, hydraulically activated ground pressure reduction plates, the ground pressure can be reduced by up to 56 %.

For the staff, safe and non-slip access to the cabin is provided by a comfortable folding staircase and illuminated platforms. Because this avoids the need to enter via the floor panels, the LR 1400 SX meets the highest possible safety standard in this respect.



The new 700-tonne class

The LR 1700-1.0 combines the advantages of the economical transport of crawler cranes in the 600-tonne class with the performance of 750-tonne lattice boom cranes – and is thus ideally suited to the height and weight of current wind turbines.

The key to the higher performance of Liebherr’s new 700 t crane is the completely redesigned base machine, which offers up to 15 % more lifting capacity. In addition, 3.5 m wide H-lattice sections in the lower section of the main boom significantly improve the lateral stability of the entire system. The dimensions of the new crawler crane are based on those of its predecessor, the LR 1600/2, thus ensuring efficient transport of the individual components. To minimise wear when moving the crawler undercarriage, the steel construction of the crawler girders has also been made particularly robust and the travel gear has been enlarged.

Powerful and user-friendly
The LR 1700-1.0 has all the innovations of the Liebherr crawler crane developments of recent years and thus has some time-saving features on board. The modern derrick system with V-frame and separable VarioTray enables flexible operations without time-consuming ballasting. With a main boom length of 165 m and a 12 m fixed jib, it is well equipped for load cases of around 100 t at 160 m height. A large number of components from the LR 1600/2 can be used for the LR 1700-1.0.

Top performance with fixed jib
With the growing demands in wind power – ever higher, ever heavier – the importance of fixed jibs is also increasing. They are used when an interfering edge requires an angled lattice jib and higher lifting loads and heights are needed. Liebherr has therefore consistently further optimised this component. The fixed jib of the LR 1700-1.0 has a capacity of 170 t, is available in three-metre increments of lengths from 12 to 39 m and can be mounted at three operating angles. Even the smallest angle creates sufficient clearance for the assembly of wind turbines. The larger angles are used for industrial applications with longer jibs.

Want to experience the LR 1700-1.0 in action? Follow the exciting premiere of the new Liebherr crawler crane during the assembly of a wind turbine here.

TO THE VIDEO →

Concrete technology

All-rounder in operation

Whether concrete work in the tightest of spaces or on narrow, winding roads: The 36 XXT truck-mounted concrete pump combines maximum flexibility with maximum usability – compact on the road, versatile on the construction site. Here, against the backdrop of an approaching thunderstorm, the multi-talent makes its way to its next assignment – whatever challenges may await, the 36 XXT is a machine for all situations.

Concrete technology

Variety on wheels – hydraulic and electric

From its origins in Bad Schussenried in Upper Swabia to the whole world: Since its beginnings in 1967, Liebherr has delivered well over 100,000 truck mixers from its manufacturing plants in Europe, Asia and South America. Over the past six decades, the product range of mobile concrete mixers has been vastly enhanced – and further developed: The latest models in the extended family are equipped with an electric drum drive.

Variety and flexibility have always been part of Liebherr's truck mixer portfolio, as has its continuous development. The fifth generation of truck mixers, which is now in service on construction sites around the world, bears witness to this. In doing so, Liebherr engineers also keep a constant eye on the changing requirements in terms of climate protection, resource conservation and noise emissions. Their answer: the Electric Truck Mixer (ETM) series. In terms of performance and availability, the electric drum drive is in no way inferior to its counterpart from the conventional Hydraulic Truck Mixer (HTM) series. Due to the built-in generator, the battery is charged by energy recovery while driving. If energy is also required, it can be recharged in less than an hour using a 22 kW charger.

Electric truck mixer up to 12 m³

The electrically driven truck mixers were presented for the first time at Bauma 2019. Since then, the development departments have been consistently expanding this product range. The newly developed combination of electric motor and mixer gearbox offers a peak output of 120 kW, enabling drum sizes of up to 12 m³ to be driven. The electric mixing drums can be mounted on both conventional and electric chassis. Liebherr now presents another combination with the ETM 1005 T semi-trailer: an electrically driven mixing drum paired with a gas traction engine – a combination that reduces emissions to a minimum.

Semi-trailers and conveyor belts as additional features

The HTM and ETM truck mixer product range includes modifications that are perfectly matched to the vehicles in the form of semi-trailers and conveyor belts. During peak order times, the fleet can be flexibly adapted with the help of the semi-trailers thanks to their higher transport volume and greater permissible total weight.

The LTB conveyor is another long-established addition to the truck mixer fleet – not least because it is compatible with both fixed superstructures and semi-trailers. Ready for use in just a few minutes, it bridges the last few metres on the construction site and can transport not only concrete but also other materials such as sand, chippings, gravel, mortar and much more directly to the desired location.

One machine for everything: The new generation of mixing plants

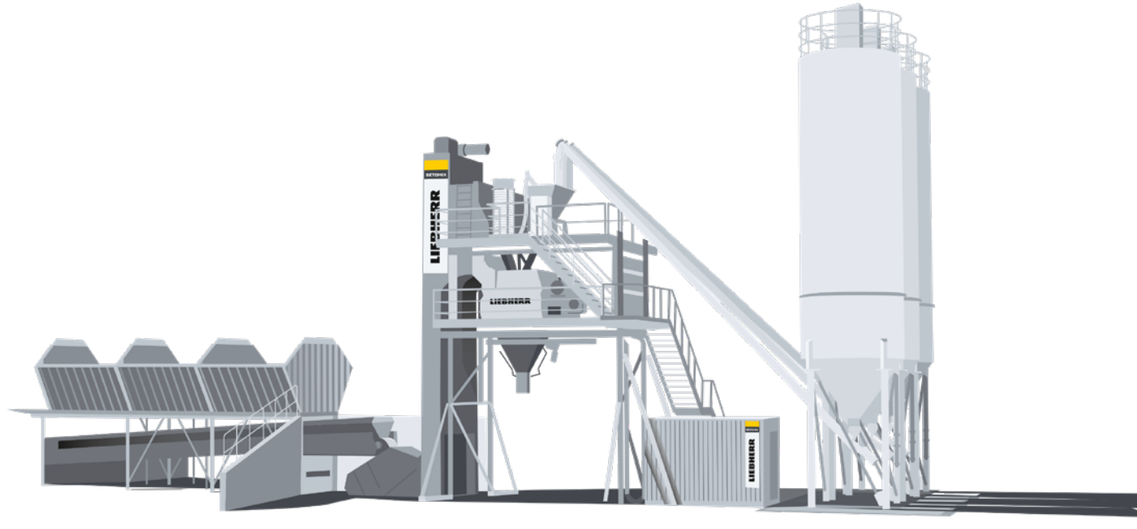
Modular, versatile, environmentally friendly: Development engineers from the concrete technology product segment spent two years tinkering – now they are presenting the new generation of mixing plants. The new edition of the Betomix is now accompanied by a mobile version, the Mobilmix, which can be quickly moved from one construction site to the next. Both variants will be available from 2023.

The core of the new generation of mixing plants is an innovative modular system whose prefabricated modules can be combined flexibly and individually. This makes the completely revised new edition of the stationary Betomix and its mobile counterpart Mobilmix the one, universal solution for all requirements. The individual modules can be planned and manufactured independently of each other. Almost completely wired at Liebherr and fully assembled, they are delivered to the construction site as complete transport units. There, thanks to a sophisticated folding system on steel foundations with an integrated technology container, the customised plants can be set up and put into operation within a very short time.

More freedom with Betomix and Mobilmix

More freedom in configuration, shorter delivery times, faster assembly and high parts availability – the advantages for users are obvious. But the two innovative mixing plant series can do much more: Frequency converters control the drives on the mixer and feeder lift for a holistically optimised mixing process. The result is up to 30 % lower energy consumption. In addition, hybrid mixing processes and shorter mixing times are possible. Wear is also reduced by the smooth starting and stopping of the drives. The decisive plus, however, is the dosing accuracy of the frequency converters of the cement augers, which is plus/minus 0.5 %. In a typical formula with 300 kg of cement, up to 7.5 kg of cement can be saved per m³ of concrete – from an ecological and entrepreneurial point of view, this represents resource conservation at its best.

Depending on the application, different mixer systems can be installed in the same basic system. Liebherr uses its own twin-shaft or ring-pan mixers, with output rates of 100 to 210 m³ of compacted fresh concrete per hour. In addition, various storage options such as high silos can be simply "attached" to the respective Betomix or Mobilmix system, as can the feeder lift. Its vertical design reduces the space required for the installation area by up to 20 %.



The 36 XXT truck-mounted concrete pump – compact all-rounder

The 36 XXT truck-mounted concrete pump combines proven technologies with innovative new developments, making it a true all-rounder. The multifoldable 5-part placing boom alone makes many things possible: Ending with the feed hopper without overhang, it shortens the machine enormously, thus ensuring manoeuvrability and agility in road traffic, on construction sites and in buildings. Especially in buildings, the low unfolding height of only 7.2 m is a great advantage. In combination with the further developed Powerbloc concrete pump drive including the patented semi-closed oil circuit HCC, the placing boom allows efficient, reliable, low-vibration and uniform concrete placement. The swivelling XXT support jib ensures stability – even in confined spaces. Thanks to the new XXA stability control, many additional outrigger variants are possible, including partial outrigger areas for the first time. The 36 XXT can be operated safely and intuitively. The modern radio remote control, for example, not only enables delicate mast movements, but also shows the authorised slewing range of the placing boom on the colour display.

Performance of an all-rounder: The 36 XXT truck-mounted concrete pump demonstrates its flexibility and manoeuvrability in use in our video.

TO THE VIDEO →

Components

For all purposes

Liebherr offers a comprehensive range of high-performance components in the field of mechanical, hydraulic and electrical drive control technology. Whether cranes, earthmoving machines, vehicle technology, mining or maritime industry, wind turbines, aerospace or transportation systems: The high-quality components are used in numerous industries and application areas – by the Liebherr Group and by external OEMs around the globe.

Components

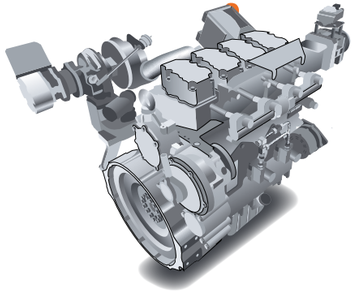
Foresight through digitisation

At Liebherr, digitisation is making great strides in all areas.

The camera-monitor-systems and surround vision solutions of the LiXplore® product line are based on digital camera technology. These assistance systems feature a higher resolution, and thus a detailed view of the working environment outside the cab. For people operating a mobile machine, this means an increase in efficiency and work safety. The Liebherr IoT solutions also ensure greater data security. The integrated, digital wear measurement system for optimum monitoring of slewing bearings, bearing clearance monitoring (BCM), the force sensor for hydraulic cylinders and digital condition monitoring for combustion engines also contribute to greater safety, higher performance and a longer service life for machines.

Technology-open approach with alternative drive concepts

The optimum drive has a decisive influence on the efficiency of the work. The heterogeneous fields of application typical of construction machines require the most suitable type of drive for the specific application and location, in order to ensure the greatest possible machine efficiency.

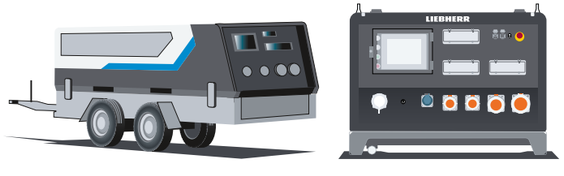


With this in mind, Liebherr is developing engines with a high efficiency and very low pollutant emissions. The first hydrogen engine prototypes by Liebherr, the H964 and H966, are in development with the aim to offer reduced CO_2 and No_x

emissions while delivering an equivalent overall performance as a diesel engine, both in terms of power output as well as engine dynamics and responsiveness. Liebherr also addresses the issue of decarbonisation in the further development of the combustion engine and offers various injection solutions for hydrogen. The system approaches to port fuel injection (PFI) and low-pressure direct injection (LPDI) are based on a common, scalable injector platform. A wide range of applications is possible for medium and heavy-duty engines, as well, as large engines in the 7 to 100 l displacement range.

To optimise the operating performance of hydrogen-powered commercial and construction vehicles, Liebherr is also developing electric turbo compressors. The air compression ensures a higher oxygen partial pressure, and thus a higher power density. The Liebherr system approach with the integration of compressor and power electronics enables weight and cost savings, as well as reliable technology that is easy to integrate into the vehicle.

The mobile Liebherr energy storage systems will ensure zero-emission operation of electrified or hybrid-powered construction sites locally in the future. The challenges for all-electric or hybrid-powered construction sites are operation of machines at maximum power, the charging of all machines during break times or the smoothing of power peaks on construction sites with limited grid supply. Liebherr meets these challenges by developing energy storage systems with the highest power density, efficiency and quality.



Innovative, efficient and open to technology into the future

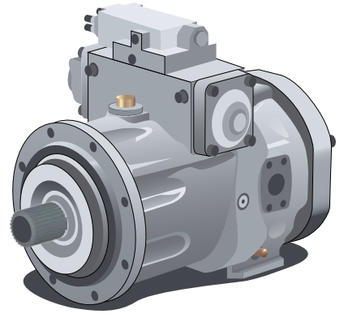
Liebherr takes its product responsibility very seriously. The aim of the Liebherr Group is to offer its customers safe, efficient and environmentally compatible products in the long term. To this end, Liebherr works on solutions that meet both work and environmental requirements at all times.

Available anytime and anywhere – this is one of the approaches Liebherr is pursuing with the new online configurator for hydraulic cylinders. In future, all products in the standard series can be configured conveniently via the Liebherr website and, for example, downloaded as 3D models. All cylinder variants can be requested directly and easily via the configurator – Liebherr also ensures rapid availability of quotations within one working day.

Hybrid cylinders as part of the fibre composite portfolio ensure greater effectiveness and efficiency in mobile and stationary applications. By using the lightweight component, performance can be increased, or fuel consumption reduced thanks to weight savings.

With the help of a new type of force measurement in the hydraulic cylinder, static and dynamic tensile and compressive loads can be measured precisely and dynamically. A sensor for this is currently in prototype status. The results enable greater efficiency and safety in a wide range of mobile and stationary applications.

Liebherr axial piston hydraulics also offers flexibility in the application. For instance, the LH30VO line with nominal sizes 28, 45 and 85 is extended by the nominal size 100. It is characterised in particular by a modular option for the controller axes and a high degree of flexibility for the through-drive concept. In addition, the nominal size 550 (also as double pump 1,100 cm^3) supplements the selection of open circuit pumps. During the development of this nominal size, the focus was on robustness. This leads to high availability and durability in various applications.



The newly developed combustion engine for off-road applications, the D976, also stands for individual customisation possibilities. Thanks to its high power density, robust design and a wide range of options, it is perfectly suited to the toughest environmental conditions and offers an ideal solution for a wide range of industries and applications. As the engine is compatible with Hydrotreated Vegetable Oil (HVO), operators can reduce their emissions by up to 90 % when using the alternative fuel instead of diesel. Thanks to the Liebherr Reman programme, customers benefit from cost-efficient purchase prices, fast and long-term spare parts availability and original quality. The reconditioning of used components into as-new parts also has an ecological effect: Up to 78 % of raw material can be saved and the CO_2 footprint can be reduced by over 50 %.

The most powerful Liebherr rotary drives, DAT 1000, are another exhibit highlight. They are specially designed for heavy-duty applications in the highest quality with design and process expertise. With their immense power, they are nevertheless relatively compact in design and can be individually adapted. They are indispensable, for example, when it comes to implementing the rotary movements for a heavy-duty crane that can lift several thousand tonnes.

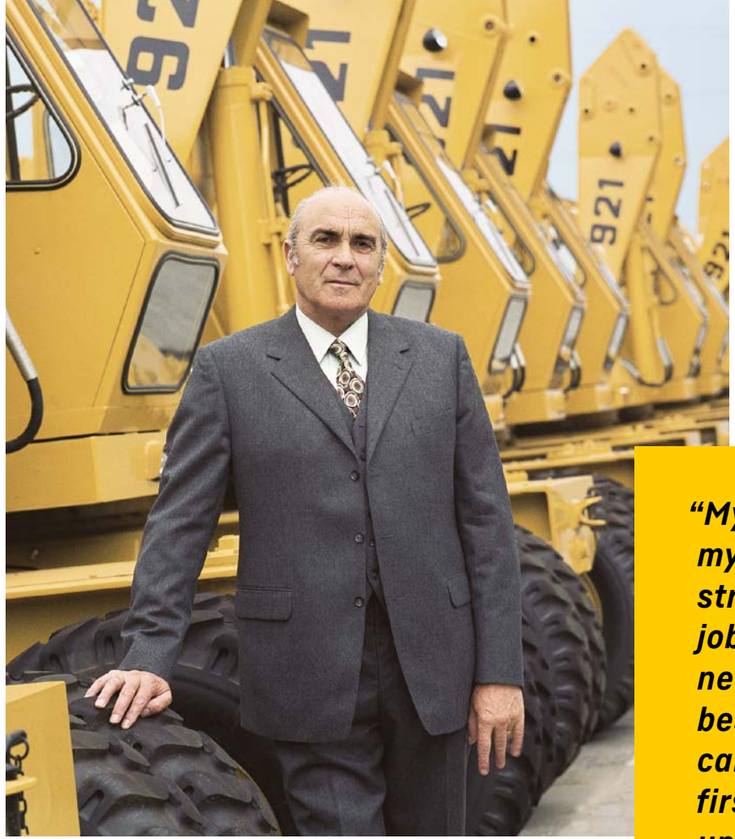
Always on your site: Components made by Liebherr thus create an all-round carefree package for the entire life cycle of your machines.

The Liebherr Group

Founded in 1949 by Hans Liebherr, the family-run company has developed into a globally operating Group that today comprises over 140 companies on all continents and employs almost 50,000 people. In 2021, Liebherr generated a total consolidated turnover of more than 11.5 billion euros.

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. With a broadly diversified product range comprising a total of 13 product segments, Liebherr plays a key role in shaping technological progress in numerous industries. The holding company of the Liebherr Group is Liebherr-International AG, based in Bulle, Switzerland, whose shareholders are exclusively members of the Liebherr family. For the company, long-term success, sustainable development, stability and reliability are what count.

Liebherr develops and manufactures an enormous variety of fascinating products that have made a name for themselves on world markets with their high precision, excellent implementation and remarkable durability. With its innovations and visionary technologies, the company strives to inspire its customers and continually redefine the limits of what is possible. The strictest quality standards apply here, and customer satisfaction is the focus of all solutions. 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 almost unimaginable. They all share a passion for technology and exciting products, as well as a determination to excel for their customers. Working together to achieve ambitious goals creates a strong bond that employees can rely on – across national boundaries and continents.



"My life has strengthened my belief that with a strong will to do a good job and meet the varying needs of customers to the best of your ability, you can achieve goals that at first seem almost unimaginable."

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



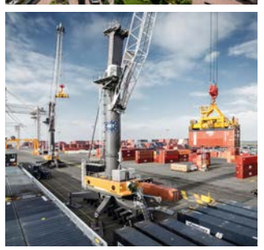













Highlights from the other product segments

Gear technology and automation systems

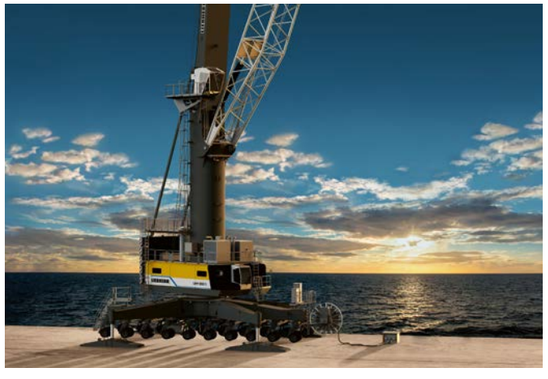
Liebherr Academy “Gear Technology” goes digital

Everyone is talking about digital learning – Liebherr is demonstrating it: Training courses on topics related to gear cutting technology now also take place as interactive live online training courses. Participants can connect from anywhere and, if required, also receive virtual training on the modern, fully equipped machines in Liebherr-Verzahntechnik’s Machine Training Centre (MTC). During the training session, the trainer can display the controls and the workspace of the machines accordingly via several cameras. Smaller learning groups also enable an interactive learning dialogue with the trainer.

Maritime cranes

New mobile harbour crane product line

The Liebherr mobile harbour crane series is gearing up for the future: The new LHM is equipped with additional digital features, even greater efficiency and a modern design. A new crane control system, extended sensor integration and digital information transmission enable future assistance and semi-automatic systems. In addition, the Liebherr Pactronic hybrid system and the cab were improved according to customer needs.



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Aerospace

First complex 3D printing for Airbus

After Liebherr-Aerospace began serial production of 3D-printed parts in 2019 and printed proximity sensor bracket for the nose landing gear of the A350 was successfully certified and delivered, Airbus and Liebherr are now launching a more complex component for the same aircraft: Liebherr supplies the lower cargo door actuator and valve for the A350 fleet. The complex valve is manufactured using the 3D printing process (Additive Layer Manufacturing) – yet another milestone and further evidence of the joint commitment of both companies to introducing pioneering innovations.

Transportation systems

New air-free Brake System for Siemens

In close cooperation with Siemens Mobility, Liebherr has developed a compact, closed, electro-hydraulic brake actuator – it contains all the components necessary to build up and release the brake force as well as those required for local control and meets the highest safety requirements. Siemens Mobility is implementing the new brake technology for the first time in the “X-Wagen” metro project in Vienna (Austria). This means that the company Wiener Linien is the first transit authority in the world to benefit from this brake system – both in conventional operation with drivers, as well as in the future on the new, fully automated U5 line.

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Hotels

Expansion of the Löwen Hotel Montafon

New architecture, stylish interior design, gastronomic delights and the return of a legend: Since March 2022, extensive construction work has been underway at the Löwen Hotel Montafon in Schruns (Austria), where an extension is being built. “Haus Montafon” offers 23 additional rooms, an expanded gastronomy area and four conference rooms with a breathtaking backdrop and will be gradually put into operation by the beginning of 2023. But the highlight awaits in the basement: The “Löwengrube” will be reopening its doors in a cosy setting with a dapper, snug atmosphere. From 1974 to 2003, the legendary dance hall was known far beyond the country’s borders: Udo Jürgens opened the club with Greek wine and the young Falco also rocked the whole of Schruns in the Löwengrube.

Refrigerators and freezers

The BluRoX revolution

In 2022, Liebherr-Hausgeräte introduced its new and unique vacuum perlite technology BluRoX. This makes it possible for the first time to manufacture freezers in the top energy efficiency classes. Perlite is a volcanic rock that is used to stabilise the vacuum body. It is also recyclable and can be reused without major processing. From January 2023 the FNb 5056 hybrid device, the door of which is equipped with the patented BluRoX technology, will mark the start of this revolution. It will be the first device of its kind in the world to bear the “B” efficiency class rating according to the EU energy labelling legislation.

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