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# Groundbreaking

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The latest from Liebherr Mining

2 | 2023

**LIEBHERR**







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## The world of Liebherr

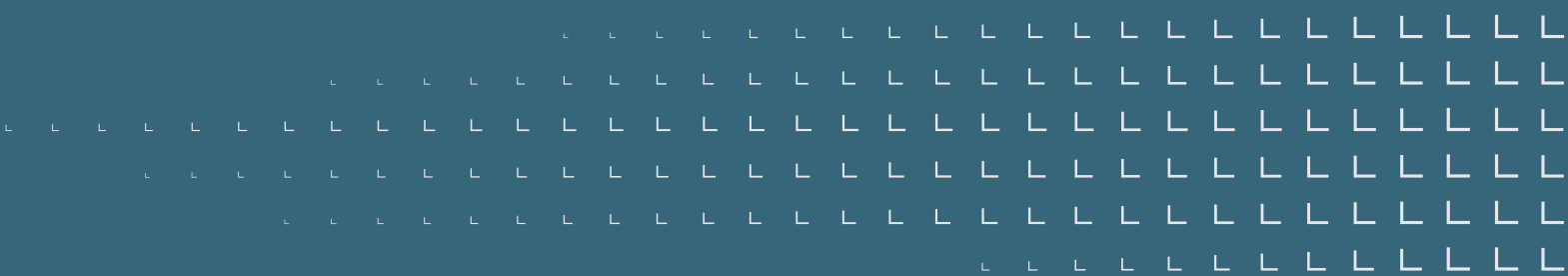
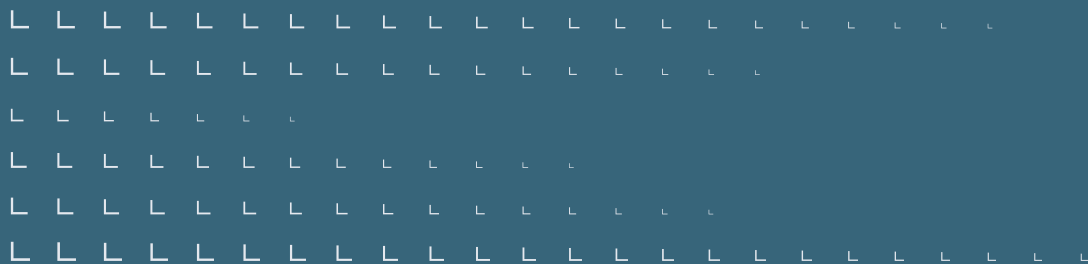
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# The latest scoop

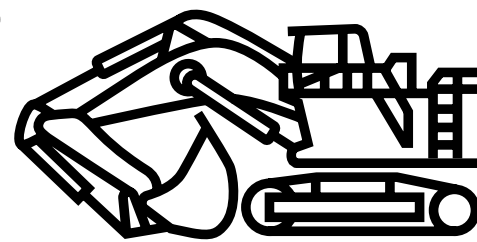
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Key updates from Liebherr Mining



# Introducing the R 9300 G8

Say hello to the R 9300 Generation 8 excavator! This impressive machine will replace the R 9250 in the 250-tonne class within Liebherr Mining's extensive excavator product range.



**+25 %** fuel efficiency

**-15 %** fuel consumption

**+5 %** productivity

**-20 %** cost per tonne

*\*all figures compared to R 9250*



## Operating weight

Backhoe:

**252**

tonnes

Face shovel:

**253**

tonnes

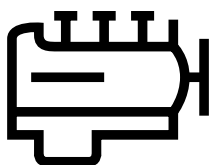
## Powertrain

Engine power (SAE J1995):

**1,007**

**kW**

at 1,800 rpm



For more information about the R 9300, [click here!](#)



## Bucket capacity

Backhoe: **16.5 m<sup>3</sup>**

Face shovel: **16.0 m<sup>3</sup>**

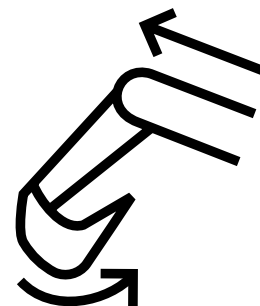
## Forces

Breakout force (backhoe and face shovel):

**885 kN/980 kN**

Digging force (backhoe): **810 kN**

Crowd force (face shovel): **1,265 kN**



# Next-level efficiency

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The new R 9300 G8 250-tonne excavator was first presented to the mining industry at the 2022 Bauma exhibition in Munich, Germany, and then introduced to the market in June 2023. We're so proud of this machine that we wanted to share some of the features that make it so impressive!



[Click here to discover how the R 9300 performs on site!](#)



## **1 The R 9300 G8 does more with less fuel**

We used a range of innovations in the design of the R 9300 to provide our customers with the best possible fuel efficiency.

Decreasing pressure loss in the hoses of the hydraulic circuit was one of the design innovations that helped us to improve fuel efficiency in this excavator. To accomplish this, we minimised bends within the circuit and used hydraulic hoses with a larger diameter than those in the R 9250.

Additionally, we reduced the amount of oil required by auxiliary systems – such as air-conditioning in the cab – to help optimise fuel efficiency by dedicating as much engine power as possible to the hydraulic pumps.

Liebherr Power Efficiency – our proprietary engine and hydraulic management system – was another of the design innovations that aids fuel efficiency. This system substantially reduces fuel consumption by using sensors and piloting signals to automatically adapt the R 9300's engine and hydraulics to different working phases, while also decreasing its engine load profile.

With these innovations, the R 9300 provides a 15% reduction in fuel consumption, compared to the R 9250. This reduction also contributes to a 25% increase in fuel efficiency compared to our previous 250-tonne excavator.

We have also ensured that the R 9300's engine complies with the most stringent emissions standards. To further aid these efforts, we are currently developing an electric-drive version that will become available in the near future!

## **2 The R 9300 G8 has a new and improved attachment design**

The attachment of the R 9300 is both lighter and stronger than the R 9250. Its new stick and boom design – with serial implementation of high-performance components like aluminium covers, cast steel elements, and hollow pins – reduces the weight of the attachment. The reduced weight allowed us to equip the excavator with bigger buckets in both the backhoe and front shovel configurations (16.5 m<sup>3</sup> and 16 m<sup>3</sup> respectively).

These bigger buckets – courtesy of the new attachment design – make the R 9300 an effective pass match for 100-, 130-, and 180-tonne mining trucks.

Further benefits of the attachment – specifically the larger stick and boom cylinders, the optimised lever arms, and 350-bar working pressure – are the excellent breaking, digging, and crowd forces it provides. These forces enable the R 9300 to work faster and more efficiently.

Combined, these factors make the R 9300 5% more productive than the R 9250.

## **3 The R 9300 G8 boasts the latest Liebherr Mining technology**

As the second Generation 8 excavator in our portfolio, the R 9300 comes with the newest Liebherr Mining technology as standard. This technology provides increased operational performance and compatibility with future product enhancements such as automation, zero emission technologies, and digital services.

The R 9300 can also be equipped with our Assistance Systems, which are intelligent onboard applications designed to improve operator efficiency by extrapolating actionable insights from live performance data. Our customers also have the option of activating the Bucket Filling Assistant on the R 9300. Once activated, the Bucket Filling Assistant provides adaptive, semi-autonomous digging functionality that allows easier and faster bucket filling, further optimising the machine's productivity while also reducing operator fatigue.

## **4 The R 9300 G8 is designed to optimise maintenance**

To make maintenance easier, the R 9300 has been designed to offer peak reliability on site. It was built for a 60,000 hour design life, which represents an increase of 33% when compared to the R 9250 model's 45,000 hours. This extended service life better aligns with the lifespan of major components, such as the engine. On top of this, intervals between major component replacements have been expanded.

When the R 9300 does require maintenance, its design has been optimised to streamline the process for technicians. The central service area provides easy access to uppercarriage fluid compartments to minimise machine downtime. Further, the refill and separate drain points are easily accessed from the ground with fast couplings and depressurised valves.

The troubleshooting process has also been simplified for technicians. All error codes – and several diagnostic dashboards – can be managed and viewed within the R 9300's main screen to keep all information in one location. Signal panels have also been installed at different points to monitor electrical signals and to make locating the source of a signal interruption much easier.

# Four facts about Liebherr's battery-electric trucks

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At Liebherr Mining, we are currently working towards offering fossil fuel free solutions for all of our products by 2030. One of our solutions is our battery-electric truck. We are so excited about this machine that we just had to share some information with you!

## **1** Our battery-electric truck will be compatible with both static and dynamic charging.

Our trucks will be able to charge via a static charger when parked and also when connected to onsite infrastructure – like a trolley system – so that they can charge during the haul cycle. And, as all of our trucks – including our battery-electric truck – are compatible with Liebherr's Trolley Assist System, this technology will be the perfect complement for these new machines.

## **2** Our battery-electric truck will be able to be charged in 30 minutes.

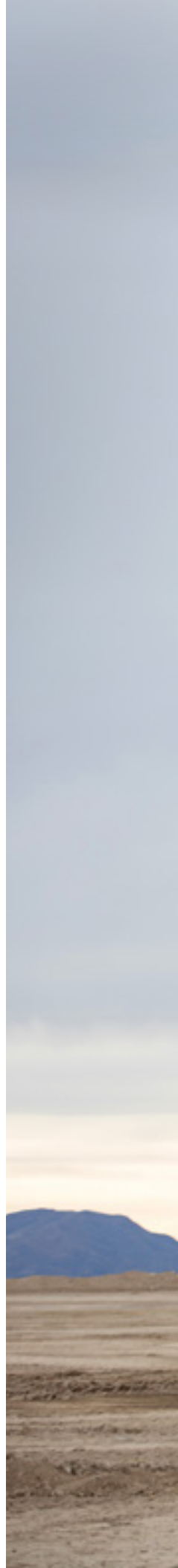
We wanted to ensure that our customers will be able to get maximum productivity out of our new trucks. With our battery-electric truck, customers unable to install a trolley system on site will still be able to statically charge their trucks in the shortest possible time. The truck's battery power system will be able to be charged in 30 minutes, meaning these machines will be ready to get back to work right away.

## **3** Liebherr is also developing battery power solutions for repowering Liebherr haul trucks.

We follow a modular and future-proof design philosophy for all of our mining equipment. Any T 264 haul truck purchased from today can be repowered with our battery technology, once available. This means customers with this machine won't have to wait too long before they can update their existing equipment to this new zero emission solution.

## **4** We are working with WAE to bring this truck to life.

WAE provides world-leading electrification, energy storage, and energy management solutions across a wide range of industries including mining, aerospace, and motorsport. WAE is not only supplying the battery for our battery-electric truck, but also the advanced battery analytics and battery management that will help customers achieve both minimum downtime and an extended battery life. We strive to provide our customers with the highest quality in everything we do and working with a pioneer in the renewable energy sector like WAE is one way we are ensuring our new truck meets our meticulous standards.





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# Steinexpo 2023

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In August 2023, Liebherr Mining and our colleagues from Liebherr's earthmoving product segment took part in Steinexpo, which is held in Homberg, Germany, every three years. Steinexpo is an international exhibition for the construction industry that takes place inside Europe's largest basalt quarry! To highlight the versatility of Liebherr's mining equipment, we showcased our R 9150 excavator, our PR 756 dozer, and showed off our Virtual Mine at our Technology Pavilion to the more than 61,000 visitors that attended the exhibition. For a bit of fun, we even had a bucket from an R 9350 that we used as a photo booth!





# Say hello to Liebherr's Autonomous Haulage Solution

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In 2023, Liebherr deployed a fleet of T 264 trucks to Australia for the onsite validation of its Autonomous Haulage Solution, marking a new stage in Liebherr's development of a new autonomy product for the mining industry. This deployment highlights Liebherr's continued evolution as a technology solution provider for the mining sector.

Liebherr's Autonomous Haulage Solution (AHS) follows an open architecture philosophy to allow customers the freedom to choose which best-in-class base machines, automation, traffic management, and fleet management systems will work best for their purposes. Further, Liebherr's flexible scope of supply solutions provide customers with scalable options – from autonomy ready haul trucks through to the fully integrated Liebherr AHS which includes a fully integrated fleet management system.

Liebherr is also providing onsite support for the entirety of the AHS validation in Australia to ensure that the business can support this deployment as well as future AHS deployments across multiple customers and regions.





**LIEBHERR**

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# Mining rock stars

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Our amazing people and achievements





# Powering the future with Liebherr's D98 engines

In recent years, Liebherr Mining has begun integrating its D98 series of internal combustion engines into its excavators and trucks in new markets all over the world – both at first fit and as repower projects. Incorporating these engines into Liebherr machines is part of Liebherr's international strategy to equip its product range with its own high-performance components.



## Reducing emissions with internal combustion engines

Liebherr's D98 internal combustion engines were designed to meet EPA Tier 4 final regulations. This was achieved by ensuring that the engines included selective catalytic reduction (SCR) technology to minimise the amount of nitrogen oxides (NOx) emitted. NOx are a critical component of smog and can damage both vegetation and the human respiratory system. A chemical reaction within the SCR system transforms the harmful NOx into a mixture of nitrogen, water, and minute traces of CO<sub>2</sub>, decreasing the amount of NOx emissions to near-zero levels.

Further – thanks to the large engine displacement of the D98 series – these engines can be powered by alternative fuels such as hydrotreated vegetable oil (HVO) or up to 10% biodiesel, without the engines needing costly modifications. Using these fuels can help mines to reduce their greenhouse gas, nitrogen oxide, and soot particulate emissions without suffering any engine power loss.

*“The D98 series was developed as a platform concept. Not only can each engine be easily configured to the machine it'll be used in, but the D9812 and D9816 engines have a lot of components in common, which helps in reducing spare parts inventory.”*

### Steffen Apel

Key Account Manager, combustion engines,  
Liebherr-Components AG, Switzerland

One of Liebherr's core values as a company is to ensure that every product or service a customer receives is of the highest possible quality. The inclusion of Liebherr componentry in its own machines means customers can be certain that the entire machine meets Liebherr's strict safety, performance, and reliability standards.

### Simplifying customer service

Liebherr's design philosophy also eliminates the need for customers to manage a number of different suppliers with different points of contact and different quality management systems when equipment support is needed.

“Installing the D98 engines into our equipment provides customers with a one-stop shop for their support needs,” explains Steffen Apel, Key Account Manager, combustion engines, Liebherr-Components AG, Switzerland. “When customers need assistance, they can contact Liebherr for all of their technical and maintenance support.”

Another advantage of the D98 series engine is that multiple payload classes of Liebherr equipment can be covered by one engine. The 12-cylinder engine of the series – the D9812 – can be used in the R 9400, R 9600, and R 9800 excavators as well as the T 264 haul truck. Meanwhile, the 16-cylinder engine – the D9816 – is compatible with the T 274 and T 284 trucks. Ensuring that a range of Liebherr equipment can use the same engine model provides a number of important advantages for customers.

“The D98 series was developed as a platform concept,” says Apel. “Because of this, not only can each engine be easily configured to the machine it’ll be used in, but the D9812 and D9816 engines have a lot of components in common, which helps in reducing spare parts inventory.”

#### **Tough enough to rough it**

Liebherr has more than 40 years’ experience in manufacturing engines for its products. The components product segment of the Liebherr Group has been building engines for the wider Liebherr company since the early 1980s, with the first six-cylinder in-line diesel engine produced in 1984.

Liebherr-Components AG used its wealth of experience to make small but incredibly impactful changes to the base design of its engines to ensure that the D98 series would perform well and be as reliable as possible on site.

“From the very beginning, the D98 series was developed to fulfil the requirements of mining applications,” explains Apel. “To best ensure this, the field validation of these engines was managed in close collaboration with the mining product segment’s factories, its affiliates, and its customers.”

The design of the D98 series includes details like additional support bearings to reduce vibrations and an improved oil and cooling system so that the engines can better withstand the rough terrain and extreme temperatures often found on a mine site.

#### **Around the world**

In 2019, a customer in Western Australia received the first Liebherr machine with a D98 engine – an R 9400 excavator. Since that time, the presence of D98 engines has expanded across multiple mine sites and different countries. The amount of these engines entering the market continues to grow, with both new Liebherr mining machines being commissioned with D98 engines and the number of repower projects increasing globally.

***“Our customers in Australia have witnessed remarkable onsite results that can all be attributed to the outstanding performance of Liebherr D98 series engines.”***

**Evan Wade**

Technical Support Advisor, Liebherr-Australia Pty. Ltd.

#### **Australia**

Australia currently has the largest concentration of Liebherr mining machines equipped with D98 series engines. Besides the R 9400 in Western Australia, there are multiple machines with D98 engines working for customers across the country. An R 9400 in New South Wales became the first Liebherr machine on the east coast to be powered by a D98 series engine. In Queensland there is an R 9600 – commissioned in June 2023 – that is loading overburden for a metallurgical coal mine. There is also a T 264 haul truck located at a different site that has been equipped with a D9812 engine.



#### **How do internal combustion engines fit into a zero emission future?**

Internal combustion engines powered with sustainable fuels will play a critical role in decarbonising the mining industry. They are a proven solution that continue to offer customers full mobility and flexibility on site, such as with current diesel-electric drive machines. Future generations of internal combustion engines can be adapted to work with renewable fuel sources such as ammonia, methanol, and hydrogen. Liebherr is currently working towards offering these alternatives to customers as they provide a strong alternative to electrification. There will be customers for whom electrification is not an option – for reasons such as the location of their mine, the cost of electrification technology in their region, or other distinct operational constraints. As such, internal combustion engines that can run on renewable fuel sources will help more customers to decarbonise their operations.

“Our customers in Australia have witnessed remarkable onsite results – including reduced fuel consumption and heightened productivity – that can all be attributed to the outstanding performance of Liebherr’s D98 series engines,” says Evan Wade, Technical Support Advisor, Liebherr-Australia Pty. Ltd. “Adopting a single standard engine family enhances serviceability, leading to increased maintenance efficiency, and a much easier local rebuild in country. And by providing customers with a unified point of contact for maintenance concerns, we can deliver faster response times and unparalleled support in the field.”

#### *Canada*

In late 2023, Liebherr-Canada Ltd. is scheduled to deliver the world’s first Tier 4 final rated D9816 engine to one of its valued mining customers in the Fort McKay region. The engine will be repowered into a T 284 truck that is also equipped with Liebherr’s Arctic kit as the machine operates in temperatures as low as  $-40^{\circ}\text{C}$ . This decision was made so that Liebherr-Canada Ltd. can offer the customer a higher level of support and greater benefits by fully integrating Liebherr power and drive systems into the truck.

“This project demonstrates the real-world application of Liebherr’s modular design philosophy for its mining equipment by taking a conventionally powered truck and upgrading it to a current, more stringent, emission standard while also incorporating the latest internal combustion technology Liebherr has to offer,” says Tom Juric, Divisional Director, Mining, Liebherr-Canada Ltd.

#### *Panama*

Liebherr Panamá S.A. has successfully repowered two T 284 trucks with D9816 engines: one was completed in May 2023 and the other in August of the same year. These are the first Liebherr machines in Central America to be fitted with Liebherr’s D98 series engines. The customer has also confirmed the repower of a third truck, which will likely take place in Q1 of 2024.

“Due to both our established partnership with our customer and the proven performance of our D98 engines during field testing, our customer had expressed interest in working with these products for quite some time. Especially as the customer has been running a number of R 9100 excavators with Liebherr’s D9512 engines since 2015 and has been impressed with the performance of these, as well as the support received from Liebherr,” says Wendel Petersen, Operational Manager, Liebherr Panamá S.A.

“After an intensive year of preparation for the D98 engines – which included providing advanced theoretical and hands-on training to our workforce – we were satisfied that we were fully ready to face any surprise once the customer’s first D98 engine went to work,” continues Petersen. “With an order received for a third repower, we are confident that this will lead to more repowers in the medium term.”



#### *South Africa*

In 2024, a major mining company operating in South Africa is set to become the first recipient of an R 9400 mining excavator fitted with a Liebherr D9812 engine in Africa.

“Our client has committed to ordering the first mining excavator to be fitted with a Liebherr engine,” explains Pierre Berrange, Head of Sales, Mining, Liebherr-Africa (Pty) Ltd. “We are excited to partner with such a major mining company for this milestone deal in our market.”

The customer will further benefit from a reliable aftermarket package from Liebherr-Africa (Pty) Ltd, which includes a team of trained service technicians well-versed with Liebherr componentry as well as a local centre of excellence for the rebuild of these engines that will support South Africa and surrounding countries.

“For this particular deal, there will be two technicians based on the customer’s site to ensure that the machine is maintained according to OEM standards, thus maximising equipment uptime. Our Kathu branch will further provide all the necessary parts, support, and services,” concludes Berrange.

# Powered by Liebherr

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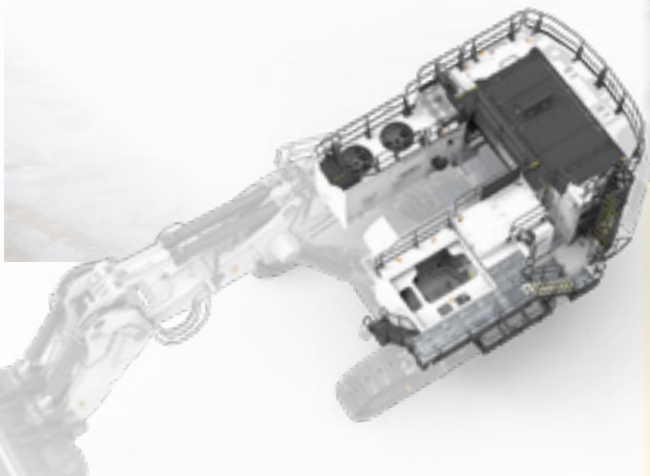
In June 2023, the first R 9600 excavator fitted with Liebherr D9812 engines was handed over to the MacKellar Group – Australia's biggest privately-owned provider of mining equipment and services. This R 9600 was delivered to the Curragh North coal mine, located in Central Queensland.

The D9812 – as part of Liebherr's D98 engine series – is specifically designed to withstand challenging mining conditions. This V12 engine reaches a power output of up to 1,500 kilowatts for hydraulic excavators and can reach up to 2,013 kilowatts for mining trucks.

**Check out this machine being assembled with the help of two Liebherr cranes!**







***“Repowering the R 9400 was an exciting challenge for our team, but one that they quickly overcame.”***

**Chris Di-Nardo**

Project Manager, New Machine Deliveries, Liebherr-Australia Pty. Ltd.

# Charging towards the future: the first R 9400 repower in Australia

In 2023, Liebherr Mining achieved its first repower of a diesel-drive machine to electric drive. The R 9400 – now an R 9400 E – is the first Liebherr electric excavator to operate in Australia. Offering the option of repowering diesel equipment highlights Liebherr’s commitment to decarbonising its products.

Repowering a mining machine involves altering its existing energy source. Customers may simply wish to update an existing diesel internal combustion engine to another, more fuel-efficient, engine and/or fuel source. Alternatively, customers may be looking to adapt their machines so they can use zero emission energy sources like electricity.

Converting diesel-drive machines – such as the R 9400 – to electric power can help mining operators to accelerate the transition of their fleets to zero emission technologies without needing to discard the mainframe of their machines. Repowering to an electric excavator can also offer the additional benefits of faster loading cycle times and improved hydraulic pump component life, thanks to the constant shaft speed of the electric motor.

### **The road to repower**

Because Liebherr takes a modular approach to building its larger mining equipment, repowering a diesel-drive excavator like the R 9400 can be completed in a matter of weeks.

“Approximately 60% of an electric-powered Liebherr mining excavator is the same as a diesel-driven machine, which helps to simplify the repowering process,” explains Chris Di-Nardo, Project Manager, New Machine Deliveries, Liebherr-Australia Pty. Ltd. “Once this R 9400 had been removed from its operations in Western Australia, the base machine was returned to our branch in Perth, where the conversion could begin.”

Among the changes necessary for the R 9400 to become an R 9400 E, the diesel powerpack and fuel tank needed to be removed and replaced with their electric counterparts – in this case, an electric-drive powerpack and a high-voltage electric cabinet respectively. Components needed in the diesel-drive R 9400 – like the water-cooling radiators, fans, exhaust, and air intake systems – were made redundant with the introduction of the electric-drive powerpack. However, the rotary connection was a unique case: in order to accommodate the high-voltage interface between the upper- and undercarriage of the R 9400 E, an entirely new rotary connection needed to be installed.

In order to simplify major machine maintenance for customers, Liebherr recommends that repowers occur when a machine is due for a major service or component exchange. So while the R 9400 was being transitioned from diesel to electric power, major components that had achieved service life were also changed out. Performing major maintenance in this way also has the benefit of making the process more cost-effective for customers.

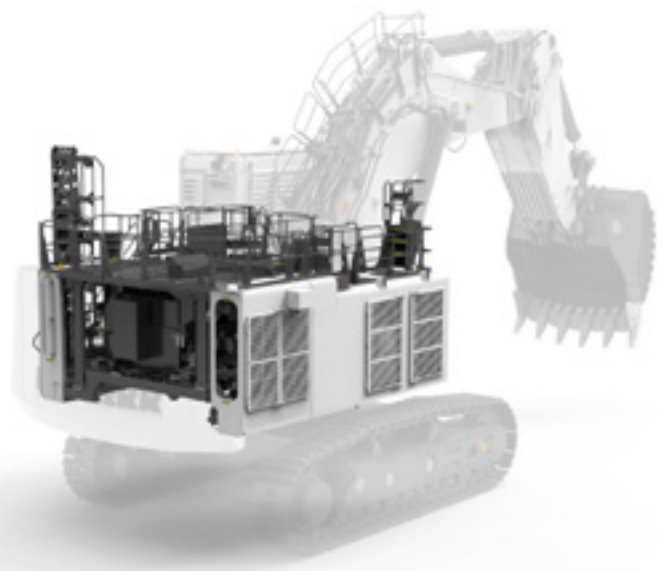
Once the new electric-drive modules were installed, connections completed, and systems checked, the repowered R 9400 E was then ‘powered up’ to energise the excavator’s operational systems. The R 9400 E requires 6,600 volts at 50 hertz for its power up process and then the electric motor and hydraulics can be ‘started and run up’. To minimise the inrush current needed to start the electric motor, Liebherr developed a specialised system that consists of high-voltage transformers. This system of transformers reduces the current required from the customer’s power grid to avoid excessive network disturbance.

### **Shared expertise ensures success**

Although the repower process is not overly complicated, specific expertise from Liebherr’s excavator factory in Colmar, France, was required to support the Liebherr team in Australia with its first diesel to electric repower project.

“Repowering the R 9400 was an exciting challenge for our team, but one that they quickly overcame,” says Di-Nardo. “Most of the people working on this project had only worked with diesel-powered machines previously. However, thanks to the combined efforts of more experienced team members here in Australia and the engineering assistance from our excavator factory, the team was able to complete the project tasks safely and on time.”

Repower projects such as this one are not limited to mine sites that can easily transport their mining equipment to a local Liebherr workshop. Liebherr can also travel to remote mine locations and complete these repowers on site, meaning a wider range of customers can take advantage of this service. And now, after the successful completion of its first repower of a diesel excavator to electric drive, Liebherr Mining has demonstrated the efficacy of this solution for any customers that wish to explore repowering as a way to meet their zero emission targets.



# Friends in faraway places: learning more about Liebherr-Canada Ltd.



***“Our singular drive for optimum efficiency is the catalyst for innovation in mining and what makes our industry so unique – we innovate because, frankly, we have no choice if we are to thrive.”***

**Tom Juric**

Divisional Director, Mining, Liebherr-Canada Ltd.

Canada. The Great White North. Second largest country in the world and birthplace of pacemakers, Trivial Pursuit, and Hawaiian pizza. But did you know that Canada is also a key producer of commodities such as gold, copper, nickel, and cobalt?

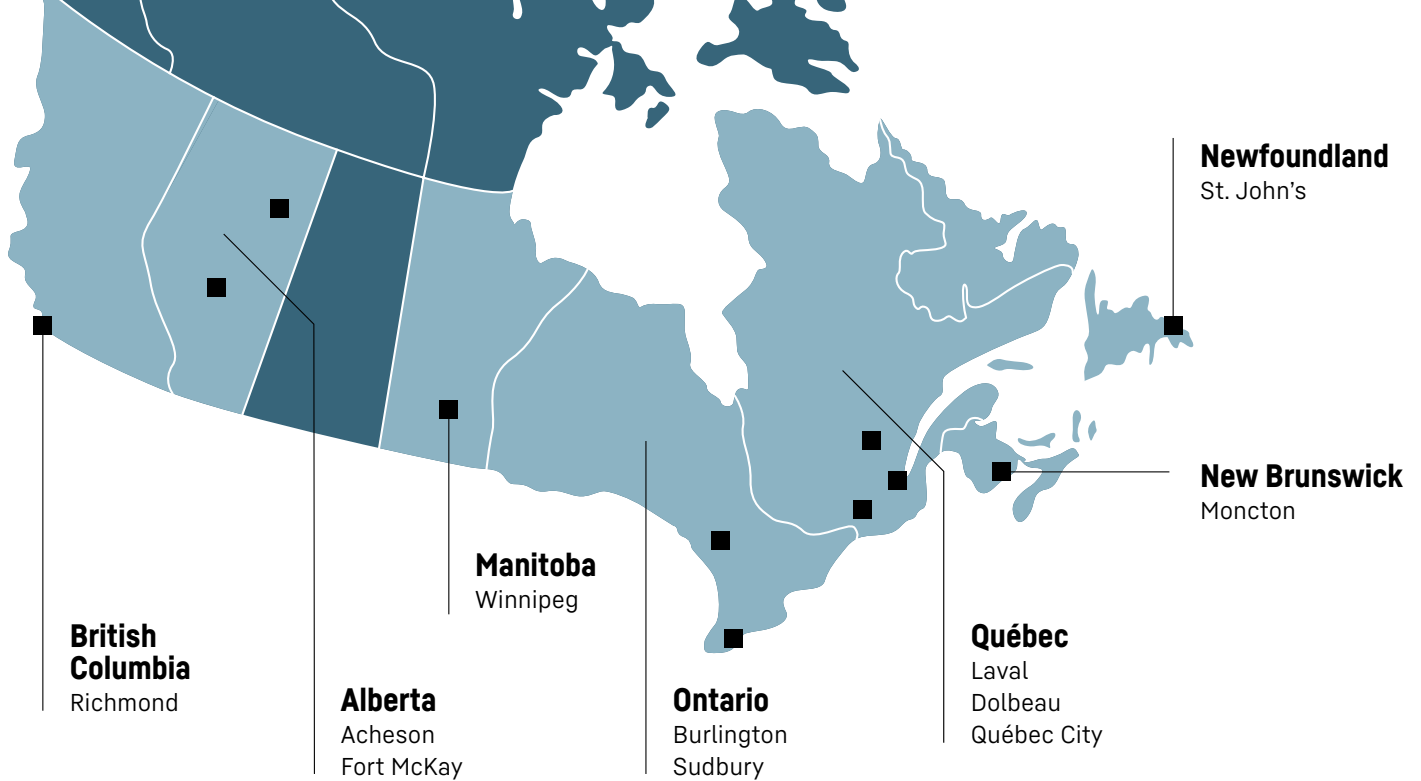
With such a wealth of mineral resources, it is little wonder, then, that Canada plays host to nearly half of all publicly listed mining and mineral exploration companies. Not to mention that 90 % of the largest mining companies in the world operate within its borders!

Today, Liebherr-Canada Ltd. has 11 locations spread right across Canada in industries like mining, earthmoving, and material handling to name just a few! It looks a bit different to when it was founded in 1973 as a sales, marketing, and after-sales hub for a select range of Liebherr products. So, to understand more about how Liebherr-Canada Ltd. works within the expansive and diverse Canadian mining industry, we spoke to Tom Juric, Divisional Director, Mining, for Liebherr-Canada Ltd.

## **What makes the Canadian mining industry different from other mining industries?**

The Canadian mining industry is very similar to that of other mining powerhouses. Having spent over a decade in Australian mining, I often say there are more similarities than differences between these two markets. Harsh climates, remote locations, vast expanses of land, and a comparatively small population mean both sectors are ruthlessly efficient. This singular drive for optimum efficiency is the catalyst for innovation in mining and what makes our industry so unique – we innovate because, frankly, we have no choice if we are to thrive.





**Canada is such an enormous place! Some Canadian mines are located in incredibly remote locations in arctic, or subarctic, climates. How does Liebherr-Canada Ltd. support customers in these places?**

Customer service is the backbone of mining. Without it, it is impossible to operate efficiently. However, customer service is not a one-size-fits-all proposition, especially in a country as vast and diverse as Canada. Liebherr-Canada Ltd. recognises this nuance and provides tailored solutions to our customer base. Whether it's innovative service offers or split parts arrangements, the key is to be open to ideas and – above all else – listen to the customer. Our customers know their operation, their region, and the people within their community better than anyone, so it makes sense to tap into that resource to determine how we can best align our skills and resources to support them.

**Besides the cold, what are some of the other challenges within Canadian mining? How does Liebherr-Canada Ltd. help customers to overcome these?**

Scarcity of skilled resources is a major challenge for mining in Canada. There are so many misconceptions about our industry that are having a major impact on the type of skills being taught in schools. There are still those that equate mining to pickaxes and headlamps, not autonomous trucks and IoT [Internet of Things] connectivity. Liebherr creates an environment to right these wrongs by showing the next generation the incredibly varied, innovative, and highly complex industry known as mining. We accomplish this by investing in our staff – our most valuable asset – through our apprenticeships and extensive training programs. This investment delivers a direct, measurable benefit to our customers. When a Liebherr employee is set a task, they undertake it with ruthless efficiency and a high degree of understanding of our products, systems, and our wider company.

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**Fast facts about Liebherr-Canada Ltd.**

- Founded in 1973
- Approximately 500 employees
- Head office in Burlington, Ontario
- Home to the mining, earthmoving, material handling, mobile and crawler cranes, cargo handling cranes, and refrigeration product segments



Liebherr-Canada Ltd.'s newest branch – Québec City

***“The Canadian market is one to watch. Fortunes can change in an instant with mining, and I believe something incredibly positive is coming.”***

**Tom Juric**  
Divisional Director, Mining, Liebherr-Canada Ltd.

**Liebherr-Canada Ltd.'s Québec City branch opened in early 2023. What has this expansion meant for the local mining industry?**

Our new Québec City location signifies the confidence of the Liebherr Group in the strength of Liebherr-Canada Ltd. Having a physical presence on the road towards the mines in the north highlights our expansion into the province. The mining customers that we hosted during our open day were excited to see our familiar logo close to home and expressed a sense of ease, knowing Liebherr's support is a few short hours away.

**How have you seen the Canadian mining landscape change since you first started with Liebherr in Canada? What are the main industry drivers and how is Liebherr-Canada Ltd. responding to these?**

The single biggest change I've seen since arriving in Canada has been conversations about zero emission mining moving from the periphery to the core of discussions. You would be hard pressed to find a mining house or contractor not talking about the future of mining and zero emission solutions. This has presented an enormous opportunity for Liebherr Mining, driven predominantly by our core principles: being agnostic in both energy type and drive system and offering modular solutions to flatten the risk profile of transitioning to zero emission technologies.



Equally, the industry has recognised the advantages of our current 'conventional' products. For example, our Technology Products portfolio – which includes the Bucket Filling Assistant and Truck Loading Assistant – have definitely raised some eyebrows. We anticipate being able to confirm the onsite benefits of these products with practical data in the very near term.

**Is there a particular growth market that you identify for Liebherr-Canada Ltd. in the near future? Maybe a particular commodity, or class of machine? How is the company well positioned within this market?**

All of Canada presents a growth opportunity for Liebherr in Canada. We've held our own in our traditional sectors while also taking graduated steps into new mining territories and commodities. For us, our dozers were the highlight of 2021–2022, with the fleet doubling during this time. We've also locked in orders for 2023–2024. I've been an avid believer in our dozers and – despite some early challenges – I feel we have a product that is more than a match for the competition. And it's only getting better!

The growth of Liebherr excavators in the Canadian market is also one to watch. Despite the challenges we face breaking into the market, we know that once you try a Liebherr excavator, nothing comes remotely close it! This fuels our team to dig deeper and push harder to break that barrier.

**What else is important for people to know about Canadian mining or Liebherr-Canada Ltd.?**

The Canadian market is both highly lucrative and highly complex. The market is not dissimilar to other markets – Australia especially. And like Australia, global reputation only gets you so far. It's results that seal the deal for customers. Liebherr-Canada Ltd. is staffed with an incredible team, supported in its endeavours by visionary managing directors and by the wider Liebherr group of companies. I definitely think the Canadian market is one to watch. Fortunes can change in an instant with mining, and I believe something incredibly positive is coming.



**Did you know...?**

- Canada produces around 80% of the world's maple syrup
- There are six different time zones across Canada: Pacific, Mountain, Central, Eastern, Atlantic, and Newfoundland
- The \$1 coin in Canada is colloquially known as a 'loonie' and the \$2 coin as a 'toonie'
- The border between the USA and Canada is the world's longest unprotected border
- More than half of the lakes in the world are located in Canada
- The Canadian territory, Nunavut, had polar bear shaped registration plates for a number of years
- Beanies are called toques in Canada
- Canada holds 20% of Earth's fresh water
- Driving from Vancouver (west coast) to Halifax (east coast) along the Trans-Canada Highway would take ~57 hours



# Pushing forward: the story of Liebherr dozers

Liebherr has been developing and manufacturing hydrostatic dozers for more than 60 years! These machines can be used in numerous applications: from mines and quarries to road construction and waste management. To learn about what's been happening in the world of Liebherr dozers, we spoke with Markus Wittwer, Head of Sales, mining dozers, Liebherr-Werk Telfs GmbH, Austria.

***“It’s our winning combination of a dedicated factory team and the state-of-the-art tools and technology within our facility that makes it possible for us to achieve a 330% increase in the number of our dozers sold around the world since 2010.”***

**Markus Wittwer**

Head of Sales, mining dozers Liebherr-Werk Telfs GmbH, Austria

**Liebherr’s entire range of dozers, including those used in earthmoving applications, are manufactured at Liebherr-Werk Telfs GmbH, in Austria. What can you tell us about the capacity and capabilities of this factory?**

We’re incredibly proud of what our Telfs factory has been able to accomplish since its founding in 1976. The team at the Telfs factory – with close to 900 talented individuals and a total area of 179,200 square metres – produces more than our range of dozers, which includes our flagship mining dozer the PR 776, the largest hydrostatic dozer in the world! The factory also manufactures an increasingly wide range of heavy-duty equipment including telescopic handlers, pipelayers, and crawler loaders.

It’s our winning combination of a dedicated factory team and the state-of-the-art tools and technology within our facility that makes it possible for us to achieve a 330% increase in the number of our dozers sold around the world since 2010. These machines have been delivered to 115 countries!

**Does Liebherr have a specific design approach for its mining dozers to make them stand out in the market?**

Liebherr strives to provide customers with the best possible quality products and services. This is reflected in our design philosophy for not just our dozers, but for all of our equipment. We place equal importance on machine performance, serviceability, sustainability, and operator safety. Addressing each of these facets of design excellence looks different, depending on the equipment in question. For dozers, the hydrostatic transmission met the majority of these criteria by reducing the number of drivetrain components, the amount of fuel burned, and the wear on the machine's parts and components. To further improve serviceability, the dozers include a tilting cab, which provides easy access to the hydrostatic transmission; a working platform for both operators and maintenance staff; and ground level services.

We also leverage the expertise and practical experience of the entire Liebherr Group and its 13 product segments by using Liebherr-made componentry in our dozers. Our components undergo field tests under rigorous conditions to ensure maximum machine availability. Further, we are continually implementing operator feedback into the designs of our products so that they are constantly improving. Therefore, we can rest assured knowing that our customers are receiving high quality products that will not let them down on site.

**You mentioned the dozers' hydrostatic transmission. What are the benefits of this drivetrain technology?**

The hydrostatic drive concept is a key technology for us. All Liebherr dozers – not just the PR 776 – use hydrostatic technology instead of the torque converters or mechanical drives that are used in a lot of other dozers on the market.

The main advantage of a hydrostatic transmission is the absence of gears, clutches, and brakes for manoeuvring. This results in seamless operation, uninterrupted power flow, and infinitely variable speed control. The hydrostatic drive also has the ability to give power on demand at the perfect torque for every situation, therefore decreasing track spin.

The combination of the hydrostatic transmission with the Liebherr D9512 engine – operating at constant rpm – means that our dozers have reduced fuel burn rates. In fact, the PR 776 dozer has the lowest fuel burn rate in the 70-tonne class at equal production, with an average hourly fuel burn of less than 40 litres per hour across our entire global fleet. This makes the PR 776 the most fuel-efficient dozer in its class!

**How else do Liebherr's dozers contribute to a reduction of greenhouse gas (GHG) emissions on site?**

Liebherr's entire dozer portfolio uses intelligent engine technology to grant customers the lowest possible fuel burn rates. Not only do all of our dozers come with a hydrostatic transmission – and the fuel efficiency this brings – but they all come equipped with ECO mode. ECO mode allows operators to choose between maximum output for difficult conditions or increased fuel efficiency for more straightforward sites. This means that maximum engine output is only used when necessary and so fuel consumption is reduced, which in turn reduces GHG emissions. Our dozers are also manufactured to meet the engine emission regulations applicable in customers' countries. And for customers seeking an alternative to diesel, our dozers can use hydrotreated vegetable oil (HVO) as a fuel source, which can reduce GHG emissions by up to 90%!



**Are there any plans to create zero emission solutions for dozers in the future?**

There are some important things to consider when designing zero emission solutions for our dozers. These machines need to have the flexibility to move around a mine site, which means that they cannot be tethered to something with a charging cable. As such, we are taking an energy-agnostic approach to this challenge. We are investigating multiple different power sources to see which will provide the most effective solution, or solutions, for our customers.

**Where do you see the biggest demand for Liebherr's mining dozers?**

Since the official product launch of the PR 776, Liebherr has delivered approximately 200 PR 776s to 20 countries around the world. Aside from our mining hubs in Oceania, North America, and Africa, we have also delivered PR 776s to Sweden, Iceland, Spain, Chile, China, Mongolia, and Uzbekistan.

**Impressive! Have you seen growth in any new markets around the world?**

We have seen recent increases to our dozer fleets in some of our established markets. Most recently, we won a contract to supply a major manganese mine in South Africa with four of the PR 776, all of which were commissioned in 2023. The project had significant need of 70-tonne machines and our hydrostatic transmission and ECO mode made the PR 776 the preferred choice as these innovations will help the customer to combat rising fuel prices in their area.

Our dozer fleet in Indonesia has also increased over the past 18 months, and we now have eight operating in the region, with more on the way! Two PR 776s were delivered to a coal mine in late 2022 and are being used for ripping and for pushing dump materials on site. A further six PR 776s are due to be delivered to a large copper and gold mine in the near future.

And a short while ago, our dozers made market entry in South America with the delivery of a PR 776. The machine is being used at an underground mine, rather than in an open-pit setting, to quickly move material brought to the surface by the mine's underground conveyor belt. This niche application of the dozer highlights the adaptability of our machines.

We also have more exciting deals on the horizon, so stay tuned!

**What's next for Liebherr dozers? Any exciting news we should watch out for?**

Liebherr is not one to rest on its laurels. We are continuously feeding back product improvements for our dozers to our design and engineering group so that we can ensure our product range is able to meet new market demands. For example, we are investigating how the next iterations of our dozers could be implemented into an autonomous mine site environment. We already offer remote operation capabilities for our PR 776 dozers in the form of our LiReCon system, which allows operators to work from the safety of a cabin on site rather than in hazardous or hard-to-reach locations.

We are also adding additional factory options that can be used in various markets so that navigating equipment documentation and parts availability becomes easier for our sales and services companies as well as for our customers. Many of these options and upgrades can already be found in today's ex-factory deliveries.

In general, I recommend watching out for MINExpo 2024 in Las Vegas, where Liebherr will present the latest and greatest information about Liebherr mining dozers as well as Liebherr's other mining products.



Liebherr Mining's flagship dozer: the PR 776!



# Only the best for Liebherr Mining

Liebherr-Mining's Quality Lab is vital for ensuring product quality. Quality Lab uses its specialist expertise to help customers get the very best out of their Liebherr equipment and can perform the same assessments in their state-of-the-art lab that they carry out in mine sites all over the world!

One of Liebherr's core values as a company is to provide the highest quality in everything that it does. To do that, Liebherr needs to ensure the quality of the parts used in its equipment, confirm that suppliers are matching the company's quality expectations, and give first-class equipment advice and support services to customers wherever they are. At Liebherr Mining, an important resource for achieving this is its Quality Lab, which was founded in 2012.

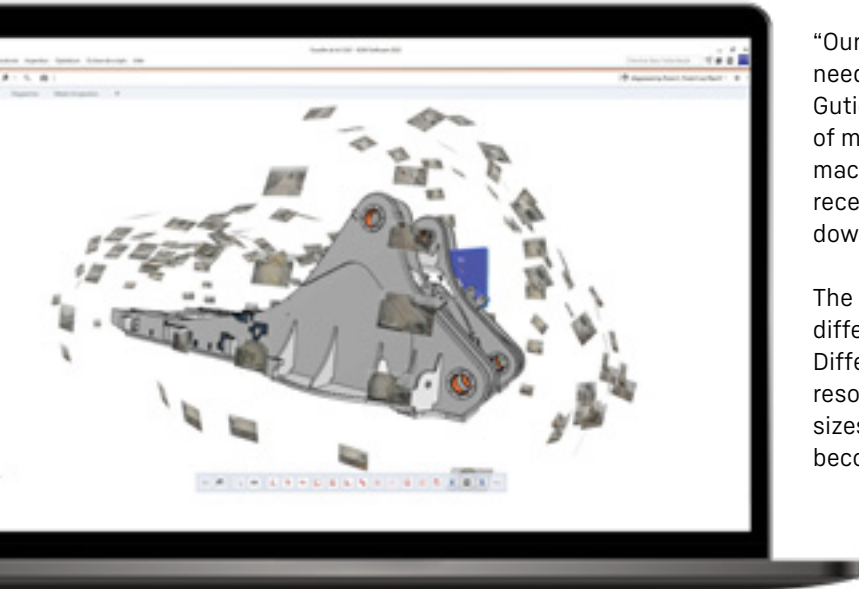
## Experts in their field

Each member of the Quality Lab team is exceptionally experienced. All seven members have advanced qualifications in a range of fields. There is a PhD in metallurgy among these remarkable individuals! And as well as these impressive credentials, each Quality Lab staff member has been certified according to international norms by all relevant official organisations.

"The work that we do within Quality Lab deals in minute details and highly technical information," says Vanessa Gutierrez, Group Leader, Quality Lab, Liebherr-Mining Equipment, Colmar SAS. "As such, it is vital that each of our team members has a deep understanding of their domain so that no question goes unanswered."

Quality Lab has five core competencies that are used when helping customers understand and overcome challenges on site or when offering advice to suppliers and customers' technical teams. These are welding, metallurgy, non-destructive testing – e.g., visual, ultrasonic, magnetic, and penetrant testing – 3D measurements, and surface finishing. The combination of these core competencies allows Quality Lab to take a granular approach to problem solving and quality control.

“After one of our customers’ excavators suffered some damage, we were asked to help them assess which parts and components from the machine could be reused,” says Gutierrez. “By taking 3D measurements of the excavator’s parts, we were able to compare these dimensions to those from Liebherr’s engineering department to see which could be kept, which required some refurbishment, and which parts needed to be written off. By providing this information to the customer, we were able to help them avoid purchasing all new parts for the machine.”



### Complete customer focus

When customers need Quality Lab’s help, they do not need to make any special trips to the Quality Lab facility, located at Liebherr’s excavator factory in Colmar, France. Rather, Quality Lab technicians pack up their testing and measurement equipment and meet customers where they are. Quality Lab has been set up to be completely mobile; all testing that can be completed at the Colmar facility can be undertaken off site, whether at the bottom of a mining pit or at a supplier’s factory.

“Our purpose is to address component quality issues as quickly as possible. This means we don’t rely on samples that need to be extracted from a machine and then sent away for testing. We bring the microscope to the machine, not the other way around,” explains Gutierrez.

Conditions on site can be a stark contrast to the controlled environment of a laboratory. Severe weather conditions, limited connectivity, and remote locations are just some of the challenges faced by technicians on a mine site. But these do not impact Quality Lab’s ability to do its job.

“We understand the constraints that customers face every day and so we work with onsite conditions, rather than asking customers to accommodate us and interrupt production,” says Gutierrez. “If customers are working in the rain, then so are we.”

Despite the challenging conditions, mine sites operate as well-oiled machines. As productivity is one of the utmost concerns of mining companies, an unexpected maintenance issue can cost the mine time that it cannot afford to lose. This is where Liebherr Mining’s Quality Lab can provide invaluable support.

“Our team can be flexible and adjust job priorities as needed as we only work with Liebherr equipment,” says Gutierrez. “This means we don’t have to juggle the priorities of multiple OEMs. So, if a customer experiences an urgent machine issue, we are able to make sure that this customer receives timely support from Quality Lab to minimise downtime as much as possible.”

The tasks that Quality Lab performs for customers can differ based on the country in which the work is occurring. Different countries have different safety protocols, different resources available, and can have customers of different sizes – all of which can impact the type of jobs Quality Lab becomes involved in.

### Shared knowledge

Not only are the members of the Quality Lab team incredibly skilled in their chosen fields, but they also have access to critical information that is likely not available to customers or external suppliers, such as a third-party lab. Being able to speak with Liebherr’s engineering department, review Liebherr’s schematics, and understand how suppliers build their parts can give Quality Lab more context about what might be causing equipment issues and therefore provide more avenues to explore during the problem-solving process.

But Quality Lab doesn’t keep all this invaluable knowledge to itself! Instead, the team uses its expertise and OEM-training to offer detailed, accurate, and reliable advice to customers and suppliers that can help improve equipment reliability. This in turn helps suppliers to improve the parts that Liebherr uses in its products while also optimising customers’ onsite maintenance and repair practices.

“We were asked to assist a customer with the replacement of a front bearing for an R 9350. The excavator’s stick had already achieved its expected service life and so the replacement was like a kind of remanufacturing to move the machine into its second life,” explains Gutierrez. “While we were there, we were able to provide recommendations to the customer on which onsite personnel would be best equipped for certain tasks in order to reduce maintenance time. Further, we were able to help the customer identify



gaps in the knowledge of onsite personnel and how to address these to save time and optimise the maintenance process.”

The degree to which Quality Lab is involved in the repair process with customers is entirely dependent on the customers' needs. In some cases, the team may be asked to evaluate whether repairs or replacement would be the most effective course of action. At other times, the team may be called upon to help establish onsite repair procedures by providing working instructions to the responsible personnel. There can also be situations where Quality Lab becomes involved in the repairs themselves and checks steps taken, provides training, and/or validates the repairs performed.

### **Quality Lab is future proof**

Each year, Quality Lab reviews its stock of state-of-the-art equipment. As the tasks Quality Lab participates in can change to reflect demand, the team may need to add new pieces of equipment in order to provide the best possible service. The most recent addition to the lab is a salt spray chamber that helps the team check anti-corrosion coatings. It works by subjecting a test specimen to a solution of sodium chloride and water that mimics sea water in order to assess the durability of anti-corrosion coatings. Testing parts and components in this way helps to ensure that Liebherr's equipment continues to align with changes to safety regulations in different regions around the world.

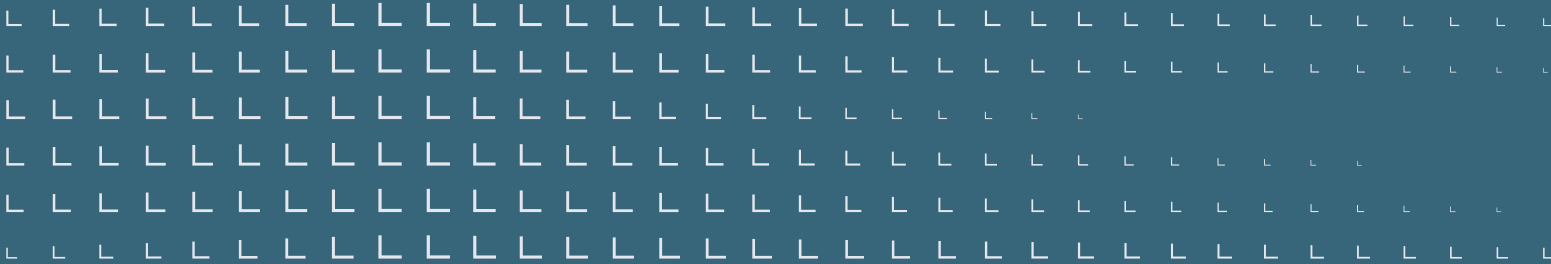
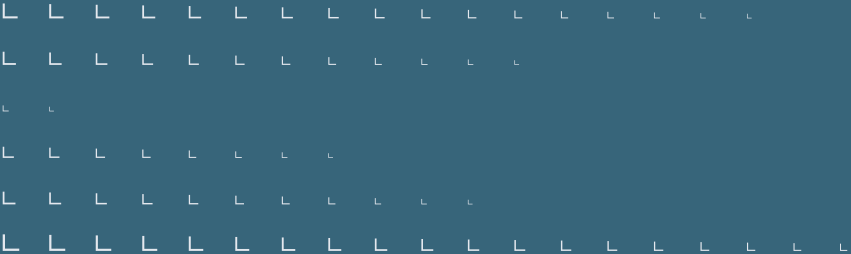


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# On the ground

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Our mining solutions in action all around the world



# New Liebherr fleet for South Africa

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**In 2023, Liebherr-Africa (Pty) Ltd. successfully supplied a fleet of Liebherr machines – comprised of four PR 776 dozers, an R 9200 excavator in backhoe configuration, and an R 9400 excavator in face shovel – to a leading mining contractor in South Africa.**

This fleet was deployed on a newly awarded mining contract at a manganese mine in Northern Cape, South Africa. This deal followed a lengthy period of collaboration and discussion with the customer that culminated in Liebherr being chosen as the preferred supplier for this high-profile deal.

The Northern Cape mine required a 200-tonne and a 400-tonne class excavator that could move large volumes of material as quickly and efficiently as possible in order to meet its production targets. Based on the performance of the R 9200 and R 9400 excavators, and Liebherr's unshakeable confidence in its products, these machines were a natural fit for this customer. There was also a significant need for 70-tonne dozers and the PR 776 was able to meet the customer's requirements. This was due to the Liebherr dozers' hydrostatic transmission, which sets these machines apart in the 70-tonne class as other OEMs generally offer torque converter or mechanical drives. The principal benefit of the hydrostatic transmission is the absence of gears, resulting in seamless operation, uninterrupted power flow, and infinitely variable speed control.





### **Minimising fuel costs**

However, in an environment where fuel prices continue to rise, the fuel efficiency features of both the dozers and the excavators were also important to the customer.

“The fuel saving nature of Liebherr machines is so important in reducing overall operating costs for the client, especially given that fuel is one of the largest cost drivers for mining fleets,” says Pierre Berrange, Head of Sales, Mining, Liebherr-Africa (Pty) Ltd. “In some cases, fuel can represent up to 60% of a company’s fleet operating budget.”

The fleet of Liebherr machines supplied to the customer comes with a range of fuel saving technologies. The standard ECO function of the PR 776 dozers – which allows operators to choose between high performance and maximum efficiency for a particular task – provides increased fuel efficiency. And the R 9200 comes with Liebherr’s proprietary engine and hydraulic management system – Liebherr Power Efficiency – as standard, helping to further reduce the excavator’s fuel usage.

These features all work together to provide mastery and optimisation for the fleet’s various equipment systems by offering constant engine speed, increased machine efficiency, and significantly reduced fuel consumption.

### **Peerless performance**

Since arriving to site, the machines have been achieving all of their key performance indicators and the customer has been extremely happy with the machines’ performance.

“Based on the performance of the machines thus far, and the positive relationship we have built with the customer, we see a great opportunity to further develop our relationship with the business and to work with more of the client’s sites in the near future,” concludes Berrange.

***“The fuel saving nature of Liebherr machines is so important in reducing overall operating costs.”***

**Pierre Berrange**

Head of Sales, Mining, Liebherr-Africa (Pty) Ltd.

# Partners in Pakistan

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**In 2019, Shanghai Electric placed the largest ever order for Liebherr excavators in number of machines – 28 R 9100s in total! The reliability of both the R 9100s and the support provided by Liebherr (China) Co., Ltd. resulted in the customer placing an order for four more of the excavators in 2022.**

These 28 R 9100 excavators were put to work for Shanghai Electric – one of the world’s foremost suppliers of smart systems – at the Thar Block-1 coal mine in Pakistan. Thar Block-1 is a key project of the China-Pakistan Economic Corridor (CPEC) and Shanghai Electric’s first Build-Own-Operate enterprise. The mine is part of an integrated mining and power project that aims to strengthen electricity infrastructure in the local area.

While Liebherr Mining is incredibly proud of this excavator deal, the company takes even greater pleasure in being a reliable, long-term partner for Shanghai Electric. Liebherr (China) Co., Ltd. has worked alongside Shanghai Electric at the Thar Block-1 coal mine since 2020, the very first year of the mine’s construction. Thar Block-1 is located within Pakistan’s Thar coalfields in the Thar Desert. There are an estimated 175 billion tonnes of lignite – also known as brown coal – located within the Thar coalfields, making it

one of the largest reserves of lignite in the world. Thar Block-1 is also one of the key projects of the CPEC, a bilateral trade agreement between China and Pakistan that was established in 2013 as part of the Chinese government’s larger Belt and Road Initiative. The goals of the CPEC are to improve Pakistan’s national infrastructure, secure better trade with China, and further strengthen ties between the countries of South Asia.

#### **The customer always comes first**

The relationship between Liebherr Mining and Shanghai Electric began well before any monumental excavator orders were placed. Liebherr (China) Co., Ltd. understands that deciding to enter into a business arrangement with a new company is not a choice made lightly. As such, in the year before the tender for the 28 excavators was won and a contract was signed for their supply, Liebherr (China) Co., Ltd. – along with its agent on the ground in

Pakistan – provided Shanghai Electric with all of the information the customer required. This involved frequent seminars and technical communication as well as providing fast responses to Shanghai Electric’s queries. The customer also visited Liebherr’s excavator factory in Colmar, France, to assess all aspects of the R 9100 – from design to manufacturing, quality control, logistics, and support – and thus gain an in-depth understanding of the machine and Liebherr’s capability and commitment.

“Each mining operation has unique requirements based on factors such as location, ore type, and environmental conditions,” says Armin Natter, General Manager, Liebherr (China) Co., Ltd. “Liebherr (China) Co., Ltd. and our customer service teams needed to provide Shanghai Electric with solutions that would address the specific needs of the site’s desert conditions while also ensuring maximum machine uptime. This involved offering training and educational resources to help operators understand how to use their equipment efficiently and safely in a desert climate.”

### **Exceeding expectations**

These 28 excavators were commissioned from early 2020. Once on site at Thar Block-1, Liebherr (China) Co., Ltd. continued to offer Shanghai Electric exceptional customer service and equipment support during the mine’s construction phase. As a crucial part of the CPEC, the Thar Block-1 project had to adhere to tight deadlines in difficult conditions.

“Ensuring machine availability in a desert area such as this is a big challenge,” says Kurt Chen, Mining Service Inspector, Liebherr (China) Co., Ltd. “To ensure Shanghai Electric’s daily power generation, machine failures must be solved within shortest possible timeframe. This requires both experienced and devoted onsite engineers as well as customer cooperation regarding appropriate spare parts and preventive maintenance for the machines.”

In a letter of thanks, Shanghai Electric praised Liebherr’s leading role during this time.

“Your business carefully organised, fully utilised its management and professional advantages, eliminated difficulties, promoted project construction in an orderly manner, standardised project management, and put in place risk prevention and control measures,” the letter reads. “We would like to express congratulations and thanks to all staff involved.”

Construction of the Thar Block-1 mine ended in February 2023 and it is now in commercial operation. The mine will produce 7.8 million tonnes of lignite per annum, which will in turn fuel the power generation aspect of the Thar Block-1 operation.

The project will generate nine billion kilowatt-hours of electricity for the local power grid every year – enough to power almost four million households.

### **Leveraging Liebherr expertise**

To ensure that Shanghai Electric’s considerable fleet of R 9100 excavators provides optimal reliability and performance, there is a team of experienced engineers from Liebherr (China) Co., Ltd. on site. These engineers are responsible for training the Thar Block-1 engineers in OEM-approved maintenance and repair processes and for offering technical support whenever needed.

“Most of the operators at Thar Block-1 are local staff,” says Chen. “Our service engineers regularly organise training on site and adjust the content based on operator feedback. Every month, we review the machine faults we have seen and create a technical summary to share with Shanghai Electric and our agents so that similar faults do not occur repeatedly.”

Having such a wealth of OEM expertise on site, plus constantly reviewing feedback from the machines and from onsite personnel, has helped Shanghai Electric’s fleet reach impressive utilisation, given its age.

### **Looking forward**

Since Shanghai Electric’s original order of 28 R 9100s, the company has ordered a further four units of the excavator, based on the performance of the original machines. Two of the four additional R 9100s began operating in March 2023 and the remaining two machines will be delivered in the near future. The customer has also expressed interest in expanding its Liebherr fleet beyond the R 9100 to include different Liebherr equipment and technology options.

“We look forward to continuing to expand our partnership with Shanghai Electric as the Thar Block-1 project matures and grows,” says Natter.





# The R 9200 comes to Peru

In May and July 2023, Liebherr Perú S.A.C. delivered two R 9200s – the first to be delivered in the country – to customer Cosapi Minería. These machines are not only the first of their kind to be delivered in Peru but are also the first Liebherr excavators to be assembled in the country, demonstrating the developing capacity of Liebherr Perú S.A.C.

## Perfectly fit for purpose

Cosapi Minería is a subsidiary of Cosapi S.A. – one of the largest construction and engineering businesses in Peru and South America – and is responsible for a considerable number of earthmoving operations in the local mining industry. The business required a machine that could provide the best possible productivity to ensure that ore loading tasks were completed in line with production targets. Liebherr Perú S.A.C. worked closely with Cosapi Minería to find the right solution and it was decided that the R 9200 was the perfect choice. The excavator's bucket design, its size, and its onboard Liebherr Assistance Systems – including the Operator Assistance System, Bucket Filling Assistant, Truck Loading Assistant, Performance Monitoring, Application Severity, and Operational Conformance – made the R 9200 the perfect fit for Cosapi Minería's needs.

“The R 9200s' advanced systems allow us to monitor the machines' performance and health parameters. This gives us exceptional control over how the excavators work and helps us to make informed decisions,” says Raphael Juarez, Project Manager, Cosapi Minería. “In addition, the assistance provided by these systems to our operators has been amazing, improving both efficiency and safety at work.”

## A myriad of firsts

Not only were these two R 9200s the first to be delivered in Peru, but they were the first to be assembled on Peruvian soil. Four technicians from Liebherr Perú S.A.C. – as well as the supervision and product support teams – assembled these machines in approximately 12 days.



“It was a challenging process and at the same time full of learning, both at a team and personal level,” says Andre Cerf, Product Support Specialist, Liebherr Perú S.A.C. “From the beginning it was possible to see the enthusiasm of the whole team for carrying out the assembly. I am happy to have been part of this team and am proud of the results we obtained.”

The R 9200s were the first excavators of their size to join the Cosapi Minería fleet.

#### **Expanding capabilities**

The introduction of the R 9200s into the Peruvian market is a milestone for Liebherr Mining. This machinery gives Liebherr and its mining solutions increased visibility in the local market. Especially as Cosapi Minería has expressed its great satisfaction with the support provided by Liebherr as well as the quality of the R 9200s, their onboard technology, and the calibre of the data the excavators collect during each shift.

“Liebherr’s technical support in the field and the availability of spare parts have been optimal,” continues Juarez. “This gives us peace of mind that Liebherr will be a strategic partner for a long time to come.”

This feedback provides a concrete example to the wider Peruvian mining industry of the strength of Liebherr’s products and after-sales services – such as machine maintenance and spare parts supply – that the company offers to each customer.

“We hope to maintain and improve this positive perception of Liebherr Mining during the operation of this and any more Liebherr equipment that enters the Peruvian market in the near future,” says Ricardo Ishida, General Manager, Mining, Liebherr Perú S.A.C.

***“From the beginning it was possible to see the enthusiasm of the whole team for carrying out the assembly. I am happy to have been part of this team and am proud of the results we obtained.”***

**Andre Cerf**  
Product Support Specialist,  
Liebherr Perú S.A.C.



# Liebherr's 100-tonne hero



Our T 236 mining truck is an impressive piece of equipment! Its diesel-electric drivetrain enables constant application of power to ground which helps the machine avoid spilling its 100-tonne payload or causing haul road deterioration. A fleet of six of these marvellous machines is currently hauling iron ore in the Austrian Alps for the Erzberg iron ore mine, VA Erzberg GmbH.

The T 236 also thrives on Liebherr's Trolley Assist System. The current collector system allows the truck to remain in contact with the overhead trolley line around small curves and switchbacks. This has made it possible for Erzberg's fleet of T 236s to run under a 4.7 kilometre trolley line, which includes 3.8 kilometres of consecutive trolley line – the longest in the world!



**[Click here for an in-depth look at our T 236 trucks working in Erzberg, Austria!](#)**

# New partnership in the Hunter Valley

In August 2023, Liebherr-Australia Pty. Ltd. commissioned the very first R 9800 excavator for new customer, Bengalla Mining Company. The delivery of this machine marks the beginning of an exciting business relationship, with a second excavator – an R 9600 – due to be delivered in early 2024.

Bengalla Mining Company (Bengalla) is located in the Hunter Valley region of New South Wales, Australia, and supplies coal to markets all over the world. Liebherr-Australia Pty. Ltd. wanted to ensure that Bengalla received the best possible solution to meet its needs and so worked extensively with the customer to determine which machine would be most suitable for meeting extraction targets and weather conditions on site.

## Cooperation is key

“Bengalla has been on an acquisition journey with the R 9800 for almost three years with Liebherr and we have been happy with the transparency that the Liebherr team has shown,” says Benjamin King, Maintenance Capital, Projects, and Services Superintendent, Bengalla Mining Company. “Bengalla, being new to Liebherr products, has had plenty of questions and by working together we have been able to have these addressed.”

Teamwork was vital for Liebherr-Australia Pty. Ltd to both support Bengalla and deliver the R 9800 to site.

“We are incredibly proud of the collaboration and collective team effort that was put into the planning and subsequent delivery of the first piece of Liebherr mining equipment for Bengalla,” says Daniel Simone, Service Manager, Liebherr-Australia Pty. Ltd.

The new excavator will be supported by an onsite Liebherr Product Support Advisor, who will directly assist Bengalla with product integration, technical support, and mentoring site-based technicians.

## First-class performance

This R 9800 is the first ultra-class excavator to join Bengalla’s mining fleet. Designed to thrive in the most challenging mining conditions, the R 9800 offers first-class reliability and performance on site, which will assist Bengalla in meeting its productivity goals.

“It’s been great to see both the Bengalla and Liebherr teams come together and pull off the 10-week onsite build and watch the machine go to work,” says King. “It has been a highlight of my 20-year career in mining to see the R 9800 in the dirt. This is the second biggest investment in HME [heavy mobile equipment] over the life of Bengalla to date.”

## Investing in the future

So that Bengalla could get the most out of its Liebherr equipment, the company also invested in an Immersive simulator for the R 9800. The simulator includes a replica of the excavator’s cab – complete with Liebherr controls and instruments like the cab’s control panel and joystick. Training operators with this simulator helps increase productivity and onsite safety, while reducing costs and instances of unscheduled maintenance.

“This R 9800 sets a firm foundation for a bright future between Liebherr and Bengalla built on trust, innovation, and strong customer support,” says Simone. “We are also excited to work with Bengalla on the delivery of a new R 9600 in early 2024 and can’t wait to see what else the future holds!”





# G'day, mate!

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The first R 9300 excavator to reach Australian soil landed in August 2023. It was delivered to long-term customer MACA at the Karlawinda Gold Project in Western Australia. The new 250-tonne excavator joins an already powerful fleet of three R 9200 excavators at the mine and will help to further exceed the client's production and fuel efficiency targets.

The R 9300 is the second Generation 8 excavator in the Liebherr Mining portfolio and comes with the most advanced Liebherr Mining innovations as standard.





**LIEBHERR**

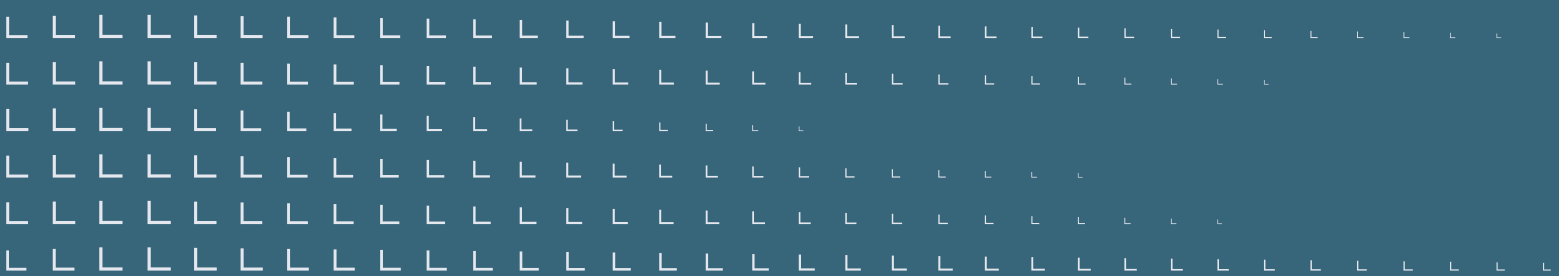
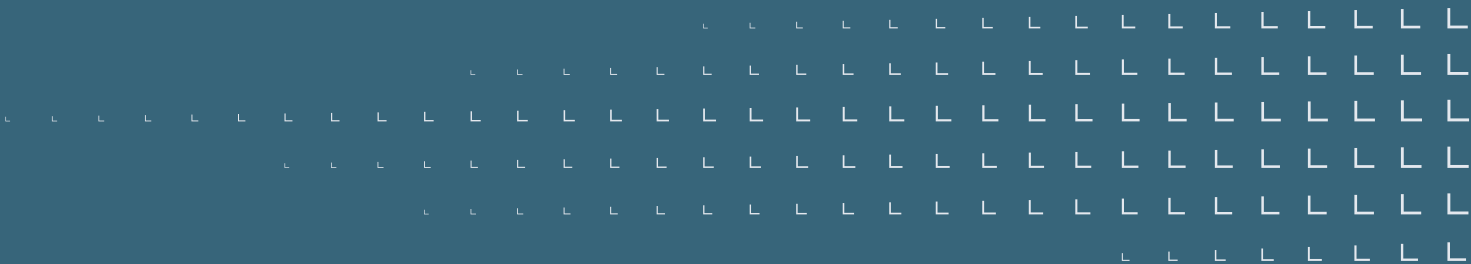
**Find out more about MACA's  
new machine!**

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# Product spotlight

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An in-depth exploration of Liebherr  
Mining solutions







# Innovation through modular maintenance

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Liebherr's modular maintenance service delivers the most practical solution to customers for safe working practices, minimised downtime, and efficient procurement methods.

Supporting customers with innovative service solutions is more important than ever with the mining industry increasingly needing to be proactive in the face of supply chain constraints and limited access to labour, while also needing to provide exemplary workplace safety and maximum equipment availability and reliability. Liebherr Mining – as a trusted partner with modular maintenance expertise – is well placed to provide customers with solutions to meet these demands.

## **How modular maintenance works**

Modular maintenance is a method of servicing mining equipment that leverages Liebherr's philosophy of modular machine design. The removed module is repaired or remanufactured to as-new quality and remains on hand to be used as part of Liebherr's component exchange program. The modular maintenance solutions offered by Liebherr help customers to minimise variable risk during the maintenance process, reduce equipment downtime, and improve onsite safety by focusing on standardisation, resource optimisation, and skills deployment.

Liebherr-Australia Pty. Ltd. has delivered over 500 modules to customers nationally since 2015.



“Our specialised teams in Perth, Mackay, and Mount Thorley will collectively deliver over 100 modules in the coming year, leading the global standard in Liebherr modular maintenance,” says Joanne Fox, General Manager, Customer Solutions, Liebherr-Australia Pty. Ltd.

Liebherr-Africa (Pty) Ltd launched the modular maintenance program for its customers in 2018. Since that time, it has delivered more than 50 modules.

“We support a machine population of 14 Liebherr excavators – including R 996s and R 9800s,” says Donald Hewitt, Head of Customer Service, Liebherr-Africa (Pty) Ltd. “At present, we plan to rebuild four power packs and two side frames per year.”

#### **Simplifying the maintenance process**

Labour shortages and mismatched skills remain a challenge in mining, but Liebherr’s modular maintenance offers customers a solution by providing a simplified approach to maintenance. With this approach, fewer personnel are required on site, thus optimising resource utilisation and safe work practices.

Modular maintenance is further enhanced as customers have the option to install product and technical upgrades during the refurbishment process, which can help to make the most of planned downtime.

Through modular maintenance, customers place orders using a single part number, rather than with numbers for each of the individual parts that make up the module. This further simplifies maintenance planning by streamlining the purchasing process.

“Liebherr Mining’s powerpack module for all mid-size and ultra-class excavators includes the splitter box and hydraulic pumps all in the one frame,” explains Hewitt. “This means just one simple changeout which makes the process simpler and faster, compared to an in situ change of individual components.”

#### **Keeping onsite staff safe**

Conditions on site can be unpredictable, meaning that it can be difficult to ensure that maintenance and repair procedures are always completed as intended. As this modularised maintenance solution is prepared in the controlled environment of a Liebherr branch, customers using the modular maintenance service can reduce high-risk machine servicing tasks – such as crane lifts – by up to 75% on average.

**[Click here to see the modular maintenance process for yourself!](#)**

“We have seen an 80% reduction in crane lifts in real cases of powerpack module overhauls, when compared to traditional maintenance methods,” says Jono Craig, Service Manager, Liebherr-Australia Pty. Ltd. “This makes modularisation safer, more economical, and a must for customers to consider when planning equipment maintenance.”

### **Working within the supply chain**

Delays in the delivery of parts and components can lead to lost productivity. By partnering with Liebherr, customers can be certain of both transparency and parts supply for consolidating and de-risking their supply chains. When planning modular maintenance, Liebherr customer service teams work with customers to optimise parts planning and the on-time delivery of their planned event schedule. Organising maintenance in this way means that Liebherr can order the parts and components it needs to perform the necessary machine servicing on time.

**[Click here to see a powerpack refurbishment in action!](#)**

### **Minimising downtime**

Unplanned maintenance is more costly for customers than planned maintenance. Modular maintenance – as a planned maintenance service – reduces downtime by up to 50%.

An important aspect of minimising machine downtime is to optimise the long-term reliability of equipment. When customers receive a new module from Liebherr, it comes with all new minor parts and harnesses to reduce ad hoc maintenance requirements for the machine.

“By supplying new harnesses with our refurbished modules, we can proactively address wear and tear to ensure maximum uptime on site,” says Jase O’Connor, Customer Support Manager, Liebherr-Australia Pty. Ltd.

Liebherr’s modular maintenance services are currently available in Australia and South Africa. To find out more, customers can speak with their local Liebherr customer service representative.

***“We have seen an 80% reduction in crane lifts in real cases of powerpack module overhauls. This makes modularisation safer, more economical, and a must for customers to consider when planning equipment maintenance.”***

**Jono Craig**

Service Manager, Liebherr-Australia Pty. Ltd.



# Technical spotlight: cable reeler for electric excavators

In 2020, Liebherr Mining released its cable reeler system. This system provides up to 300 metres of autonomous cable reeling for Liebherr's electric excavators, increasing the manoeuvrability of these machines and the safety of the onsite personnel that work with them.

Liebherr used its extensive expertise in developing, manufacturing, and maintaining electric excavators – honed over more than 40 years – to develop the cable reeler. For electric excavators to provide optimal onsite productivity, they must be as mobile and as easy to use as possible while also staying connected to their power source.

## How it works

The Liebherr cable reeler system is a fully autonomous solution that consists of a drum, cable, winder, hydraulic motor, and several safety sensors.

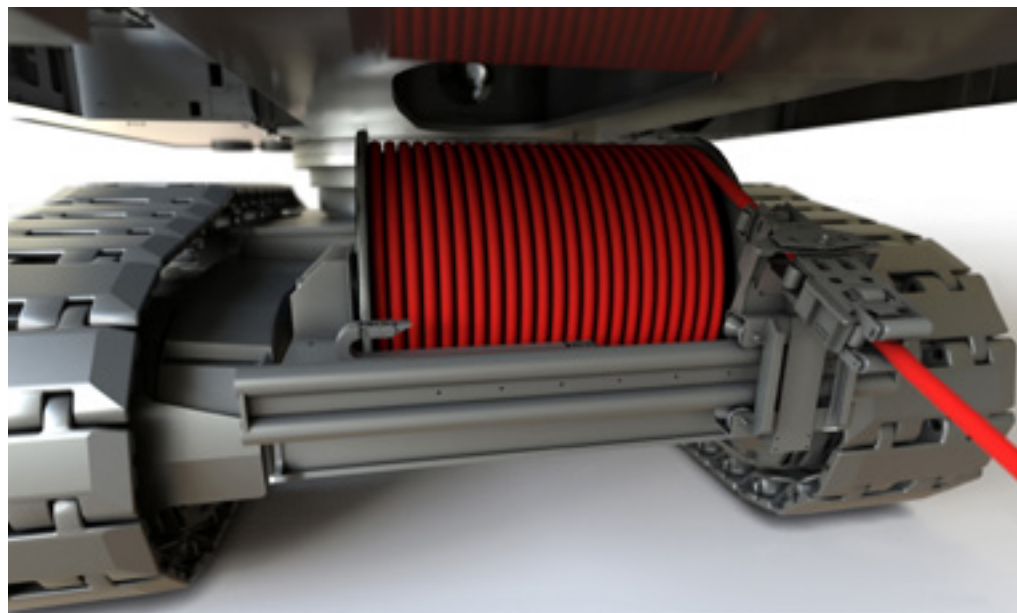
### Drum

The size of the drum – and therefore the length of cable within the system – depends on the size of the excavator. Specifically, it depends on the space available between the bottom of the uppercarriage and the top of the undercarriage, as the cable reeler is installed onto the centre girder. There has to be adequate room between the drum and the ground to prevent any damage to the cable reeler system. Because of this, a smaller drum is used on smaller excavators. However, this does not mean a reduction in reeling capability. The reeler system is hydraulically driven, allowing for smaller component integration than an electrically driven system. Liebherr's R&D team chose to power the cable reeler with a hydraulic motor rather than an electric one as electric motors are highly sensitive to dust and humid environments. As mine sites are often situated in dusty areas with extreme temperatures, this sensitivity would have been likely to cause performance issues on site.

Furthermore, hydraulically driven systems are more reliable and more compact than their electric equivalents, while also being simpler and easier to maintain.

### Cable

The cable in the reeler system is different to the one used for a standard trailing application. The trailing cable is specifically designed to withstand the friction caused by the stress of continuous contact with the ground as the excavator pulls the cable. On the other hand, the cable in the reeler system is designed to be coiled and so offers much more flexibility than the trailing cable. Additionally, the cable in the reeler system is larger than the trailing cable to prevent the power cable from overheating.



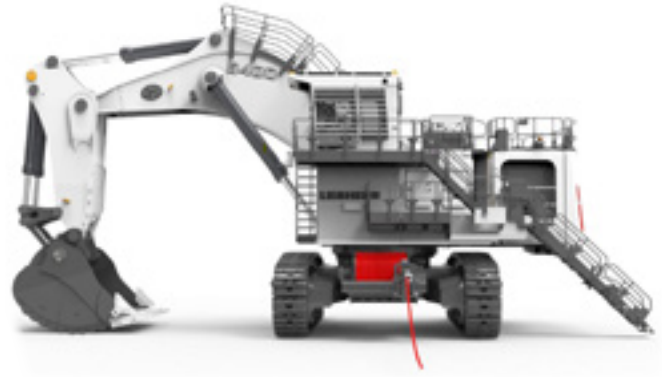
### Sensors

The safety sensors within the reeler system help to ensure that the cable always remains at an optimal tension. When the excavator reaches the maximum length of its cable, these sensors let the system know that the machine can no longer move forward. The reeler system is equipped with a number of limit switches that alert the operator to how much cable is on the drum. Once activated, these switches trigger an audible chime and warning lights within the cabin so the operator knows the excavator must change direction.

### How it helps

Electric excavators that use Liebherr's cable reeler system benefit from better machine mobility and optimised safety. In fact, the cable reeler system provides the best possible solution for managing the cables of electric excavators in backhoe configuration – particularly those that need to be repositioned multiple times. Because the cable can be retracted automatically while the machine is reversing, there is no need for an operator to manually handle the cable. This not only speeds up the excavator relocation process, but also improves the safety of the operator as they do not have to get too close to an active machine.

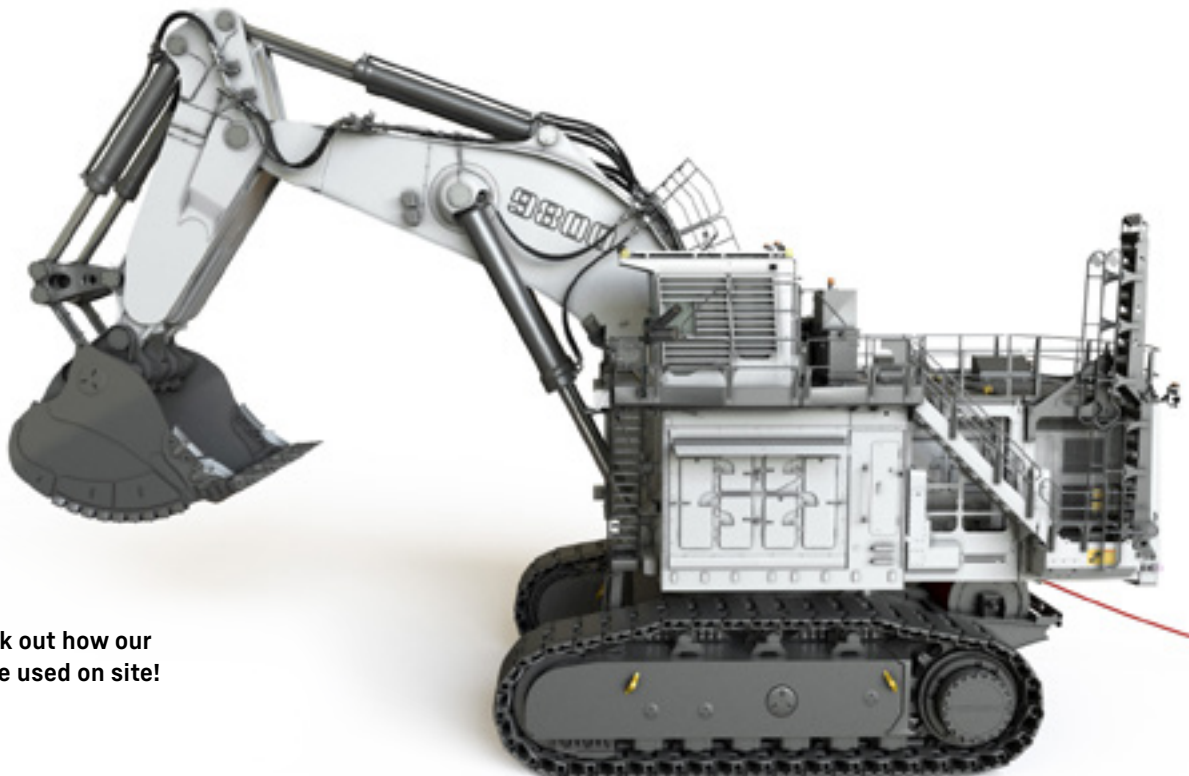
The robust design of the cable reeler is also an advantage on site. The cable reeler is protected by thick steel plates that keep the structure off the ground and prevent the cable reeler from being damaged should it come into contact with the terrain of the mine.



### How to get started

Liebherr's cable reeler system has been designed to be straightforward to install, while also preserving easy access to the travel drive circuit for routine maintenance. Customers using the cable reeler for their electric excavators can use the same infrastructure to connect to their site's electric grid as they would when using the trailing cable. Further, Liebherr's electric excavators have been designed so the reeler system can easily be integrated. The machines' frames are reinforced so that they can easily accept the additional weight of the cable reeler once bolted to the centre girder. Plus, there is enough room underneath Liebherr's electric excavators to accommodate the reeler system without reducing the amount of ground clearance.

Liebherr's cable reeler system can be installed at first fit or can be retrofitted and is available for the majority of Liebherr's electric excavators.



[Click here to check out how our cable reeler can be used on site!](#)

# Raising mining to new heights

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It's not uncommon to see cranes used when historic buildings are restored, or when turbines on wind farms are built. But cranes also play an important role on mine sites! Cranes offer fast and flexible assembly and maintenance of mining equipment and can also help to construct mine site infrastructure.



Liebherr-Werk Ehingen GmbH is the international market leader for mobile and crawler cranes. The factory has grown and evolved since its founding in 1969 and now boasts a workforce of 4,500 staff, capable of delivering nine mobile cranes to customers every day. The factory leverages its more than 50 years' experience in manufacturing cranes to develop mobile cranes with lifting capacities from 35 tonnes to 1,200 tonnes and crawler cranes of up to 3,000 tonnes that can be used in a wide range of environments, including on mine sites. We spoke to some experts to learn more about Liebherr's mobile and crawler cranes and how these can be a valuable asset for mining:

Felix Mussotter, Sales Department, mobile and crawler cranes, Liebherr-Werk Ehingen GmbH, Germany

Hubertus von Sperber, Division Manager, mobile and crawler cranes, Liebherr Chile S.p.A.

### Where do you see the biggest demand for mining cranes?

**Hubertus:** Our cranes are operational all around the world, and anywhere that operates a mine could be a good market for our cranes! But generally speaking, the major markets for our mining cranes are North and South America, the Middle East, and Australia. Which isn't surprising as these are some of the largest mining markets in the world.

But we are seeing expansion into new markets as well. In 2023, we delivered two LTM 1650 8.1 mobile cranes directly to mining customers in Peru. And for 2024, we already have 10 units of our new rough terrain cranes – the LRT 1130 2.1 – planned for the Chilean market!

### Which kinds of cranes are used most often in mining?

**Hubertus:** All types of cranes can be used in a mining context – they just serve different purposes. Because of the flexibility offered by our all-terrain cranes, these machines are often used to service mining trucks and excavators. The strength of our crawler cranes means they are generally found completing construction on site or changing out heavy machine components.

However, it's our rough terrain cranes that are most closely associated with everyday use on a mine site. These machines are a cost-effective option for pick and carry tasks on site.

### Could you explain the difference between an all-terrain crane and a rough terrain crane?

**Felix:** All-terrain cranes and rough terrain cranes are both mobile cranes. However, there are some important differences. An all-terrain crane is approved to drive both on and off road thanks to their all-terrain chassis. This type of crane might need to be assembled on site as – depending on the size of the machine – it may require additional ballasts on additional transport trucks. On the other hand, rough terrain cranes can only operate off-road as – due to their width and high axle loads – they are not allowed to drive on public roads. As such, rough terrain cranes are transported on low-loaders because these trailers are designed to handle the weight and height of industrial machines. However, when rough terrain cranes arrive to site, they arrive ready to work.

### What are some of the features that allow these cranes to operate in the challenging conditions found on mine sites?

**Felix:** Our cranes have a number of features that keep both the operators and machines safe when they are in use. Our innovative VarioBase® technology means that cranes can safely operate in constricted areas. VarioBase® allows each of a crane's outriggers to be extended to different lengths to best suit the conditions. The data collected by the crane's onboard computer – such as outrigger extension length, maximum load capacities, and support force – allows the crane operator to see the crane's current centre of gravity via a screen in the cab. All of this helps us to avoid accidents caused by incorrect operation while the machine is working.

***“Anywhere that operates a mine could be a good market for our cranes!”***

**Felix Mussotter**

Sales Department, mobile and crawler cranes, Liebherr-Werk Ehingen GmbH, Germany





***“Our first electric mobile crane – the LTC 1050 3.1E – was delivered in Q3 2023 to the Netherlands, with three more to be delivered to South America in 2024.”***

**Hubertus von Sperber**  
Division Manager, mobile and crawler cranes, Liebherr Chile S.p.A.

So our cranes are able to drive within the rough conditions of a mine site, we need to be mindful of the cranes' cylinder stroke – that is, the difference between the completely extended and completely retracted heights of a crane's lift cylinders. The cylinder stroke needs to be enough to level the crane while also providing enough clearance for timber or load distribution mats to be placed under the cylinders.

We also work to ensure that our cranes are constructed in such a way that they can function as a permanent fixture within a mine or can be transported and used in multiple locations. Liebherr offers load distribution mats for all crane sizes, for customers who use their cranes in fixed applications. But it all depends on what the customer needs – we adapt the machines so that they are the best option for a variety of applications and site requirements. Our range of cranes has robust support plates for all substrates and temperatures.

**Hubertus:** We place great emphasis on special driving conditions – like those found on mine sites – when developing our cranes. The technical driveability of our machines allows for increased axle loads. When driving on construction sites, crane operators can take the full counterweight with them – saving time, money, and additional means of transport.

We also offer products that can be added to our cranes for extra layers of safety, such as reversing cameras and alarms. For mining in particular, we offer a lighting package that includes – among other things – reflective strips and warning stickers that are attached to the cranes by third party specialists.

#### **How have you seen the market for mining cranes change over the years?**

**Felix:** In recent years, we have seen customers focusing more and more on our cranes' impact on the environment. All of the cranes that leave our factory can be used with hydrotreated

vegetable oil (HVO) instead of diesel. They are also offered in EU Stage V versions, meaning that they include selective catalytic reduction technology and AdBlue – an exhaust fluid used in diesel engines that is burned at incredibly high temperatures to help break down nitrogen oxides.

In terms of diesel alternatives, our first electric mobile crane – the LTC 1050 3.1E – was delivered in Q3 2023 to the Netherlands, with three more to be delivered to South America in 2024. Our factory is also focused on developing other alternatives for our cranes so in future we will be able to offer customers a wide range of zero emission possibilities.

Another development we have seen is that components have been getting bigger and heavier. This seems to be the trend in a number of industries. In fact, within mining, the mines as well as their trucks, components, and production parts are getting bigger as well! These component size and weight increases help to save transport costs and lifting turns, meaning that fewer trucks are needed and crane occupation time is decreased. We are also seeing an increase in the demand for larger cranes.



#### **Liebherr-Werk Echingen GmbH, Germany**

- More than 50 years' experience in mobile crane construction
- 2,000 cranes produced per year
- 40,000 mobile cranes from Echingen in operation worldwide
- 1,000,000 m<sup>2</sup> factory premises
- 270,000 m<sup>2</sup> covered area
- €2.3 billion annual turnover
- 4,500 employees





# When parts come full circle: remanufacturing with Liebherr Mining

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Liebherr Mining prides itself on offering a number of ways for mining companies to operate more sustainably. One such method is Liebherr Mining's Reman Program, which can substantially reduce the number of resources used and greenhouse gases emitted during the machine maintenance process.

## **Supporting customers wherever they are**

An impressive 50% of all major components sold for use in customers' Liebherr machines come from Liebherr Mining's Reman Program. In order to reach this number, Liebherr needed a robust support network that could provide services to customers, no matter their location.

"Liebherr has 12 reman and repair facilities around the world," says Jeff Rounds, General Manager, Global Remanufacturing, Liebherr-Mining Equipment Colmar SAS.

"We are proud to employ and train more than 300 people across these locations."

However, mines are often located in remote areas without easy access to these facilities, or the resources needed to remanufacture parts effectively. To assist these customers, Liebherr leverages the resources and expertise of its international remanufacturing teams and locations.

“Our robust logistics network allows us to easily move customers’ used parts – known as ‘cores’ in remanufacturing – from their sites to our regional or central reman facilities,” explains Rounds. “This means that – for customers who don’t have a local Liebherr remanufacturing operation – their cores are sent to one of our regional hubs for processing to fulfil their needs. Being able to share resources in this way ensures that customers still receive our world-class remanufacturing services, regardless of where they are in the world.”

Thanks to Liebherr Mining’s Service Excellence Program, customers are guaranteed to receive consistent, high-quality support from whichever facility they work with during the remanufacturing process.

“Because the Service Excellence Program regularly evaluates all Liebherr Mining service and support facilities, it ensures that our international network of reman workshops offers consistent, first-rate services to each and every customer, no matter which branch they walk into,” says Rounds.

#### **Why remanufacture?**

Remanufacturing helps to reduce the impact of machine maintenance on the environment in a number of ways. Because remanufacturing salvages as many existing components as possible from customers’ cores, fewer raw materials are needed to restore the parts to as-new quality.

***“Our international network of reman workshops offers consistent, first-rate services to each and every customer, no matter which branch they walk into.”***

#### **Jeff Rounds**

General Manager, Global Remanufacturing,  
Liebherr-Mining Equipment Colmar SAS

“When looking at the data, we see that remanufacturing reduces the volume of raw materials used in the maintenance process by up to 75%,” says Rounds. “Keeping these components in circulation for as long as possible also helps us to contribute to the circular economy.”

With fewer raw materials needing to be extracted or recycled (i.e., melted down to create something new), less energy is burned which means that fewer greenhouse gases are emitted into the atmosphere.

“In 2022, the Liebherr Mining Reman Program saved about 10,000 tonnes of CO<sub>2</sub> from being released,” enthuses Rounds. “And as a bonus, the reduction in energy burned and raw materials used means that a remanufactured part costs less than a brand-new part for our customers.”

Beyond the reduction in environmental impact, the remanufacturing process also allows Liebherr to analyse its parts and components to ensure optimal onsite performance.

“When component cores are returned to Liebherr, their condition is examined by our development engineers to assess their reliability and durability,” explains Rounds. “The engineers see where a part might benefit from an upgrade and make suggestions as to how this can be integrated into the product.”

Any upgrades or technical improvements incorporated into a part based on this analysis are included during remanufacturing – just as they would during the manufacture of a new component.

#### **Next steps for Reman in Liebherr Mining**

Liebherr Mining has been expanding its remanufacturing capabilities in recent times. In Q1 of 2022, a new state-of-the-art remanufacturing facility was built in Panama in order to support a large fleet of T 284 trucks. Additionally, PT Liebherr Indonesia Perkasa is in the middle of expanding its remanufacturing facility. This will create an extra 3,500 square metres of production space, providing enough room for the remanufacturing team to work with Liebherr internal combustion engines, gearboxes, and hydraulic cylinders.

“It’s fantastic to see the expansion of our remanufacturing program around the world,” says Rounds. “Increasing our capacity to support our customers demonstrates our dedication to being a reliable partner and we are excited to see what the future will bring!”

**To learn more about  
Liebherr Mining’s Reman  
Program, [click here!](#)**





## i

### **The remanufacturing process**

Remanufacturing is a meticulous industrial process that takes a used and/or non-functional part – the ‘core’ – and restores it to same-as-new quality, in line with an OEM’s specifications.

The process involves breaking down the returned core into its components so that these can be cleaned and inspected in order for the technicians to assess what happens next. Some of the core’s components may be able to be refurbished, while others may be unsalvageable and need to be completely replaced.

Once technicians understand which components need to be worked on, these are then rebuilt to Liebherr’s strict quality and reliability standards. The rebuilt part is then reassembled and goes through rigorous quality control processes to eliminate any performance issues. Once reassembly is complete, the remanufactured part is then either returned to the customer or entered back into Liebherr’s onsite inventory.

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# The world of Liebherr

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A taste of the wider world of the Liebherr Group

Gear technology and automation systems

# Liebherr automates disassembly of battery packs

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Federal Ministry  
of Education  
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In 2030, the batteries of an estimated four million electric vehicles will reach the end of their useful life. The lithium-ion batteries contain valuable raw materials and recycling them makes both ecological and economic sense.

Up until now, however, the disassembly of the battery system has been complex and expensive as the separation of the components is usually done manually. This is where Liebherr-Verzahntechnik GmbH, Germany, comes in. The company is developing strategies and processes for the automated disassembly of battery packs and is a partner of the research project "ZIRKEL" – funded by the German federal government – which is investigating the entire circular economy of traction batteries.



Liebherr pilot plant for the automated disassembly of battery packs

Lithium-ion vehicle batteries are taken out of circulation once their total capacitance has reached about 70-80% of their original capacitance (state-of-health). The majority of these batteries are recycled and the raw materials are returned to the material cycle for the production of new batteries. Depending on their condition, a small proportion of the old batteries are reused in battery-electric vehicles (via remanufacturing) or in second-life applications, such as stationary battery storage systems.

When the batteries have finally reached the end of their useful life, the new EU Battery Regulation stipulates recycling quotas and minimum quantities of reused raw materials in new production. The industry must find the most efficient solutions possible for returning them to the material cycle, especially since the volumes of batteries returned will increase significantly in the future. The aim is to achieve sustainable, CO<sub>2</sub>-neutral battery production along the entire process chain with unlimited reuse of materials in a closed product life cycle. This is intended to minimise waste products and dependence on important primary materials.

### High recycling rates through automation

Due to the relatively low quantities and large number of variants of diverse manufacturers and product generations, many disassembly and remanufacturing processes still take place manually.

“Because of the complexity of recycling such different varieties of batteries, we are almost talking here about a batch size of one in the return flow of battery packs,” explains Jan Pollmann, Development Engineer, automation systems, Liebherr-Verzahntechnik GmbH, Germany.

In order to achieve a high recycling rate and to be able to process the increasing return volumes economically, it is necessary to automate the processes. Another aspect is occupational health and safety – automated disassembly ensures the health and safety of employees and excludes their exposure to high voltages, hazardous substances, and fire risks.

### Liebherr develops automated disassembly processes for battery packs

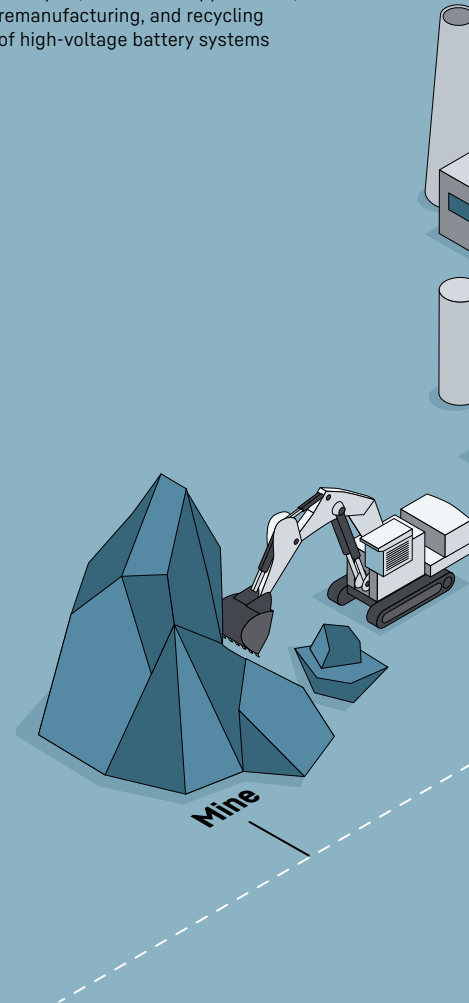
The “ZIRKEL” research project – funded by the German Federal Ministry of Education and Research – involves an interdisciplinary consortium from research and industry to investigate the entire recycling management of batteries. As part of this project, Liebherr is developing strategies and processes for the automated disassembly of battery packs. The aim is to recover and recycle the highest possible proportion of raw materials by mechanically disassembling and sorting the components. By removing valuable components or those containing pollutants at an early stage, the cost- and energy-intensive pyro- and hydrometallurgical processing of the so-called ‘black mass’ – the raw material mixture that remains after the batteries have been shredded – is reduced.

### Automation challenges

In addition to the variety of batteries, a number of other challenges exist for an automated disassembly process. Used batteries can be corroded, deformed, or damaged. Contaminated components are sometimes difficult for vision systems to detect. Sealants, adhesives, and heat-conducting pastes change their consistency and properties over time and may be difficult to remove. Risks such as high voltages or hazardous substances must be taken into account. And finally, the disassembly of flexible parts such as cables or cooling hoses is difficult to automate.

“In principle, the established assembly process runs backwards here, but it is many times more complex,” explains Viktor Bayrhof, Product Manager, automation systems, Liebherr-Verzahntechnik GmbH, Germany.

Life cycle, second-life applications, remanufacturing, and recycling of high-voltage battery systems



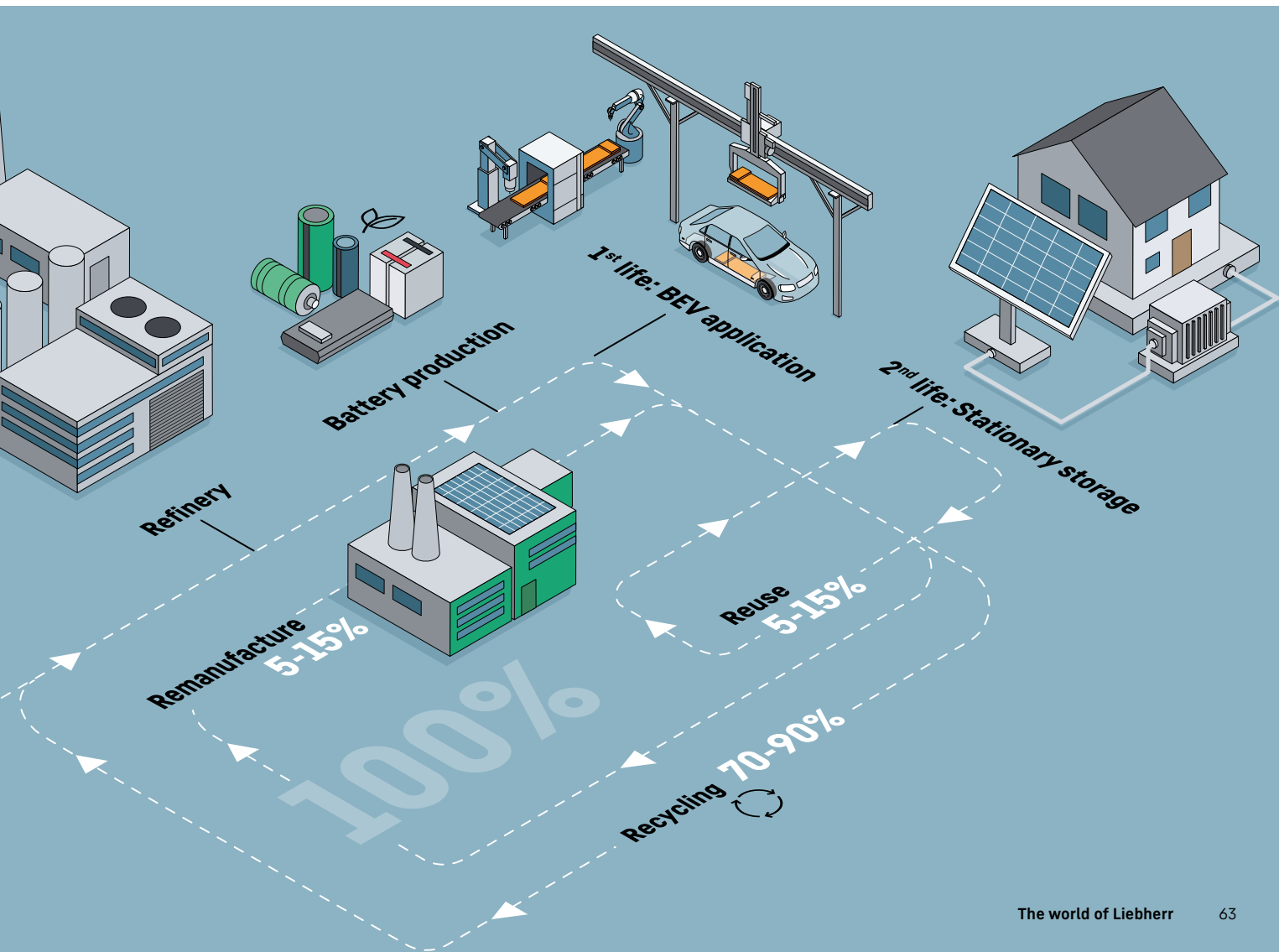
**Pilot plant for the “ZIRKEL” joint project**

Liebherr’s first pilot plant was installed at the Open Hybrid LabFactory research campus in Wolfsburg, Germany, in July 2023. Liebherr will continue to support the project there and carry out further test series. The results will be incorporated into a planned industry guideline for recyclable battery product design.

“We are pleased to be able to contribute our process expertise in the field of automation in this future-oriented project,” explains Pollmann.



3D layout of the partially automated prototypes process station





The Group

# The best of all worlds

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They say that all roads lead to Rome. And the same applies to sustainable development and climate-friendly technology. An openness to technology of all kinds is a must in order to address the diverse requirements of commercial vehicle transport on construction sites, mines, or off road. This is where the future lies.



## No shortcuts to climate action

Climate protection at the touch of a button would be great. Unfortunately, however, an instant feel-good shift from fossil combustion engines to sustainable carbon-free, or at least carbon-neutral, drives is still a long way off, especially for certain types of construction machinery. "A compact wheel loader for horticultural use will have different requirements than a 100-tonne crawler excavator used in mining sites at altitudes of 5,000 metres in the Andes. In other words, developing drive concepts calls for a great many and different skills," says Jürgen Appel, Head of Technology Coordination, Liebherr-International AG, Switzerland.



## Seeing the big picture

What does the carbon footprint of construction machines include? To find out, Liebherr carried out a comprehensive life cycle analysis of the greenhouse gas emissions of standard construction machines in cooperation with the business consultancy, Frontier Economics. Exactly the same machine model was equipped with different drive solutions and examined. It became apparent that there is no superlative, catch-all solution for climate-neutral drive systems for construction machines.

“We can only achieve the CO<sub>2</sub> reductions that we want and need by looking at the entire life cycle of a machine holistically. And we can't do if we're closing our eyes to certain technologies from the outset. Instead, we have to concentrate on ensuring that innovative, future-proof, and climate-relevant technology is presented in such a way that customers can work with it, too,” says Appel.

### Future to the power of three

Liebherr is pursuing a three-part approach to its technology:

1. increased efficiency of existing drive systems
2. electrification
3. alternative fuels for combustion engines

## Liebherr technologies with bright prospects

The Frontier Economics study has shown that holistic, life-cycle-based analysis of construction machines and heavy equipment is necessary in order to achieve the climate goals laid down in the Paris Agreement. Liebherr brings together a wide range of experience and engineering skills in its central operations Corporate Technology and its own competence centres, such as the Liebherr facility dedicated to batteries in Biberach and the Liebherr Digital Development Centre in Ulm, both located in Germany.

“Liebherr isn't just a manufacturer of machines and components. It also combines entire system competence in one place. This enables us to make advances in efficiency in all types of drives,” explains Appel. “This is invaluable for the timely and practical transition of technology.”

It is always about taking a holistic perspective that encompasses both the environment and the available infrastructure. “It doesn't make sense to develop alternatives based on renewable energies without considering their availability,” continues Appel. “Openness to technology means that our machines actually work for our customers, not least in terms of progressive climate action.”



## Liebherr's path to the energy transition

Liebherr equipment and components are playing an important role in the global transition to a decarbonised economy. The Group's contributions include ship and mobile cranes for the construction of offshore and onshore wind farms, construction machines for smart city and rail network expansion, and material handling technology for recycling valuable materials.

It must be said that many of the Liebherr machines that will play a key role in advancing the energy transition are designed for high power requirements and continuous operation, and are therefore based on powertrains that use fossil fuels. As this makes them major emitters of CO<sub>2</sub>, Liebherr has accelerated the development of low and zero emission technologies across its wide range of products, making significant progress along the way. “In the interests of future generations, we are continuing to invest heavily in innovations that are good for our customers and the environment alike,” explains Appel. “In doing so, we are focusing on a comprehensive increase in efficiency.”

### Green electricity bottleneck

The key to lowering greenhouse gas emissions lies in the electricity generated from renewable forms of energy. It is the basis for climate-neutral, electric-drive systems and the production of e-fuels and green hydrogen. In its annual survey of energy professionals for 2023, the global classification society Det Norske Veritas recently found that few figures in the industry (17%) believe that the energy transition over the next decade will deliver safe, clean, and affordable energy for all parts of the energy system in their country.

However, the energy industry expects higher investments in clean energy sources in 2023, mainly in low-carbon hydrogen and ammonia (52%). Wind power (49%) and solar energy (46%) will see a similar share in investment.

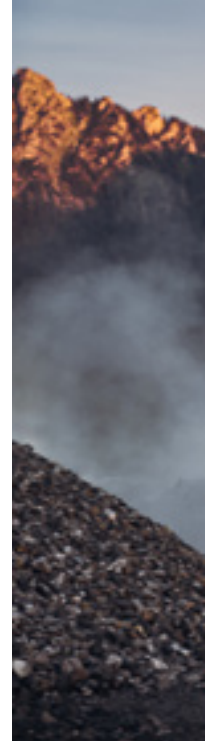
Renewables are still on the rise in Europe and the USA. In Germany, for example, they accounted for 48.3% of consumption in 2022 (in 2021 this was 42.7%).

# Highlights from other product segments

The Group

## Liebherr-inspired playground opens in Ravensburger Spieleland

Ravensburger Spieleland and the Liebherr Group have joined forces: a new Liebherr adventure playground opened with the start of the German theme park's 2023 season on an area of over 1,300 square metres. At the Liebherr adventure playground within the Ravensburger theme park in Meckenbeuren, Germany, visitors young and old can immerse themselves in the fascinating world of Liebherr. Numerous machines invite them to romp around, and visitors can also find out about the Liebherr Group and Liebherr as an employer on display boards throughout the playground.



Earthmoving

## New 170-million-euro production site in Alsace

Liebherr-France SAS – based in Colmar, France – is responsible for the development and production of the Liebherr Group's crawler excavators. As part of its efforts to strengthen local supply chains, Liebherr-France SAS is planning to open a new manufacturing site for welded components as well as pre-assembly and assembly work for driver cabs in the EcoRhena industrial park in Namsheim (Alsace, France) in 2025. Liebherr is investing 170 million euros in an area of around 47 hectares and will create more than 300 jobs.

Components

## New test bench for Liebherr main bearings

Liebherr's components product segment is revolutionising wind turbine technology with the introduction of a new state-of-the-art main bearing test bench. With a maximum electrical input power of 300 kilowatts, a maximum rotational speed of 15 rpm, and an impressive test capacity of up to 125 tonnes, the innovative test bench ensures rigorous testing and validation of main bearings for offshore wind turbines. Liebherr thus underlines its commitment to maximum efficiency and reliability in the generation of clean and sustainable energy.





Earthmoving

## New TA 230 Litronic articulated dump truck

At the 2023 Conexpo in Las Vegas, USA, Liebherr presented the TA 230 Litronic – a representative of the new generation of articulated dump trucks. The new TA 230 has been redeveloped based on comprehensive market research and customer feedback and features state-of-the-art technology. This model has been tested to the limits through extensive evaluation phases to meet the highest quality standards. The result is an excellent product with a new design that presents maximum quality and reliability. The TA 230 offers optimum performance and efficiency and provides the utmost comfort.



Deep foundation machines

## Two new models for deep foundation: LRB 23 and LB 30 unplugged

Liebherr has expanded its portfolio for deep foundation applications. With the piling and drilling rig type LRB 23, the company closes the gap between the LRB 16 and the long-established LRB 355. The battery-powered drilling rig LB 30 unplugged has the same performance specifications as the conventional version and has the additional advantage of being a zero emission solution.



The Group

## Liebherr impresses at Conexpo 2023

Las Vegas – the dazzling metropolis of Nevada – once again hosted North America's largest construction trade fair from 14 to 18 March 2023. Liebherr presented numerous innovations as well as further developed products and technologies from its extensive range of construction equipment and components at Conexpo. Visitors were able to experience the approximately 30 Liebherr exhibits live on an impressive booth area of 5,600 square metres.

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Printed in Germany. Subject to amendment.