LIEBHERR

Bauma Magazine 2016

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Be Part of Something BIGGER

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

Dear guests,

Liebherr welcomes you most cordially to the 2016 Bauma. It's great to see how many visitors have come to Munich to sense 'the heartbeat of our industry'. We look forward to sharing our passion for technology and innovation with you.

Our motto this year is 'Be Part of Something Bigger'. This idea suits us well, since from our position as leaders in technology we always strive to find the very best results together with our customers. Furthermore, this motto is an invitation to you: get to know the fascinating world of Liebherr construction machinery and mining equipment, including a closer look at the latest components we have developed.

You may have suspected it: Liebherr's open-air stand is one of the biggest at any trade fair in the world. In this magazine we describe how it was built and list some of the remarkable facts and figures associated with it. The Bauma is of course a welcome opportunity to discuss trends and how they influence our industry. An interview with Tobias Wallisser, Professor for Innovative Building and Spatial Concepts at the State Academy of the Arts in Stuttgart, gives us his view of the situation, and we describe a whole lot more exciting developments too: digitised construction work, efficient use of energy, a pioneering synthetic-fibre rope for cranes, our product highlights at the Bauma and a meeting with one of our earliest apprentices, whose loyalty to our family-owned company goes back 66 years.

Wishing you interesting reading and an enjoyable visit to the Bauma.

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

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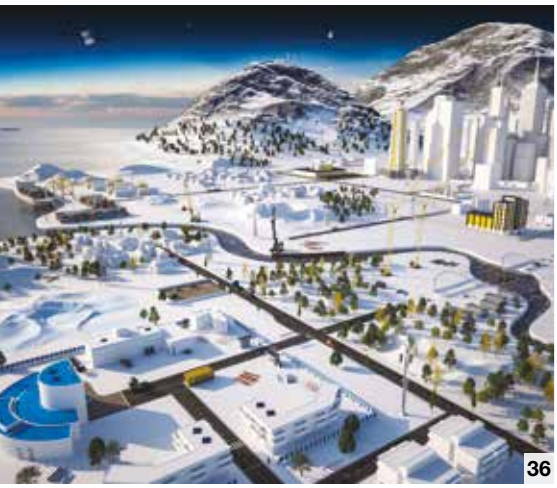
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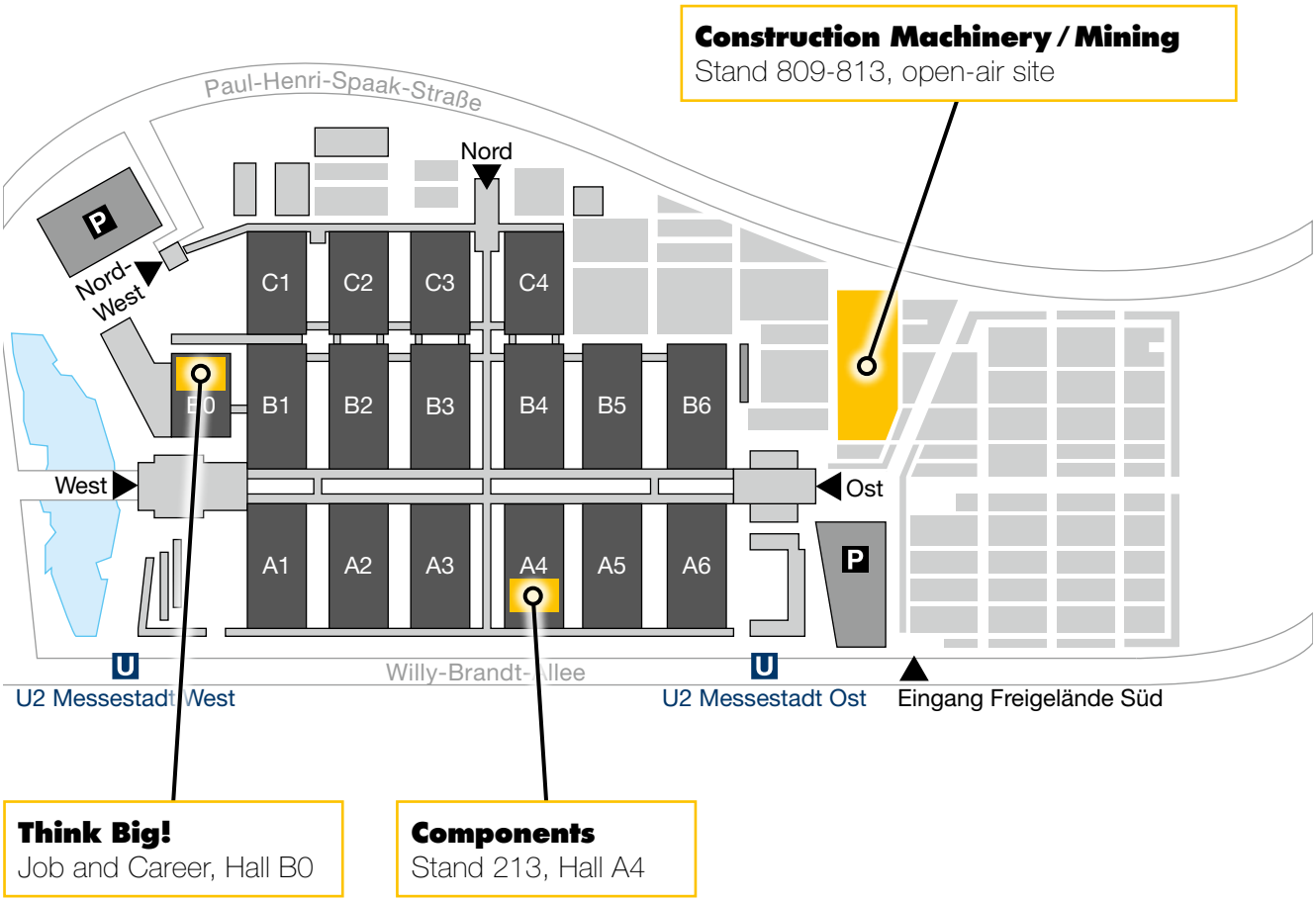
Be Part of Something Bigger

Welcome to Liebherr at the 2016 Bauma where, from April 11 to 17, visitors will be able to meet us at the world's largest non-permanent exhibition stand and immerse themselves in the world of Liebherr construction machinery and mining equipment. Around 60 exhibits will be on display, including a substantial number of both new and enhanced products. Other trade fair highlights include a separate demonstration area for earthmoving machinery, the latest developments in the component area, full information on career prospects with Liebherr – and a whole lot more.


PERI

Liebherr at the 2016 Bauma



"Think Big!" – with a Career at Liebherr

As in previous years, the 2016 Bauma is devoting the entire B0 exhibition hall to vocational training, study and career choice. On every day of the Bauma, trainees and instructors from Liebherr will share their experiences of working for the family-owned group of companies and answer visitors' questions for the VDMA's "Think Big!" project.

Demonstration Area for Earthmoving Machinery

It takes only about five minutes by road from the main Liebherr stand to reach the BRICS site, a separate area made available specifically for the Bauma, where Liebherr will be presenting earthmoving machinery designed and built to suit the needs of operators from markets with less stringent emission limits, such as Brazil, Russia, India, China and South Africa. Existing and prospective customers interested in these machines can book a visit to this site with Liebherr sales personnel at the Liebherr-Export AG information desk on the main Liebherr stand. Transport to the BRICS site will be by shuttle bus and a rickshaw service.

Attractions on Liebherr Square

On Liebherr Square visitors can enjoy highlights from various Liebherr product areas including the LR 1300 crawler crane, the LH 110 C High Rise Port Litronic material handler, the PR 776 crawler tractor and, from the mining range, the R 9200 excavator and T 264 truck.

Construction Machinery and More

Although construction machinery, mining equipment and components are all significant categories in the Liebherr product range, they are not all that Liebherr has to offer, as visitors to the 2016 Bauma will discover. In the Bauma pavilion foyer, examples from other Liebherr product areas, including for example Aerospace and Domestic Appliances, will be on display.

Liebherr Trade Fair Added Extras

A visit to Liebherr at the Bauma is a memorable experience with a varied programme of events and demonstrations accompanying the many product highlights. Visitors will find plenty to interest them on the Liebherr stand and can also interact with Liebherr by heading to one of the following locations.

A Foyer:

the place to find the central infotec points and to ask about careers with Liebherr.

B Driver's Club:

a place for drivers of Liebherr construction machines to get together while enjoying local food and drink.

C Meeting Point:

this is where tours of the Liebherr stand begin and is also a convenient place to arrange to meet friends.

D Liebherr Shop:

on the ground floor of the Liebherr pavilion, the shop has a full range of Liebherr merchandise from construction machinery models to T-shirts. See page 35 for more detailed information on items available from the Liebherr Shop.

E Customer Service:

presenting the full range of Liebherr's after-sales support including the global service network, original spare parts and the Reman Programme, retrofit and upgrading, operating recommendations, LiDAT, Liebherr-P@rts24, Crane Planner and additional software tools.

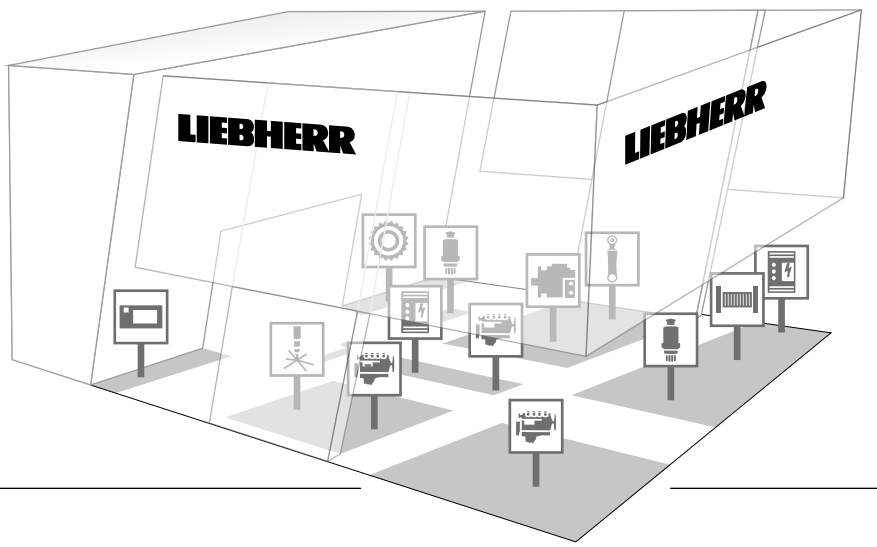
F Social Media:

on the Social Wall, visitors will be able to play an active part in Liebherr's Bauma presentation. For example, they could take a picture and post it on Facebook, Twitter or Instagram with the hashtag #LiebherrBauma to become "Part of Something Bigger" within seconds.

Components

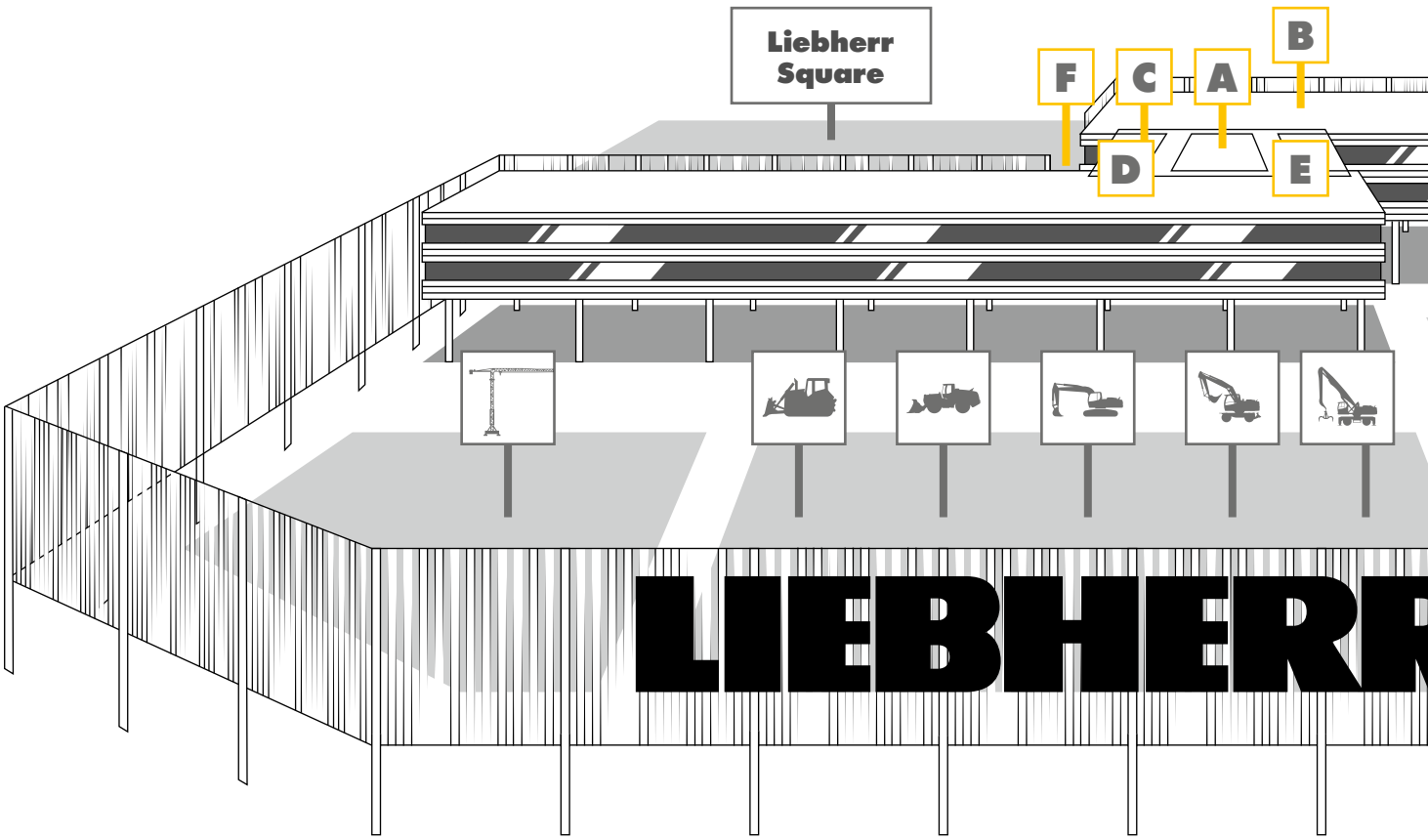
The Exhibits at a Glance

Stand 213 in Hall A4 is where Liebherr will have its latest developments in mechanical, hydraulic and electrical drive and control technology on display. The components and systems being exhibited include diesel and gas engines, fuel injection systems, hydraulic cylinders, pumps and motors, large diameter bearings, gearboxes and rope winches. There will also be exhibits from the electronic and control technology ranges and electrical machines.



- Axial piston hydraulics
- Control technology
- Electronics
- Gas engines & diesel engines
- Gearboxes
- Hydraulic cylinders
- Injection systems
- Large diameter bearings
- Rope winches

Discover more:
www.liebherr-bauma.com

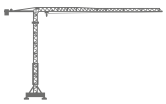


Mobile Excavators
A 912 Compact Litronic
A 918 Compact Litronic
A 918 Litronic
A 922 Rail Litronic

Remanufactured Components
Sectioned model of V8 diesel engine
Hydraulic motor reconditioning cycle

Mining Excavator
R 9200

Crawler Excavators
R 926 Litronic
R 918 Compact Litronic
R 914 Compact Litronic
R 936 LC Litronic
R 950 Tunnel Litronic
R 950 VH-HD Demolition Litronic
R 970 SME Litronic



Tower Cranes
172 EC-B 8 Litronic
710 HC-L 32/64 Litronic
81 K.1
L1-24
MK 140

Crawler Cranes
LR 1500
LTR 1220
LR 1100

Mining Truck
T 264

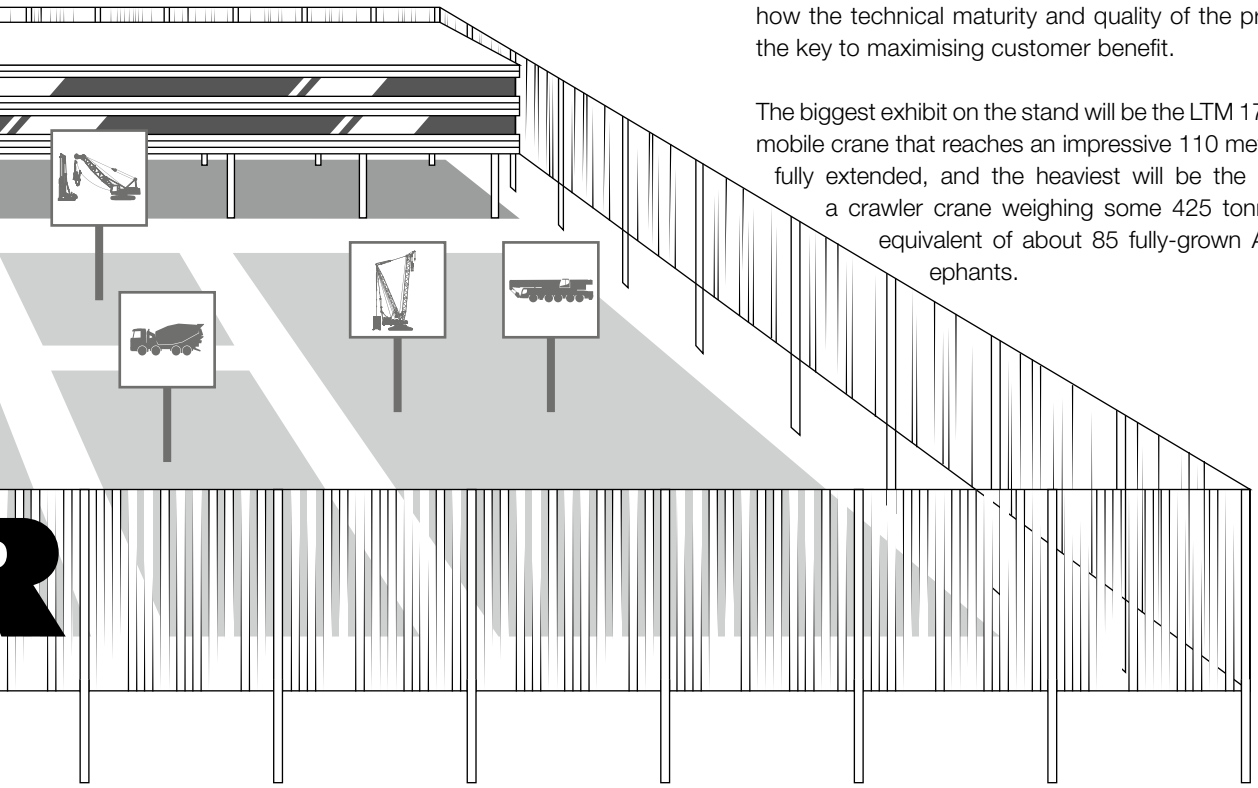
Wheel Loaders
L 506 Compact
L 507 Stereo
L 526
L 546
L 566
L 566 XPower®
L 586 XPower®

Construction Machinery and Mining

The Exhibits at a Glance

The Liebherr Group will have around 60 exhibits on display at its open-air stand 809-813. The selection of the Group's construction machinery and mining equipment being shown at the 2016 Bauma includes a number of new products and developments of existing ones, making it potentially one of the largest and most extensive ranges being exhibited. Visitors will be able to see for themselves how the technical maturity and quality of the products is the key to maximising customer benefit.

The biggest exhibit on the stand will be the LTM 1750-9.1, a mobile crane that reaches an impressive 110 metres when fully extended, and the heaviest will be the LR 1500, a crawler crane weighing some 425 tonnes – the equivalent of about 85 fully-grown African elephants.



Crawler Tractors and Crawler Loaders

PR 716 Litronic
PR 726 Litronic
PR 776 Litronic
RL 64

Material Handling

LH 30 M Industry Litronic
LH 40 M Industry Litronic
LH 26 C Elektro
LH 110 C High Rise Port Litronic
TL 441-7

Concrete Technology

THP 140 H/37 Z4 XXT
THP 140 HL/50 M5 XXT
HTM 905/36
HTM 904
HTM 904 mit LTB 12+4
Mobilmix 2.5
Ring pan mixer RIV 2.5-D
Trailer concrete pump THS 80 D
Crawler concrete pump THS 110 D4f-K

Mobile Cranes

LTC 1050-3.1
LTF 1060-4.1
LTM 1030-2.1
LTM 1060-3.1
LTM 1070-4.2
LTM 1130-5.1
LTM 1160-5.2
LTM 1250-5.1
LTM 1300-6.2
LTM 1450-8.1
LTM 1750-9.1

Deep Foundation Machines

Rotary drilling rig LB36
LR 1100
LRB 355
LR 1300 with LRH 600
HS 8130

Discover more:
www.liebherr-bauma.com

Keep in Touch with Liebherr at the 2016 Bauma

On the Internet

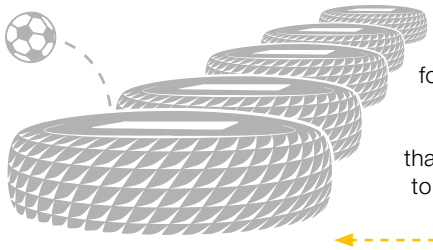
Liebherr has its own website www.liebherr-bauma.com for the 2016 Bauma trade fair. It's an opportunity for everyone to plan their visit or see what's on display. Those who are interested can keep in touch with events every day during the Bauma.

On the Social Media

Dialogue with Liebherr is easy during the Bauma by direct contact through the various social media platforms – Facebook, Twitter, YouTube, Instagram, LinkedIn and Google+.

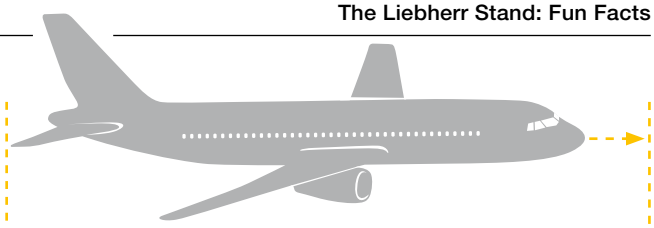
As an App

Liebherr's Bauma application has a news ticker for all product demonstrations, breaking news from the Liebherr stand and background information on the exhibits. The app also navigates you to the Liebherr stand and around it. It's free of charge from the App Store (iOS), Windows Store and Play Store (Android).



Liebherr looks forward to welcoming about **350,000 visitors** from more than **200 countries** to its Bauma trade fair stand.

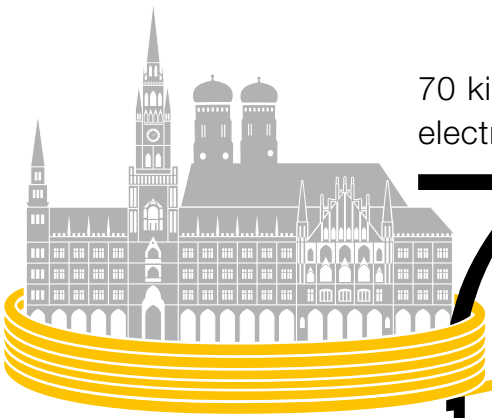
They would fill the **Allianz Arena** almost five times over.



The Liebherr logo on the front wall of the stand is **40 metres** wide ...

LIEBHERR

... longer than an **A320 Airbus.**

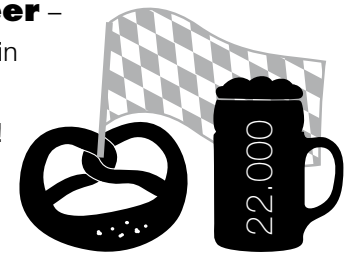


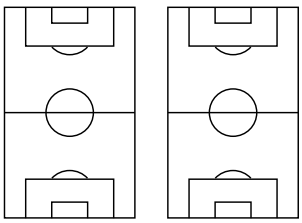
70 kilometres of electrical wiring were laid –

70

enough for nearly **14 laps** of Munich's Old City Ring.

Visitors to the Liebherr stand will probably consume nearly **26,000 pretzels** and drink **22,000 litres of beer** – we are in Bavaria after all!

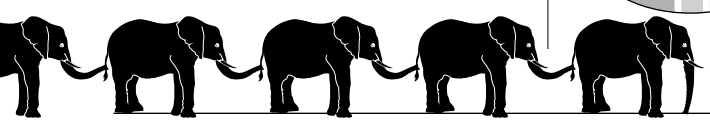




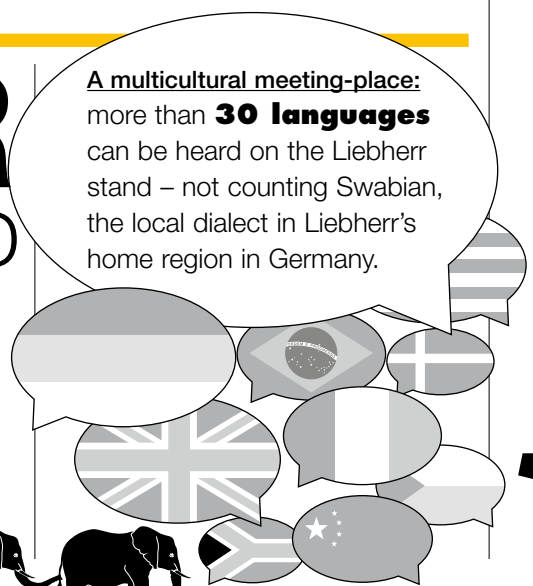
Liebherr's open-air site is almost **14,000 m²** in area, equivalent to **two football fields.**

FOUR THOUSAND

The machines on the main exhibition stand have a total weight of about **4,000 tonnes** – as much as 800 fully-grown African elephants.



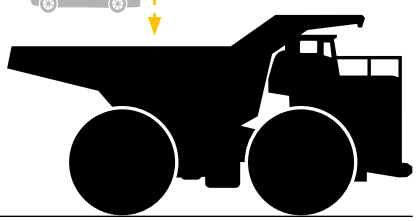
<u>A multicultural meeting-place:</u> more than **30 languages** can be heard on the Liebherr stand – not counting Swabian, the local dialect in Liebherr's home region in Germany.



The **T 264 mining truck's** dump body has a volume of approximately

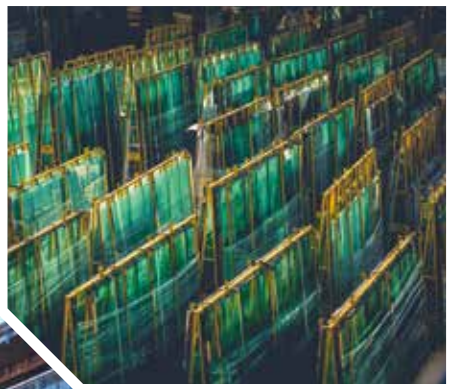
130 m³

and could hold about **13 Mercedes-Benz A Class cars.**



Down to the Last Nut and Bolt

Six months before the 2016 Bauma is due to open its doors, Liebherr begins to build its stand on the Munich exhibition ground. 14,000 square metres in area, this is one of the largest exhibition stands anywhere in the world. Until the grand opening, 200 trucks arrive at the construction site, loaded with 1,000 tonnes of steel and glass with a total area of 5,700 square metres – ready to be assembled and installed.



Ready, steady, go!

In November a 50-strong team starts work on the trade fair stand project. First comes the pavilion structure and the first of 230 support posts. A road that runs across the site is broken up – Liebherr having promised to rebuild it after the Bauma.

A giant drops in

From Newport News in the USA to Munich the disassembled T 264 mining truck covers 7,500 kilometres! On reaching the exhibition ground the T 264 is slowly but surely restored to its original shape and size. The giant dump body is welded together in a specially erected tent.

November

December

Christmas is coming

Liebherr invites everyone working on the construction site to its traditional Christmas party. A Christmas tree is of course provided. After only one month and a half, the pavilion roof is already completed and the first windows are installed.

January

Interior view

Inside the big Liebherr pavilion work is in progress, but as yet only the general layout can be detected. Apart from an atrium, no fewer than 70 meeting rooms in which customers and sales staff can discuss business in private are being built.

February **March** **April**

It grows and thrives

Construction work is going ahead at full speed. Early in February it's time to get the typical slats ready for installation all round the Liebherr stand. Further exhibits arrive on the site – fortunately there's only a light sprinkling of snow in Munich.

The grand finale

Equipment and furnishings are still being assembled and carefully cleaned right up to the last minute, so that all the exhibits look their best. A time lapse version of the construction process from start to finish is available at www.liebherr-bauma.com.

Discover more:
www.liebherr-bauma.com

Across the Wide Atlantic

Storms on the high seas didn't faze it at all. The T 264 mining truck from Liebherr's production plant in Newport News, Virginia (USA), went on board ship in December 2015, bound for a destination on the other side of the Atlantic Ocean: the Bauma trade fair in Munich. The individual components of this mining truck had been prepared for their long journey and shrink wrapped in special synthetic film a few weeks earlier. The voyage then commenced, starting with the docks in Baltimore (USA), Southampton (England) and Le Havre (France) as the first ports of call before the freighter reached the port of Bremerhaven (Germany). The mining truck's components were unloaded there and taken by a flatbed truck all the way to Munich, the capital of the German Free State of Bavaria, where an authentic US team of tough guys were awaiting the giant vehicle for assembly. First installed was the engine. Then came the wheels and cab, after which the enormous dump body was welded together in a specially erected tent and mounted on the truck's chassis. More than three months passed between embarking for the voyage to Europe and the proud moment when the complete T 264 mining truck could be seen in all its glory on the Bauma site.

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1. Preparing the gigantic chassis for transport. 2. 'Shrink wrapping' the dump body in a special synthetic film. 3. An imposing truck moves the individual elements from the Liebherr plant to the dockside. 4. The complete outfit is almost 42 metres long. 5. Crossing the Atlantic Ocean. 6. The freighter reaches Bremerhaven after more than two weeks at sea. 7. Loading and unloading call for care and accuracy. 8. The giant tyres are brought to Munich by flatbed trucks.

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9. Arriving in Munich early in the morning. 10. Two cranes lift the ‘package’ from the flatbed truck. 11. Assembling the giant vehicle. 12. The chassis is ready. 13. Welding the dump body. 14. Genuine US guys for the assembly work. 15. In the dump body, the sparks fly. 16. Final work before the ‘marriage’. 17. Almost ready: the T 264 is an eye-catcher on a grand scale.

Discover more:
www.liebherr-bauma.com

The Stand-maker

The Bauma trade fair comes around every three years, and Werner Haas has been in charge of building the Liebherr stand ever since 1998: a tough, challenging task even for a 'Swabian' from a region in South Germany.

"I don't think anyone ever asked me to take the job on. I kind of inherited it, and as the job grew, I grew with it!" As he says this, Werner Haas looks out expectantly through the window of his building-site container at Munich's exhibition centre. All that can be seen are a half-dozen curiously shaped uprights and the foundations for them. At the moment the site is rather like an archaeological dig. But before long Haas, a service engineer from Liebherr-Werk Biberach GmbH, will have once again completed one of the construction machinery and mining equipment world's largest exhibition stands, in good time for the Bauma, the highlight of the construction and mining industries' activities.

Every three years this mega-event attracts more than half a million visitors from all over the world to Munich, the capital of Germany's Free State of Bavaria. Liebherr's own preparations begin six months before the Bauma opens its doors. On a stand site 14,000 square metres in area, the company stages a display that can only be described in superlatives. The stand and its buildings consume 1,000 tonnes of steel, 7,000 square metres of wooden panelling and 70 kilometres of electric wiring – not forgetting up to 155,000 screws. The glass frontage alone has a total area of 5,700 square metres.

"I kind of inherited it, and as the job grew, I grew with it!"

Werner Haas

In November 2015 excavators and wheel loaders started beavering away among the Liebherr tower cranes. The container for Werner Haas' small office and the site control centre is dwarfed by the steel girders and powerful machines. Haas is fully aware that supervising the complete building work is a monumental task. "I often have to remind myself that 'The buck stops here'," he says. He monitors the progress of work on the open-air site, coordinates the activities of 'his' building companies with the trade fair's own contractors – and, if things get critical, has been known to burst out of his tiny office and take a hand himself.

Any interview with Werner Haas tends to be constantly interrupted by his mobile phone beeping. The stress analysts are conducting an inspection, the Bauma organisers want a date for a photo shooting session. The container has a second occupant too: Jochen Schneider from Liebherr-Hydraulikbagger GmbH in Kirchdorf an der Iller (Germany), who coordinates all the earthmoving on the site and helps out with the site manager's complex organisational work.

Despite his responsible job, Haas remains calm and level-headed. He's one of the movers and shakers of this world. His career seldom keeps him in one place for very long. As an erecting mechanic for the Liebherr plant in Biberach, he supervises the assembly

Werner Haas likes to give a helping hand ▸

and start-up of all kinds of tower crane in many different parts of the world. This has already taken him as far afield as Hawaii and Myanmar, to the lakeside theatre in Austria's Bregenz and to Iceland – where he was almost lost without trace. "I underestimated the fog, and soon I could scarcely see my hand in front of my face – altogether a very nasty experience." But it takes a lot to shake the confidence of this trained electrical equipment technician. Last October his expertise was needed in St. Petersburg. Now, as the Bauma stand takes shape under his expert guidance, he can enjoy the rare luxury of spending six months in one place.

Inside the Bauma container, a large chart occupies one wall. It's the time schedule that simply must be complied with. Another crucial factor for the 50-strong Liebherr team is the weather. Haas explains: "We listen carefully to the weather reports. They have an enormous influence as the stand takes shape." Conditions on a big open-air site in winter can be very unpleasant, and often slow the work down. For example, before the special white flooring material can be laid, the under-surface has to be heated. Once again, Haas' 24 years of experience with Liebherr paid off: "Special equipment has been built for this purpose. It's like an oversized Bunsen burner!"

Before the main pavilion can be completed, no fewer than 230 uprights have to be installed and assembled. We only have about two months to get the roof on without delaying the start of interior outfitting. About then, the first large exhibits for display on the stand start to arrive. So that this process runs efficiently, Haas has to agree the timetable most carefully with the management of the various Liebherr companies. His eyes light up when he looks back on his work as Liebherr's Bauma site manager. "It's a major task, but I'm always proud when everything functions smoothly. We're an experienced team and I know I can rely on it."

A good overview for the stand construction manager

"It's a major task, but I'm always proud when everything functions smoothly. We're an experienced team and I know I can rely on it."

Werner Haas

Werner Haas' reputation as a trouble-shooter has spread beyond the Liebherr stand at the Bauma. If other exhibitors encounter a problem, he is often consulted. Haas, who is incidentally an enthusiastic amateur footballer, values these contacts very highly: "Over the years some remarkably close friendships have grown up. There are no artificial borders between the exhibitors; we simply help each other whenever we can."

As the trade fair's opening date draws closer, the site manager needs to keep a clear head. Werner Haas breathes a sigh of relief when all the fixtures and fittings are in place within the pavilion, and all the exhibits are in precisely the right positions. But even when the Bauma gets under way, his job is not over. His experience is invaluable when machines have to be explained to customers or cranes demonstrated. Something else too is at the back of his mind: after the gates close at the end of the final day, everything has to be taken down and removed within a mere five weeks. But why think about that, when a steady stream of old acquaintances is still arriving at the Liebherr stand? "I can't very well hide, can I?" says Haas contentedly. Before long he'll be back in his site office – but tomorrow is another day.

Discover more:
www.liebherr-bauma.com

Action Is What You Get

They climb mountains, make aircraft fly and work reliably on terrain that looks more like Mars than Earth. Construction machinery and mining equipment from Liebherr operates all over the world, in the most widely varying conditions. But with one aim always in mind: top performance that contributes to success.

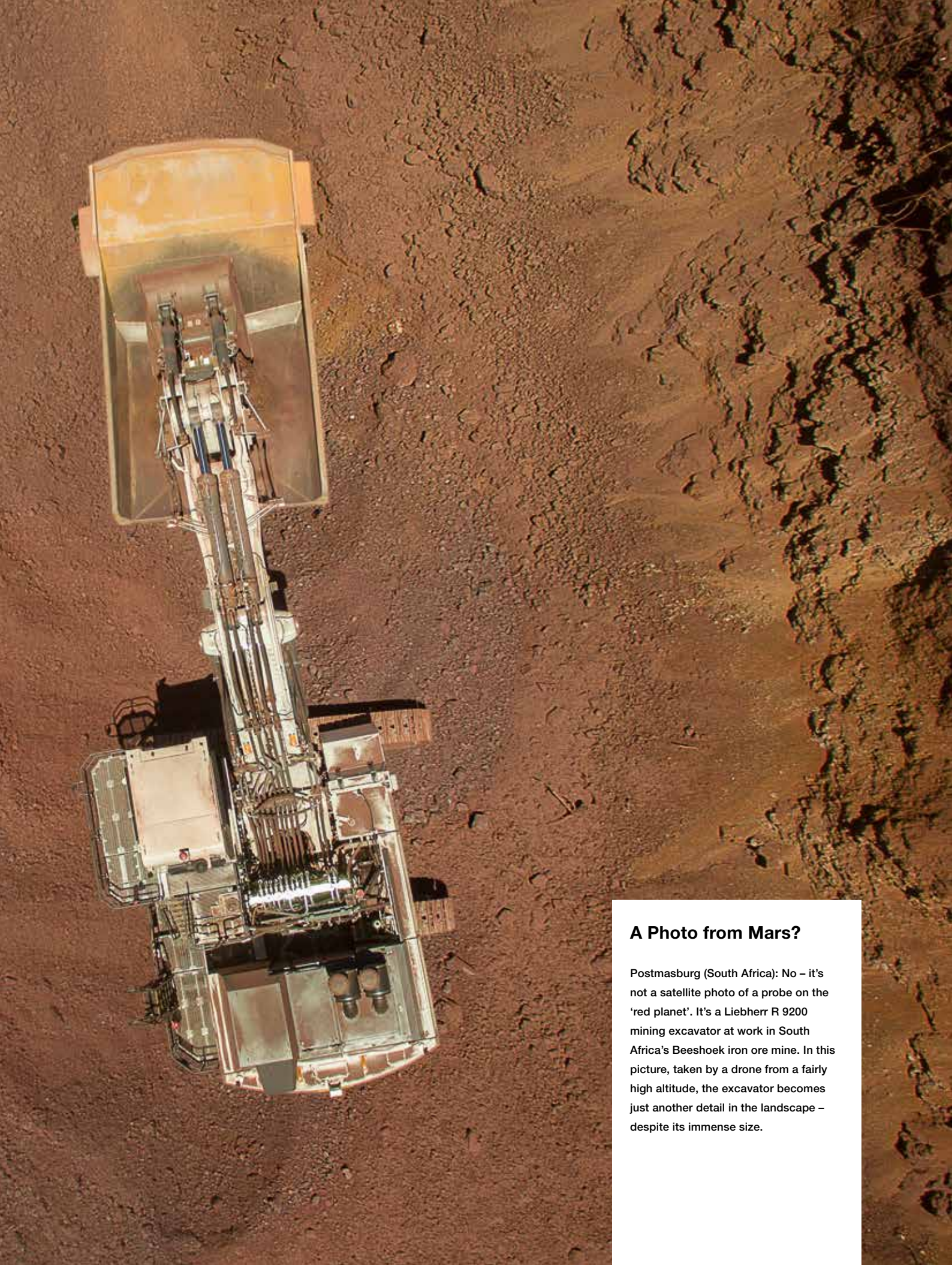
Peak Performance

Garmisch-Partenkirchen (Germany): At 2,975 metres above sea level, the atmosphere is frosty, to say the least. The snow-covered 150 EC-B 6 Litronic Flat Top tower crane bears this out. It will be operating on the Zugspitze, Germany's highest peak, until the end of 2017. And since it's 13 metres higher than the mountain on which it's standing, Liebherr can claim for a short time at least to be the highest point in Germany.


EC-B
LIEBHERR

Down Under

Sydney (Australia): Despite the picture-postcard setting, they work hard too in this city. Here an LTM 1350-6.1 is installing a giant open-air viewing screen in the harbour area. The backdrop is so spectacular, it's not surprising that some of the erecting staff are evidently impressed.



A Photo from Mars?

Postmasburg (South Africa): No – it's not a satellite photo of a probe on the 'red planet'. It's a Liebherr R 9200 mining excavator at work in South Africa's Beeshoek iron ore mine. In this picture, taken by a drone from a fairly high altitude, the excavator becomes just another detail in the landscape – despite its immense size.


LIEBHERR

Through the Mountain

Aschaffenburg (Germany): Since 1854 trains have passed through the 'Schwarzkopf Tunnel' and under the mountain of the same name in Northwest Bavaria. Such a long tradition is impressive, but the tunnel costs too much to maintain and is to be replaced by a more modern one, due for completion in 2017. Construction work is already in progress, with earthmoving machines from Liebherr playing their part.


DLR
NOVESPACE
cnes
esa
ZERO-G
Köln Bonn Airport

Off the Hook

Cologne-Bonn airport (Germany): airborne for the last time, including a precise landing behind the safety fence. For this, the Airbus A300 relied on assistance from a Liebherr Type LR 1600/2 crawler crane. For the past 15 years this aircraft, code-named 'Zero G', was used for in-flight maneuvers aimed at simulating zero gravity. Now more than 40 years old, it will in future be on display to airport visitors.

Building Today, Thinking About Tomorrow

Which trends will influence the future? And what will be the consequences for the building industry? Tobias Wallisser is an architect and a visionary urban planner; he has risked a view of the future and is convinced that a growing world population will need more and more living space, and that these buildings will have to be manufactured quickly and by series production methods. They must also take their occupants' varying needs into account and make allowance for individual forms of living – while maintaining a high standard of quality. For this, important preconditions must be satisfied: digitising and networking of all the stages in the process, and high-tech construction machinery that works together with human beings to promote efficiency.

Professor Wallisser, the Bauma is not only a leading international trade fair but also sees itself as a place to discuss trends and their influence on the construction industry. Which global megatrends does this involve?
Megatrends are usually the outcome of necessity. In my view, urbanisation is a classic megatrend. It develops in parallel with the continual increase in the population. In Germany we are not faced with this growth to the same extent as in many other parts of the world. But at some future date all these people will need suitable living accommodation, which will have to be built without loss of time.

As someone involved in building our cities, how do you react to this?
It's naturally a challenge to the urban planner. It always raises the question as to whether new residential building should be spread relatively thinly or its density increased – and also how the necessary energy is to be generated. At the same time urban planning has to take building regulations in built-up areas and objectives of various kinds into account.

Is there any alternative?
We have learned from our desert project 'Masdar City' in the United Arab Emirates, for example, that there is. The top-priority principle was that each housing block had to generate its own energy. We therefore took several decisions, for instance combining living and work areas, as a means of optimising overall energy consumption. This ruling permitted the building volume to be increased, and released a large amount of creative potential. But despite pressure to lose no time and boost efficiency, planners must always remember who they are building for. To take the people as the starting point is the most important principle of all. It's their life that has to be worth living.

How can this be achieved?
People need public centres and spaces, and good infrastructure. This leads in most cases to relatively dense urban building. Other factors also have to be borne in mind in the town and city centres, for example the increasing age of the population. That calls for new concepts in the use of space, to match these changed requirements and allow people to remain for a longer period in the house or apartment to which they are accustomed. Such factors include barrier-free access, wide doors and a bathroom suitable for use by older people.

What challenges does the construction industry have to face as a result?
It has to answer the question 'How can we produce high volumes of living

Rethinking concrete as a construction material

In the shape of a double helix, with a metal outer skin and concrete double-curvature surfaces: the Mercedes-Benz-Museum in Stuttgart is among the most spectacular structures of our time in terms of its architecture and the technical aspects of its construction. It covers 35,000 square metres and consumed more than 110,000 tonnes of concrete. For this exceptional design the architects, engineers and construction companies developed their own formwork and concreting procedures as well as other techniques.

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"People need public centres and spaces, and good infrastructure. This leads in most cases to relatively dense urban building."

Tobias Wallisser, architect and visionary urban planner

space that nonetheless permits floor plans to vary and be adaptable to people's needs?' Prefabricated elements have to be used so that building work can take place quickly, cost-effectively and to a high standard of quality, but these elements must be suitable for use in various combinations without losing their visual appeal or their practicability. Buildings are not sustainable and open to future needs, nor will they satisfy people's requirements in the long run, unless they are adaptable and provide scope for conversion. A young couple may be looking for an apartment with two rooms, a bathroom and a floor area of 100 square metres. If they then have children, the interior space can be divided up differently with partition walls and an additional bathroom module integrated into the layout. Later, further conversion work would result in an apartment suitable for older people.

Not an easy task!

The solution calls for an innovative approach in the preliminary stages, and is related to the quality of building work. I can only obtain high-quality residential accommodation – not forgetting the prefabrication requirement – if I have access to well-trained workers with the necessary craft skills. At the same time, however, this is an unbelievably slow process. We must give these craftsmen the advanced techniques needed to cope with this challenge.

When it comes to increased innovation, who has to take the first step – the building trade or the planners?

Both parties have to contribute. Architects must produce adaptive spatial structures and designs, and must visualise spaces and materials jointly; the building trade must move very much more closely toward the implementation of digital planning work.

© Tobias Wallisser

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"The better each partner in the creative process understands the situation facing the others, the earlier the stage at which techniques and plans can be coordinated."

Tobias Wallisser, architect and visionary urban planner

And in more specific terms?
The better each partner in the creative process understands the situation facing the others – from planner to engineer, and also the construction-site worker with intelligent machinery at his or her disposal – the earlier the stage at which techniques and plans can be coordinated, and the more rapidly the construction project can be completed and will satisfy the desired conditions.

When you speak of 'techniques', which do you have in mind?
In the planning phase, I'm naturally thinking of digital draft design, but I attach the same importance to systematic digitisation and networking of the individual stages in the building process. Today, information can be called up at any time and from any source. With this as a starting point, models can be drawn up as a basis for the construction engineer's work. Even if the building project is very complex, this permits us to identify and incorporate central factors at an early stage. A good example of this is BIM (Building, Information, Modelling). At the end of this stage everyone finds themselves working once again on the same project, whether in the planning office or on the construction site: one set of data for widely differing areas.

What opportunities does this digitisation offer us?
The aim is for data management to be applied to all the relevant data of the construction project. For example, let us take industrial-scale production, the aim of which is to supply elements as rapidly as possible. Intelligent control of all part-processes and interlinking of the various information flows make it practicable to manufacture individual components on one and the same production line. They are a precondition for the 'adaptable buildings' of which we have spoken.

What are the consequences for construction machinery, for example?
The central factor when taking both series production and tailormade character into consideration is logistics. The site manager must be in a position to ensure that component X arrives at the intended installation point Y when needed. Manufacturers achieve this by way of codes that can be read by machine, and by the appropriate selection techniques; a crane or robot on the building site can then place the element automatically in the correct position.

Apart from digitisation, does efficient use of energy have a part to play?
Certainly. Since we now have computer technologies that can test material characteristics or building performance, sustainability becomes a topic that can be taken into account at an earlier stage. But it is of course important for the entire construction process including the materials and machines to make efficient use of energy.

When you look well ahead at the construction site of the future, what do you see?
I'm assuming that more and more robots will work jointly with human beings on the construction sites of the future. They can for instance perform movements far more accurately than their human colleagues thanks to a highly sensitive control system. Even today many decisions have to be taken on the actual construction site, often at short notice and under pressure, which leads to stress that affects everyone concerned. Three-dimensional printing technology may be one key to individual prefabrication directly on site: it enables end blocks, for instance, to be effectively prefabricated and ideally tailormade on the spot. The aim is not to render workers redundant: in every area of manufacturing we can see how people and machines cooperate, and this will be the situation to a distinctly greater extent on the construction site.

Tobias Wallisser – designing the future

Prof. Tobias Wallisser M.Sc. is also a graduate engineer. He was born in 1977, studied architecture at Berlin University of Applied Sciences and Stuttgart University, and obtained his post-graduate Master of Science degree in Advanced Architectural Design at Columbia University, New York. In 1997 he joined the highly regarded architects' office run by Ben van Berkel and Caroline Bos in Amsterdam, where in 2001 he became the responsible architect for the new Mercedes-Benz Museum in Stuttgart. In 2007 Tobias Wallisser and two partners established an office known as LAVA (Laboratory for Visionary Architecture). As Professor for Innovative Building and Spatial Concepts, Tobias Wallisser has taught since 2006 at the State Academy of the Arts in Stuttgart.

For True Fans

Stop by at the Liebherr Shop – on the ground floor of the Liebherr Bauma pavilion

1

2

3

4

5

| 1 | Children's cap. Trendy children's cap with large peak and decorative embroidery. Material: 100 % cotton. Size: One-size-fits-all from approx. 4 years old. Price: 6,00 €

| 2 | Bed linen. Two-item bed linen set consisting of duvet and pillow cover with construction machinery design. 100 % cotton in Renforcé quality. Ökotex 100 certified. Washable at 60 degrees. Made in Germany. Size: 135 x 200 cm, pillow 80 x 80 cm. Price: 32,00 €

| 3 | Liebherr L 566 XPower® wheel loader. True to the original, detailed model of the versatile 24 t XPower® wheel loader in 1:50 scale. Die-cast zinc model, produced by Conrad. Length: approx. 17 cm. Price: 88,00 €

| 4 | Liebherr PR 776 Litronic crawler tractor. Exact model of the world's largest hydrostatic powered crawler tractor in 1:50 scale. Die-cast zinc model by WSI. Length: approx. 19 cm. Price: 119,00 €

| 5 | T-Shirt. Dark grey / olive round-neck t-shirt with ribbed hems, neckband, and side seam. Material: 100 % cotton single jersey. Sizes: S – 3XL. Price: 12,00 €

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On the Way to the Digital Construction Site

Punctuality and high quality are crucial success factors in the construction business. They are the ultimate result of a complex chain of processes. With the aid of support from information technology, the aim is to network these processes and avoid interfaces that need manual attention. A unified database for all those involved allows for better planning from the outset, and an optimal response to changes during the process. Digitising the construction process is a promising starting-point. As a system supplier, Liebherr is able to network the individual processes by means of suitable IT tools and support all the participants wherever practicable. The company can already supply a large number of solutions when it comes to tackling tomorrow's construction site challenges. Here is an example of how Liebherr-Werk Nenzing GmbH applies them in order to create a network.

Data recording, planning, site equipment and facilities, quality assurance – all together, they form a production chain that must be closely linked

1

Liebherr Crane Planner – step by step to the most suitable machine

Liebherr-Werk Nenzing GmbH supports its customers in various ways right from the early stages of planning and equipping the construction site. It can often be very difficult to choose suitable machines, for example crawler cranes, and configure them in the best possible way. The nature of the site, the work to be done and the prevailing soil conditions all play an important part. Until now the assessment of these factors has been largely based on personal experience. However, automatic surveying and subsequent monitoring from the air, for instance through the use of drones, is often a means of obtaining highly accurate digital survey models as a planning basis. The Liebherr Crane Planner makes use of this basic data to determine the optimal crane for the job. BIM (Building Information Modelling) data for the planned building can also be entered into and exported from the Crane Planner. This opportunity will soon be extended to other product groups such as duty cycle crawler cranes and deep foundation machines. Incidentally, Liebherr-Werk Ehingen GmbH and Liebherr-Werk Biberach GmbH also use a similar crane planner.

2

LiSIM – training and simulation

LiSIM – in this case the Liebherr simulator version from Liebherr-Werk Nenzing GmbH – is a means of testing and practising how to handle and operate a selected machine under authentic conditions, comparable to those provided by a flight simulator. It is also planned to make data from actual construction sites available, making training as realistic as possible. Processes can be practised and optimised. If necessary, site planning details can be also be corrected. More than 20 Liebherr simulators are already in use in various parts of the world – and visitors to Liebherr's stand at the Bauma trade fair can experience a new LiSIM version: Liebherr-Werk Biberach's tower crane simulator (more information on page 39).

3

LIPOS – determining positions on the construction site

Liebherr's LIPOS permits machine positions to be determined accurately on site. All over the world, tens of thousands of 'Differential Global Positioning Systems' (DGPS) are in operation. Totally new, however, is the ability to correlate a position with planning data, including networking with process data. Questions like these can now be asked and answered: where is the machine standing, where is the machine's next working position, where exactly do drilled piles have to be driven, where are potentially hazardous areas that must not be entered? Connecting LIPOS to the planning data and Liebherr's Process Data recording provides us with a digitally networked planning, assessment and implementation tool. Work processes can be optimally created, defined and the results can be confirmed as being in accordance with quality standards. The distances covered by machines and their operating times are reduced, and risk of errors during construction work are minimised.

4

LiDAT – optimised real-time operation

For an accurate assessment of how machines have performed on site, LiDAT supplies real-time data, for example on fuel consumption, particular machine states and the amount of time spent in various operating modes. Moreover, LiDAT, which is also used by the earthmoving machinery division, enables data to be transmitted to the machines themselves, or rather to the driver in order to improve efficiency on site.

5

PDE / PDR – continuous site scheduling, quality assurance and documentation

Strong winds, fog or other unforeseen circumstances can make it essential for construction site working plans to be corrected. In order to be able to revise subsequent stages in the work in such situations, full documentation of actual work data is essential. With the Process Data Recording Liebherr has provided a tried-and-tested electronic collection, visualisation and recording tool for more than 15 years. PDE automatically records not only operating data and process parameters from the Litronic control system (for example, pressure or rope length measurement) but also data from external sensors, such as concrete pressure detectors or the actual depth of drilled holes. This facility is especially important for documentation purposes and as evidence that the construction company has performed its task satisfactorily. A new feature is online transmission of the data to site management, so that travel times can be reduced and further processing of the data without additional interfaces is possible. The Process Data Report (PDR) software is available for reporting and evaluation on a PC.

Interview with Marcel Flir, Liebherr-Werk Nenzing GmbH

"Creating a Network Is of Central Importance"

As a unifying element, digitising offers us plenty of scope for optimising construction processes. Liebherr, the family-owned company, is exhibiting several major milestones at the 2016 Bauma trade fair: the LiSIM simulator has been further developed and data can now be collated from different IT systems. Marcel Flir, Head of ITM Product Management at Liebherr-Werk Nenzing GmbH, explains the vision that lies behind this overall concept.

Mr. Flir, can you tell us how important digital networking will be in future construction work?
Creating a network between the active participants in the construction industry is a matter of central importance. Data recording, planning, site equipment and facilities, quality assurance – all together, they form a production chain that must be as closely linked and free from losses as possible. Compared with other business sectors, the construction industry still has room for improvement in certain areas of process technology. Decisions based more on experience than on specific sets of data are often taken on the spot. There are of course various ways of solving a problem successfully, but a complete data analysis can help us establish the most suitable way. IT tools have an absolutely central part to play in improving work processes on the construction site.

"As a system supplier, Liebherr already provides numerous tools for simulation, position determination and documentation."

Marcel Flir, Liebherr-Werk Nenzing GmbH

How can Liebherr contribute to this?
If we look at the complete construction process from surveying, planning and choice of site equipment to quality assistance and documentation, we can see how closely these topics are interwoven. We therefore regard Liebherr's role as that of system supplier and service provider, since as a manufacturer of key machines we can assess at various interfaces in the system as a whole. As a system supplier, Liebherr already provides numerous tools for simulation, position determination and documentation. By networking them together step by step, we can ensure that no data have to be recorded twice – or are lost! The whole process can be presented digitally, with any changes clearly visible for all concerned.

Is all this still a future dream, or are companies already using these networking tools?
Networking is already in full swing. For example, up to now surveying of the site has been carried out manually. It's a time-consuming process that takes several weeks on a major construction site. However, large companies are already beginning to operate drones, not only to determine the initial situation but also to monitor sequences and changes in real time, 24 hours a day. This can have considerable benefits in terms of the progress of work. In view of this the trend is already moving in the direction of digital data and this is opening the door to further applications. In the medium term small or moderate-sized building companies will switch to digital networking in order to retain their place in the production chain.

Another trend is for systems that further improve the interaction between people and machines. What developments does Liebherr have to offer in that area?
Driver assistance systems enhance safety and greatly improve comfort on the construction site. The solutions we offer in this respect are well above average. An example is the 'Vertical Line Finder', which ensures that the rope is precisely vertical when lifting a load. This prevents the load from swinging as it is lifted and from possibly colliding with surrounding obstructions or causing injury. 'Horizontal Load Path' is a Liebherr assistance system that coordinates boom and hoisting rope winch at the touch of a button and moves the load at a predetermined constant height when passing over obstacles. At some future date it may well be possible to link such systems to the planning data providing minimum heights and defining danger areas on the construction site, in order to warn the drivers about any hazardous situations.

Realistic Crane Operation in a Virtual Setting

A genuinely new development from Liebherr-Werk Biberach GmbH at the Bauma trade fair: a new crane simulator. It provides a virtual environment in which the operator of a tower crane can 'learn the ropes' in realistic conditions. The crane's dynamic responses are simulated in real time. Conditions such as wind, fog, rain and different day and night visibility are all conjured up realistically and call for the correct reaction on the part of the trainee. This type of training promotes safety and increases productivity in 'real' conditions.

The tower crane division's new simulator, LiSIM, consists of a cabin, a control desk and a switchgear cabinet, the last-mentioned item to permit service technicians as well as crane operators to be trained. The new simulator is a means of acquiring practical experience even in extreme conditions and by far exceeds theoretical knowledge. Service technicians, both new to the task and more experienced, benefit from the integration of genuine crane components into the simulator.

The trainee wears 'virtual reality' goggles which, together with the special synthetic film on the cabin windows, form a projection surface. This technology depicts the virtual construction-site area around the crane, but the trainee can still see the actual cabin interior – and himself or herself. Signal inputs from the control desk are processed and visualised in the switchgear cabinet: movements are transmitted to the cabin by a motion platform. The overall effect is close to reality and communicates the actual behaviour of the tower crane in real time.

"Thanks to virtually aided training the crane operator or service technician can test the tower crane to the very limits of its rated performance without themselves incurring any safety risk."

Thomas Steib, Tower Crane Service, Liebherr-Werk Biberach GmbH

Awareness of training and safety

"Thanks to virtually aided training the crane operator or service technician can test the tower crane to the very limits of its rated performance without themselves incurring any safety risk. Realistic simulation of the surrounding area gives them a valuable impression of what safe, efficient on-site working means," explains Thomas Steib, Tower Crane Service, Liebherr-Werk Biberach GmbH. "In the future there are plans for the simulator to process actual planning data from the Liebherr Crane Planner and in this way to supply an authentic picture of an actual construction site." At Liebherr-Werk Biberach GmbH the new LiSIM simulator will in future be a firm element in the initial and follow-up training of tower crane operators and service technicians.

Thomas Steib explains the motion platform

Different scenarios can be simulated and controlled by tablet

“As I See It, the Crane’s Rope Is Its Heart”

Sometimes an innovation is better described as a sensation. Together with the wire rope manufacturer Teufelberger, Liebherr is developing a new type of high-strength fibre rope which will replace wire ropes for various applications in the future. It will be presented to the public for the first time at the Liebherr-Werk Nenzing GmbH technology pavilion as well as at various open-air exhibits throughout the Bauma trade fair.

It is truly an extreme location. Temperatures can be as high as 80 degrees Celsius here, or as low as five degrees below freezing point. Sand or dust may swirl through the air to simulate conditions on a construction site in the desert. A moment later, monsoon-style rainfall sets in. Is this an adventure on some faraway continent? Far from it – we are in Biberach an der Riss, South Germany, and this is the new climatic chamber, which Liebherr put into operation in February 2016. A team led by Dr Ilaka Mupende, Research and Experimental Manager at Liebherr-Components Biberach GmbH, is testing a pioneering innovation for use on cranes: a high-strength synthetic-fibre rope that will be presented to the public for the first time at this year’s Bauma trade fair. Dr Mupende explains: “The rope is extremely light but nevertheless very strong. It has the same load capacity as a steel rope and spools up excellently, especially when the load has to be lifted at a considerable height. Although the prestress is low in the lower rope layers, the rope is scarcely subject to any wear when several layers are spooled onto the drum.”

This innovative product is being tested under extreme weather conditions as well as different load patterns. “The fibre rope has to withstand severe temperature fluctuations if it is to be suitable for use in Saudi Arabia, the Middle East and Siberia. This is why we set up the climatic test rig,” says Dr Mupende, an engineer born in the Democratic Republic of the Congo. Together with his team he is subjecting each prototype of the new rope to thorough testing on various fixtures for at least three months.

The new climatic chamber in Biberach an der Riss, South Germany

A team led by Dr. Ilaka Mupende has developed the new high-strength fibre rope

The idea to develop a high-strength fibre rope emerged at Liebherr about ten years ago in response to a steady increase in demand for higher crane load capacities and greater lifting heights. Every reduction in the deadweight of the crane in the jib area leads to a direct increase in load capacity. Up to that time the rope had scarcely been investigated as a means of reducing the crane’s ‘dead weight’, which is required for load handling but otherwise has no specific advantages. For Ilaka Mupende, the rope is only one element in the overall lifting gear, but a decisive one. “A high tower and a long jib may make the crane look highly spectacular, but without the rope the entire structure would be pointless. As I see it, the crane’s rope is just as essential as a human’s heart.”

The project began officially in 2009. The component manufacturing plant in Biberach joined forces with three other companies within the Group: Liebherr-Werk Biberach as the tower crane manufacturer, Liebherr-Werk Ehingen, where mobile and crawler cranes with load capacities up to 3,000 tonnes are built and Liebherr-Werk Nenzing in Austria, which develops and builds maritime cranes and crawler cranes of up to 300 tonnes load capacity. The project is being led by Ilaka Mupende, who had previously chosen the topic ‘Ropes and rope drive systems’ for his doctor’s thesis. After studying mechanical engineering at the University of Kinshasa (Democratic Republic of the Congo) and working as project engineer and production manager for Unilever in the central African country, he came to Germany as part of a promotional programme and studied at Clausthal University of Technology. “I had always

The rope is extremely light but nevertheless very strong, it has the same load capacity as a steel rope and spools up excellently

been enthusiastic about German technology," he says. His plan at that time was to become a university professor.

In 2011 following an extensive consultation phase, an ideal project development partner was found: the rope manufacturer Teufelberger. Like Liebherr, this Austrian company maintains the highest quality standards and is noted for its immensely innovative spirit.

Together with Ilaka Mupende, engineers from several Liebherr Group companies contributed to this pioneering project. Dr Mupende: "The fibre rope is as much as 80 percent lighter than a conventional steel rope, and can therefore be almost entirely disregarded as an operating factor." This advantage applies to its use on mobile, crawler and tower cranes as well as in the maritime crane area, where ropes up to three kilometres long are by no means uncommon. The weight at the hook is also lower: with a steel rope it can be as much as two tonnes, this can be cut to about 600 kilograms with the new synthetic fibre rope. There is an enormous gain in rope operating life as well. "The fibre rope we have developed has an operating life ten times longer than a steel rope," says 51-year-old Dr Mupende. Translated into customer benefits, this means the rope must not be replaced so frequently and therefore the crane availability is increased considerably. This is accompanied by ecological benefits: the rope has lower internal friction and therefore does not have to be lubricated. The corrosion proofing needed by a steel rope can also be dispensed with, since the new rope consists entirely of synthetic materials. These in turn effectively avoid the risk of injury: people working on the crane can even renew the rope without having to wear gloves. Last but not least on Dr Mupende's list of customer benefits: the low weight makes the work easier.

During development work on the synthetic fibre rope, close attention was given to the correct spooling formation on the rope drum and to identifying the need for renewal when approaching the crucial rope wear limit. "A visual check on the outer sleeve of the fibre rope is all that's needed," says Dr. Mupende, who has been with Liebherr in Biberach since 2006. "People here evidently enjoy life." The local Swabian dialect doesn't cause him too many problems: "My colleagues soon taught me enough to get along!" he says with a smile.

After ten years in scientific research, Ilaka Mupende brought a large amount of accumulated know-how with him when he joined Liebherr. He remains fascinated by rope technology, and will press ahead with intensive research work until the high-strength fibre rope is ready for the market. An important aspect of his team's work is identification of the wear limit. "Our aim in the next few years is to modify and optimise the rope to make it suitable for a variety of practical applications."

Discover more:
www.liebherr-bauma.com

Top Performance

Whether on a large or small scale, energy-efficient and intelligent solutions increase cost-effectiveness. Liebherr provides many such solutions, some of which are self-evident, for instance economical diesel engines, the Pactronic® hybrid drive system or the brand new XPower® driveline for large wheel loaders, which combines two forms of transmission. However, equally ingenious ideas are also often hidden away in the control or other support systems located deep within the machine. Liebherr's experts have worked steadily for many years on innovations and further developments and have succeeded in lowering the energy consumption of wheel loaders, excavators and material handling machines by as much as 30 percent.

All the key elements of a vehicle's drivetrain, such as engines, fuel injection systems, engine control units, hydraulic and electronic components as well as exhaust gas aftertreatment are developed by Liebherr in-house. Therefore, they are ideally matched together. The targets thereby are minimum fuel consumption and maximum performance. An important requirement during diesel engine development is for maximum power to be available even at low speeds; this not only cuts fuel consumption but also prolongs trouble-free operating life.

Then there are intelligent control systems that optimise power output and fuel consumption according to the demand for the task that the machine is currently performing. Among the features of Liebherr hydraulic excavators and material handling machines is the ability to select various operating modes, so that the driver can quickly vary engine output to suit the work situation. The 'travel mode' has now been added, and allows full engine output to reach the travel gear. This improves acceleration and the vehicle's performance on gradients, but at the same time keeps fuel consumption low. On machines with an automatic idle speed system as standard equipment, engine speed drops to an idle as soon as the driver's hand leaves the joystick, but full power output is available as soon as the driver reaches for the control lever again.

Lower fuel consumption, higher performance

But surely it's a contradiction in terms to expect additional power and greater economy all at the same time? Dirk Asam, Product Line Manager for Industrial Material Handling Technology, doesn't accept this view: "Depending on the actual application, we at Liebherr have developed various systems to consume energy efficiently, to store it or to increase the amount available. For example, we divert excess energy into a suitable storage system and use it to boost performance later, when peak loads have to be handled. In this way the engine can always run in the most efficient operating range, which reduces fuel consumption, pollutant emissions and noise."

Material handling machines in size category LH 40 or higher are equipped with Liebherr's Energy Recovery Cylinder (ERC), which operates independently of the engine. When the boom is lowered, gas stored in the cylinder is compressed. When a load has to be lifted, energy is supplied not only by the engine but also by the ERC, in which the gas previously compressed in the cylinder expands again. The machine's working movements are more powerful and uniform and load handling capacity is increased, but there is a fuel saving at the same time.

At the 2016 Bauma Liebherr will exhibit its in-house developed fully integrated energy storage system Liduro for the first time. It is a powerful and flexible storage unit for stationary or electric

Material handling machines in size category LH 40 or higher are equipped with Liebherr's Energy Recovery Cylinder (ERC)

The key element of the XPower® wheel loader is the power-split driveline

drive systems based on double-layer capacitors (also known as 'supercaps'). The energy storage system is especially designed to perform frequently repeated lifting and slewing movement cycles, for example in cranes, excavators or loaders in application on construction sites, in mines, at seaports or terminals. Liduro combines all the storage system's individual components into a single compact unit that can easily be retrofitted and installed in accordance with the 'connect and use' principle (see box).

A decisive factor in Liebherr's capacity for innovation is its in-house production depth. Liebherr develops and manufactures key elements such as engines, hydraulic and electronic components, large diameter bearings or slewing drives so that their performance can be precisely matched together.

The XPower® generation

Another bold step forward is the new XPower® generation of large wheel loaders, a fully integrated, innovative machine concept. For the development team at Liebherr-Werk Bischofshofen GmbH, the priorities were efficient consumption of fuel, maximum power, strength and operating convenience. The key element of the XPower® wheel loader is the power-split driveline that is standard equipment on these Liebherr models. It combines the hydrostatic transmission for an effective reduction in load-cycle times with a mechanical driveline that takes over for longer distances and gradients.

Dr.-Ing. Herbert Pfab, Head of Wheel Loader Development at Liebherr-Werk Bischofshofen GmbH, explains the factors that led to the adoption of this power-split transmission: "A wheel loader has to make very dynamic forward and reverse movements, with the hydraulics performing lifting movements at the same time. By installing a power-split transmission on the wheel loader, we can be sure of satisfying these requirements so efficiently that as much as 30 percent fuel can be saved." The system has been thoroughly tested and has already proved successful in more than 90,000 hours of operation.

All the other components of the XPower® wheel loaders have been precisely matched to the new driveline concept. The well proven Liebherr Power

Dr.-Ing. Herbert Pfab, ▸ Liebherr-Werk Bischofshofen GmbH

Efficiency system has an important part to play. Operating in real time, it adjusts all the relevant components to optimum efficiency values, and is also used on most wheel loaders, excavators and mechanical handlers with a conventional driveline. Proactive influence on engine management, variation of the hydraulic pump discharge angle and engine-speed control maintain the optimum efficiency of the driveline elements in every work situation – and extract top performance from every drop of fuel.

Hybrid drive for dockside and construction machines

Not only wheel loaders but also duty cycle crawler cranes, maritime cranes and other machines are being continuously optimised and developed by Liebherr's engineers. Depending on the nature of the work and the customers' needs, the drive system varies with regards to efficiency, for instance electric or hybrid drive. The hydraulic hybrid power system Pactronic®, which brings both economic and ecological advantages, is installed for the first time in a Liebherr construction machine, namely the HS 8300 HD – the largest duty cycle crawler crane in the HS series. The storage and subsequent reactivation of excess energy increases handling capacity by up to 25 percent and reduces fuel consumption at the same time. Pactronic® technology has proven itself in mobile harbour cranes since 2010. The hydraulic energy store ensures minimum maintenance work and extremely reliable operation.

The new duty cycle crawler crane, type HS 8300 HD with hybrid drive was recently sold to an Italian customer and installed earlier this year on a 41,000-tonne ship, the principal task being to keep waterways in the Mediterranean region unobstructed. The work mainly involves dredging canals that threaten to become blocked with sand.

Ideal component matching from engine to exhaust gas aftertreatment system

The key to greater economy and efficiency is to offer an adaptable drivetrain in the optimum performance range, with a control system that ensures effective interaction between the installed elements. Moreover, additional systems that

Nominated for Bauma Innovation Award

The New Liduro Energy Storage System for Mobile and Stationary Applications

The compact and powerful Liduro system is an innovation in energy storage. With this in-house development, Liebherr can supply a compact storage unit for electric drive systems and equipment with all the key elements in a single housing. The 'connect and use' principle simplifies installation. Only the power supply, a communication line to the main control system and the liquid cooling pipes have to be connected. Daniel Ried, Head of Control Technology Product Management at Liebherr-Components Biberach GmbH, explains: "Our aim was to develop a compact energy storage system that would be easy to integrate into both new and existing machines. The energy storage unit has all its components aggregated inside a housing, where they are protected against dust, water spray and vibration, and can withstand a load of up to 5 g. This specification makes the device extremely suitable for both stationary operation in a rough environment and for use on mobile machinery."

Daniel Ried, Liebherr-Components Biberach GmbH

The Liduro energy storage unit is based on double-layer capacitors (known as 'supercaps'). These are capable of accepting high levels of energy that occur during rapid work-cycles on cranes, excavators and material handling machines, when they turn, lift, lower or move loads. Due to its very compact housing (approximately 1 x 1 x 0.8 metres), the device allows simple installation. Daniel Ried: "On a construction site the Liduro can act as a buffer store for a crane's peak loads, so that the connected load limits can be smaller. At material handling terminals Liduro helps to reduce soot and exhaust emissions. New machines can be specified with a smaller diesel engine without their peak performance being affected." Each unit can store about 1.5 MJ, equivalent to 100 kW of power for a period of 15 seconds. If necessary, up to ten Liduro units can be combined without difficulty.

The basic energy storage system has already been installed and tested on a mobile dockside gantry crane with a diesel-electric drivetrain. Fuel consumption proved to be as much as 40 percent lower, equivalent to a saving of 700 litres per week. Depending on the application, the system's costs can be recovered in two to two and a half years. At this year's Bauma trade fair, Liduro was one of the three finalists in the component category of the Bauma Innovation Award.

operate independently of the drivetrain are optimised. A good example of this is the SCRFilter exhaust emission control technology developed by Liebherr's diesel engine centre. In view of the European Union's Stage V emission directive for diesel engines, which will probably come into force in 2019, the engineers have developed a highly effective exhaust gas aftertreatment system. It combines an SCR catalytic converter and an SCR-coated particulate filter in a single unit. As with the Stage IV system, no exhaust gas recirculation is needed. The SCRFilter technology has already proved successful in tunnel construction and is certified for use in Switzerland, where the emission limits are similarly high to those that will probably be called for from 2019 onwards by Stage V of the EU directive.

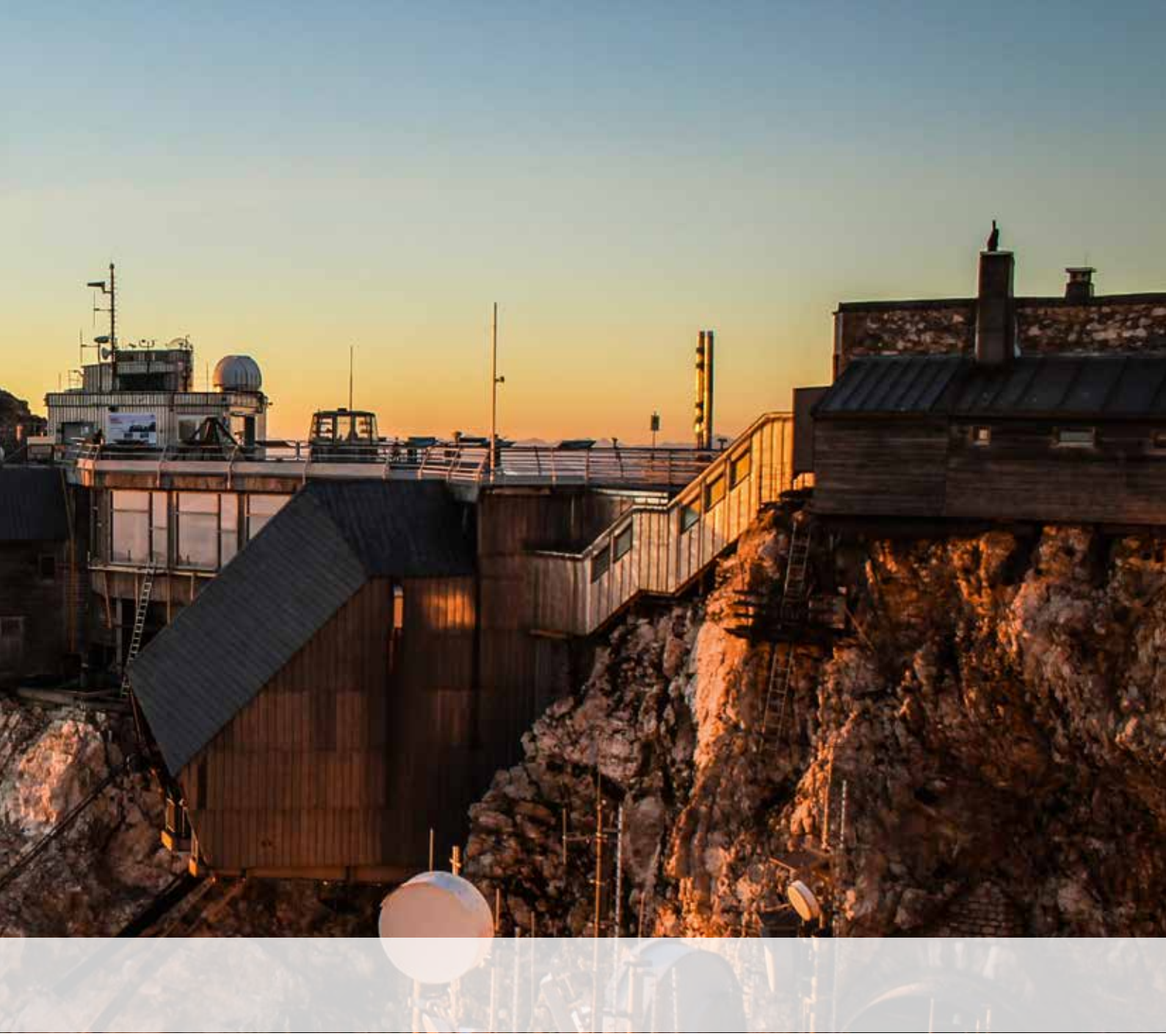
Electric power for the giants: Liebherr also offers an electric driveline for its mining excavators and material handling machines. At seaports and inland docks, but also for scrap metal and steel processing or the recycling of valuable raw materials, more and more attention is being paid to low noise and exhaust emissions. Other advantages of electric propulsion are distinctly lower operating costs and the resulting increase in productivity, due also in part to reduced maintenance volume.

Tower Cranes

Liebherr Crane Is Germany's Highest Point

Freezing temperatures, snow and winds of up to 280 kilometres an hour: the Liebherr 150 EC-B 6 Litronic Flat-Top crane has to withstand some very tough conditions at the top of the Zugspitze, Germany's highest mount. This tower crane is being used on the construction of the new Eibsee cable car line. With a working radius of 50 metres, a height of 18.6 metres under the hook and a maximum load capacity of 6,000 kilograms, the crane has been especially configured for severe weather conditions and is therefore ideal for this project in the Bavarian Alps. The 150 EC-B, incidentally, is 13 metres higher than the peak of the Zugspitze – making this crane, for a few years at least, the highest point in Germany.

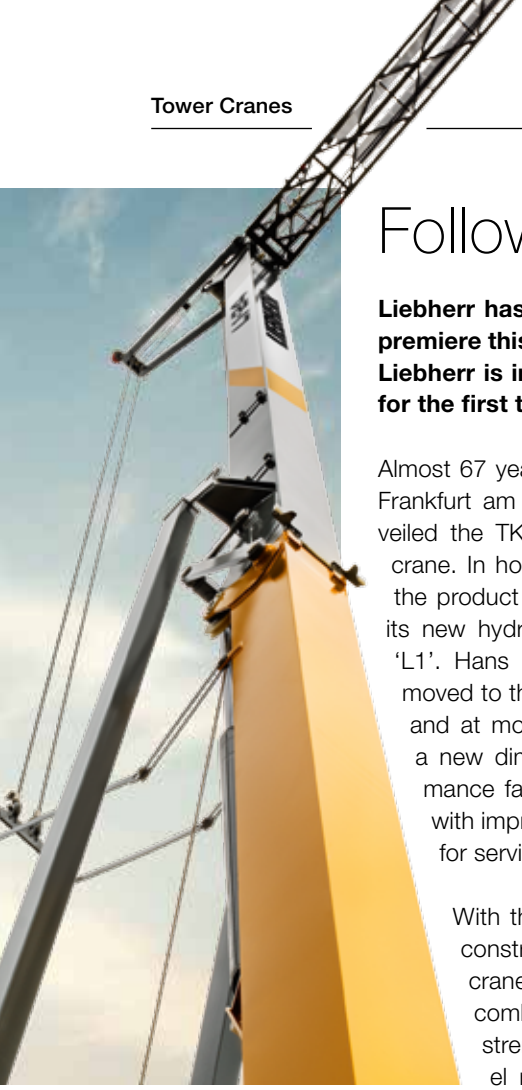
Last July the crane was dismantled and moved by the Heliswiss helicopter company from the midway station at Sonnalpin to the top of the mountain, where a team of experts



from Liebherr assembled it, again with the aid of a helicopter. The challenge of working on such a difficult site called for perfect teamwork between the Liebherr mechanics, the helicopter pilot and the staff of the Zugspitze railway, but thanks to detailed preparation and the pilot's and mechanics' skill the whole operation was completed professionally and no problems were encountered.

Starting in 2018, the new Eibsee cable cars will carry visitors from the Sonnalpin station at the halfway mark to the top of the Zugspitze. The supporting pylon, at 127 metres, is the highest in the world. Another record figure is the 3,207-metre span between the support pylon and the upper station, unmatched by any other cable car line in the world.

Discover more:
www.youtube.com/liebherr



The L1 is convincingly compact and functionally efficient

Following in Hans Liebherr's Footsteps

Liebherr has developed the L1, a new series of hydraulic fast-erecting cranes. Following the premiere this March at partner-companies in Germany, Austria, France, Spain and Switzerland, Liebherr is introducing the smallest model in this bottom-slewing range to the general public for the first time at the Bauma.

Almost 67 years ago, at the 1949 Autumn Fair in Frankfurt am Main, Germany, Hans Liebherr unveiled the TK 10, the world's first mobile tower crane. In honour of the company's founder and the product he developed, Liebherr has named its new hydraulic fast-erecting crane series the 'L1'. Hans Liebherr's original design could be moved to the operating site and erected quickly and at moderate cost. This concept acquires a new dimension with the L1: a high-performance fast-erecting crane of modern design with improved ergonomics and easier access for servicing and maintenance.

With this new series Liebherr supplies the construction industry with a functional crane that is economical to operate and combines compact dimensions and strength with maximum safety. The model range starts with the L1-24, which has a working radius of either 25 or 27 metres and a maximum load capacity of 2,500 kilograms. Two ballasting methods are available: standard concrete ballast or full steel ballast. The full-ballast version avoids additional transport or erecting costs for the crane operating company.

The new hydraulic fast-erecting crane is not only attractive in appearance; with its slewing radius of only 1.9 metres it is also highly adaptable when space is limited. The support base area is also variable: either 3.8 x 3.8 metres or 3.1 x 4.3 metres. This can often avoid the need for road closures. The control-system technology, with Micromove fine positioning mode, load swing damping and work-area limiter, makes operation easy and safe.

Safety on the Construction Site

All over the world construction sites are becoming more and more complex. This makes safety at work increasingly important. The crane operator is a key safety factor. For this reason Liebherr-Werk Biberach GmbH has developed an intensive ten-day theoretical and practical training programme for crane operators, which started in early 2016 and is held by the company's tower crane experts. The programme complies with the official German 'ZUMBau' (authorized German construction industry machinery operating requirements) including industrial accident prevention and operating safety law. Liebherr's training centre in Biberach became an officially certified ZUMBau training facility toward the end of last year.

Ralf Österle, Manager of the training centre at Liebherr-Werk Biberach GmbH, explains: "With these training programmes we aim to offer our customers even greater safety and productivity, and train machine operators in specific safety and efficiency aspects of crane operation." When participants pass the final examination they are issued with official confirmation of their expertise. Many companies will not employ machine operators without this certificate. Completing the programme successfully is legal evidence of the holder's competence – and is incidentally valid in France, Austria and Switzerland as well as in Germany.

Liebherr Tower Cranes in the Big Apple

The new 77-storey MoMA tower block in the heart of New York City will be 320 metres high and will include 139 luxury apartments. It is scheduled for completion in 2018. Two Liebherr cranes will be working on this 'Manhattan project': a 710 HC-L 32 / 64 Litronic with luffing jib began to operate toward the end of last year, and will be joined by a second 710 HC-L this summer.

Innovative design with characteristic features and the location directly alongside the Museum of Modern Art (MoMA) have led to strong interest in the new MoMA tower. The crane used for construction work is also a new development, the 710 HC-L with luffing jib, which had its North American debut near the end of 2015. The 710 HC-L is a high-performance tower crane with fast work cycles, rapid handling rates and compact external tower dimensions; it was introduced to the North American market at a most suitable time to satisfy the needs of construction companies operating in major cities with high building density.

The first of the two tower cranes with luffing jib was erected on the construction site in the Big Apple only 17 hours after its arrival. It has a working radius of 45 metres and its own climbing equipment to reach a height of 131 metres. The second 710 HC-L will arrive this summer; it will have a maximum working radius of 60 metres and be able to climb to a tower height of 216 metres. This crane will be mounted on a platform on the 20th floor outside the building and will then have a maximum height of 320 metres. Together, the two Liebherr luffing jib cranes will have the task of handling 7,357 tonnes of reinforced concrete and 37,348 cubic metres of poured concrete.

The 710 HC-L 32/64 Litronic helps build the MoMA Tower

The home of art

The Museum of Modern Art (MoMA) in the heart of New York houses one of the most significant collections of modern and contemporary art to be seen anywhere. The museum was opened on November 7, 1929, and with about three million visitors, is now one of the world's most popular art galleries. In addition to paintings and drawings, there are collections devoted to architecture, design and film. Up to 150,000 exhibits include work by Pablo Picasso, Paul Cézanne and Andy Warhol, but also the VW Beetle developed by Ferdinand Porsche.
The MoMA tower is currently taking shape next to the museum building: it is planned to partly integrate the two buildings and use three floors of the tower for art exhibits.

Discover more:
www.youtube.com/liebherr

Interview with Michael Weißschädel

Over the Rooftops of Paris

The Grande Arche, a notable landmark in the La Défense business area of Paris, is currently being renovated. Two Liebherr cranes are helping with this work. The Liebherr Group's Tower Crane Solutions department assisted the client in the planning stage, supplied detailed stress-analysis calculations and recommended a specific construction-site concept. Here is an interview with Michael Weißschädel, head of the project management department and responsible for special operations in Western Europe and India.

Mr. Weißschädel, why was this project 'above the rooftops of Paris' necessary?
We were consulted on this project in the autumn of 2014. In view of the extensive renovation work that was planned, the client suggested locating a 202 EC-B 10 Litronic Flat-Top crane on the roof of the Grande Arche.

Not an easy task!
You're right! First of all we worked out how to get the crane on to the roof and assemble it. There was no way we could use a mobile crane for this. The arch is 110 metres high, so we would have needed a very large mobile or crawler crane, but the ground surrounding the building simply wasn't firm enough to support the crane's weight. In the middle of Paris we couldn't use a helicopter either, and so the search was on for some other solution.

How did you finally get the crane on to the roof?
After further consultation with the client we decided to use a 200 DR 5/10 Litronic Derrick crane for the erecting work. This type of crane has the advantage that none of its elements weighs more than one tonne and can therefore be moved up to the roof by means of a normal builder's elevator. When the Derrick crane had been assembled, it was used to erect the Flat-Top crane.

Michael Weißschädel advises customers in Western Europe and India on special projects

What was the biggest challenge you had to contend with?
I would say that thinking through the entire operation in advance, including dismantling the 202 EC-B, was the major challenge. We had to look hard at every single detail, for instance finding an optimal position for the crane so as to keep the load on the roof as low as possible. Erecting the crane had to go ahead smoothly and not involve any unwanted expense. Technically, almost anything is feasible, but safety is of course the prime consideration, followed by reasonable cost. As Tower Crane Solutions we aim to offer our clients tailormade answers to their problems and not involve them in unnecessary expense.

You can call upon many years of experience in tower crane operation. How much of each project is routine?
Every special project we tackle, and the Grande Arche is a good example, is proof that routine is simply not enough. My team and I approach each task with an open mind, and help the client to find the ideal solution.

1. The EC-B is almost ready to start work. 2. It was assembled with the aid of a Derrick crane. 3. Manual labour at a great height. 4. Greetings from the Liebherr cranes on the roof of the Grande Arche. 5. The EC-B can move along a 60-metre rail track.

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Earthmoving

Wherever the Crawler Tracks Can Go

It's more than thirty years since Franz Zagler first realised how much he was 'hooked' on Liebherr's crawler tracks. In the Panama jungle or at the world's largest diamond mine in Siberia, the man from Liebherr-Werk Telfs in Austria found deep satisfaction in his job: demonstrating new machines all over the world and training their operators. By now, he can safely claim to have 'seen it all' on the crawler-track scene, but the Liebherr PR 776, exhibited for the first time at the Bauma trade fair, has brought a new gleam to his eyes.

He can still hear them: the helicopter's rotor blades. For three days and nights Franz Zagler was isolated from the outside world during a visit to a customer in Siberia. The temperature had dropped to minus 48 degrees Celsius. Looking back, he recalls: "There was so much snow, the roads and bridges were invisible. In this situation we normally drive on the frozen rivers and lakes, but on this occasion I had to wait for a helicopter to arrive." For Zagler, now 56, journeys to such out-of-the-way places have more than a hint of adventure about them. "Sometimes I've had to rely on the Transsiberian railway. That can add two or three days to the journey!"

Franz Zagler began his travels more than 30 years ago. His first 'lovechild' was the PR 731 A crawler tractor. "Something told me 'Crawlers are your thing!'" Born and bred in the Styrian region of Austria, he began to work for after-sales service at the Telfs plant in 1984. From 1986 to 1999 he was a member of the

The machine demonstrator trains drivers all over the world

Liebherr service team attached to the Bischofshofen plant, then returned to his original place of work in the Tyrol. “It’s a dream job!” And one that has taken him to almost 100 countries all over the world.

One could be forgiven for assuming that nothing would surprise Franz Zagler after all these years, but when he saw the PR 776, the latest crawler tractor to emerge from the Liebherr production site in Telfs, it was love at first sight. “That’s my baby!” With its new model Liebherr has not only built the world’s largest crawler tractor with hydrostatic transmission: it is in fact the construction machinery Group’s first 100 percent mining tractor. The aim was to build a high-efficiency crawler tractor capable of performing the most arduous material extraction tasks too. Among its features are the continuously variable transmission, easily operated control by joystick, a new lighting concept and an excellent all-round view from the cabin. Roll-over protection is integrated into the cabin structure for the best possible accident prevention. Another innovation is to be found under the engine hood of this more than 70-tonne machine: proactive power control, which varies engine speed automatically to suit the surrounding conditions and can achieve considerable fuel economies. And ample power is certainly available: the new PR 776 can deliver up to 598 hp forwards and 768 hp in reverse to its crawler tracks.

Franz Zagler, who has two children, spends half of each year travelling the world. He supervises final assembly of new ‘crawlers’ on the customer’s working site, demonstrates what the machines are capable of and trains their drivers. “As I see it, crawler-track machines are complex and need a sensitive hand at the controls. With the ability to look ahead and assess the situation. I can tell at a glance whether a driver is suitable.” Before he can instruct operating staff, however, he has to have mastered the machine and its reactions.

Franz Zagler and his new baby, the PR 776

“Something told me ‘Crawlers are your thing!’”

Franz Zagler

“Sometimes I have to go to the absolute limits of the machine’s performance simply to find out how it behaves.” As a trained motor-vehicle mechanic, Franz Zagler welcomes even the most arduous tasks. “I enjoy the adrenalin kick,” he says, “and the chance to show the customer just what our machines can do!”

Communication problems, for instance in South American copper mines, on the African steppe or remote areas of Eastern Russia? No serious ones, because Zagler can normally make himself understood. “I’ve been to Russia so often that I’ve picked up a bit of the language, and an interpreter is always present to help me put across what I have to say.” But for all the charisma he possesses, Franz Zagler remains humble and open to other cultures. “My work is always interesting because it gives me a chance to see how other people live – and for instance what they eat! To relax with the drivers on an evening is always a special experience.”

Even in his leisure time, Franz Zagler can’t shake off the influence of ‘his crawlers’ entirely. For some time he has been building a 1:5 scale model of the new PR 776 and plans to use it for not too strenuous earthmoving work in his garden. With his wife, who also travels extensively on business, Franz Zagler enjoys few things more than gardening at his home in Styria. A sympathetic guy, who may be in his mid-fifties now but has every intention of remaining loyal to Liebherr’s – and his – crawlers for a lifetime.

Discover more:
www.liebherr-bauma.com

Tested at Night on a Large Construction Site

Tegernseer Landstrasse is one of the busiest roads in Munich. It links the Obergiesing, Untergiesing and Harlaching districts in the south of the capital of the Free State of Bavaria. For the last six months of 2015 this important highway was transformed into a large-scale construction site with up to 80 people working on it at any one time. Their efforts were assisted by various Liebherr earthmoving machines, among them a brand-new A 918 Compact – a model that did not go on sale until April 2016.

The brand-new A 918 Compact was tested for four nights

Starting in June 2015, a double-track tramline 500 metres long in Munich's Tegernseer Landstrasse had to be renewed at a project cost of three million euros. For the final phase in the project Liebherr supplied the contractor with a pre-production A 918 Compact for testing purposes. Its task was to complete twelve tree beds over four night shifts.

Each night shift started at eight o'clock in the evening as soon as the site had been made secure. By midnight the A 918 Compact had to break up the provisional asphalt surface at the planned locations for the trees, remove this material and excavate the previous frost protection layer down to an approximate depth of 1.5 metres. By half past one in the early morning the stainless steel brackets had to be installed, then the bales inserted and their position checked. After the stainless steel brackets had been grouted in, the A 918 Compact was used to plant the trees in their holes. From half past two onward its next task was to place soil substrate A in position up to a level 20 centimetres below the protective concrete slabs. Installing these was the final task in a busy night's work.

At the end of the operating session, the test driver was asked for his opinion, which proved to be extremely favourable: the cabin was felt to be large enough and well equipped with the controls correctly positioned. Ample power was available although the excavator was operated in the 'Eco-Mode'. The low rear-end slewing radius was much appreciated since it meant that the driver did not have to watch out all the time for passing vehicles. The very clear engine compartment layout was also highly praised because all daily maintenance tasks can be performed easily from ground level.

Machines That Match Their Markets

Liebherr earthmoving machines are in use all over the world. They are configured to suit the specific needs of the various markets. Exhaust emissions are just one example of this. For markets where the limits are not so stringent Liebherr has developed a separate product line. These products benefit from the know-how and quality standards of this family-owned company. This machine range achieves high levels of performance in terms of productivity, fuel consumption, reliability and operating convenience.

The PR 734-4 is a model in this product line. The crawler tractor in the 20-tonne class is based on the successful fourth Liebherr model generation and complies with all the requirements applicable to markets with less stringent emission limits. All versions of the PR 734 are powered by a Liebherr 150 kW (204 hp) diesel engine, which operates within the Stage IIIA / Tier 3 exhaust emission limits and runs reliably on all available grades of fuel. Thanks to its electronically controlled hydrostatic transmission, the PR 734-4 achieves high productivity allied to low fuel consumption. The Litronic system also makes the machine highly manoeuvrable. For operation in very cold weather, optional special low-temperature kits can be supplied. The interior of the cabin has also been designed to suit the needs of the markets for which this model is intended.

Thanks to its electronically controlled hydrostatic transmission, the PR 734-4 achieves high productivity allied to low fuel consumption

At the 2016 Bauma, Liebherr is also exhibiting three new crawler excavator models designed for markets with less severe emission regulations: the R 920, R 922 and R 924. With service weights between 21 and 24 tonnes, they comply with the Stage IIIA / Tier 3 / Guo III exhaust emission limits. Equipped with an energy-saving six-cylinder engine, the largest fuel tank in this market segment and one of the largest available backhoe bucket volumes, these new crawler excavators operate at a very high level of efficiency.

Liebherr also builds five wheel loader models for less severely regulated markets: the L 566, the latest model in this product line, introduced in 2015, as well as the L 524, L 538, L 550 and the L 580. All these machines meet the well-established Liebherr standards of performance, reliability and fuel economy. It was recently confirmed, for example, that an L 580 in use at a quarry on New Zealand's south island has been giving consistently excellent results. In identical operating conditions the L 580 is using as much as 25 percent less fuel than other makes of wheel loader – but nonetheless providing immense breakout force at the workface.

New Crawler Excavators Operating Successfully in Brazil

The new Liebherr R 954 C SME crawler excavator has been in production at the plant in Guaratinguetá (Brazil), since June 2015. Four of these 60-tonne machines are already operating successfully at quarries in the region around the country's biggest city, São Paolo.

The new crawler excavator has an S-HD (short for super heavy duty) undercarriage with the same DK8 tracks used on the R 964 C and R 966 models. The tracks have plates with two angled webs, twin support roller bearings and a cast drive sprocket with double-row gear teeth. With this package the only 60-tonne excavator available in Brazil achieves rapid work cycles at low fuel consumption, and an even better cost-benefit ratio. It is an ideal option for customers who have operated 50-tonne machines until now and who wish to boost their productivity without significant extra costs. The new model will also be of equal interest to those with 70-tonne excavators, who can optimise their costs with a model in the next-lower category without risking any undue drop in productivity.

The SME (super mass excavation) version of the R 954 C is powered by a Liebherr six-cylinder diesel engine developing 240 kW (326 hp). Every aspect of its configuration is rated for maximum productivity, including the 6.7-metre boom, a 2.35-metre-long arm and a 3.7-cubic-metre bucket for stone quarrying. Larger hydraulic rams increase breakout force by almost 30 percent and bucket crowding action by more than ten percent.

The first two R 954 C SME excavators built by Liebherr Brasil in Guaratinguetá started work last year in Jaraguá, near São Paulo. The quarry there, which has a history of more than 50 years as a supplier of material for construction projects, acquired the new crawler excavators with the aim of enhancing the operating cost-benefit ratio – a target that has been well and truly achieved. The customer confirms that the two R 954 C SME models are ideally suited for work in the big stone quarry.

At another quarry in Itapecerica da Serra, also not far from São Paulo, the management is also extremely satisfied with the R 954 C SME's performance. The customer describes the new machine as 'very reliable with excellent availability'. At the end of 2015 another R 954 C SME began work in a third quarry in the São Paulo region, where it joins a machine fleet consisting almost entirely of Liebherr products.

Discover more:
www.liebherr-bauma.com

A World Premiere Weighing 22 Tonnes

The BRICS open-air site is only five minutes away from the extensive Liebherr stand at the Bauma. It is where Liebherr displays and demonstrates earthmoving machinery specially designed to suit the needs of companies in parts of the world where official regulations and emissions limits are less stringent – for example Brazil, Russia, India, China or South Africa. The Liebherr R 922 crawler excavator is a newcomer to this group of machines.

This 22-tonne machine, developed especially for earthmoving, trenching and drainage work, has a rated power output of 110 kW (150 hp). Its launch has been accompanied by an extensive redesign of all the Liebherr crawler excavator models with a service weight between 20 and 25 tonnes. As well as the R 922 this includes the R 920 and R 924 models, which have service weights of 21 and 24 tonnes and engines rated at 110 kW (150 hp) and 125 kW (170 hp) respectively.

The R 922 concept is based on European standards, with the emphasis on optimal reliability and even greater on-site productivity allied to low fuel consumption. The crawler excavator has a six-cylinder common-rail engine from Cummins that complies with Stage IIIA / Tier 3 / Guo III exhaust emission limits and accepts diesel fuel with a high sulphur content and with B20 bio-diesel. Features that add to the R 922's exceptional efficiency are the largest fuel tank available in this machine category and the option of larger buckets. The optimised Positive Control hydraulic system that can be specified as an extra makes combined machine movements even smoother, which in turn enhances crowding and breakout performance.

Comfort and convenience in the driver's area have been further improved. The R 922 has new seats, a seven-inch touch screen and larger windows for an even better view of the work area and greater operating safety. The new maintenance concept means that less time has to be spent on the machine. Items needing routine maintenance are located close together and easily reached from ground level. The central lubricating system (a standard feature) and intelligent engine management also save time and boost productivity still further.

The R 922 crawler excavator is an exhibit on the BRICS site and has a 5.7-metre-long monobloc boom, a 2.9-metre dipper arm and a 1.15-cubic-metre bucket. Its undercarriage with LC tracks is 2,380 millimetres wide.

The R 922 was developed especially for earthmoving, trenching and drainage work

A Technical Milestone: Large XPower® Wheel Loaders

Liebherr wheel loaders are hard at work wherever heavy loads have to be loaded, unloaded or manoeuvred safely, especially where space is limited. The new large XPower® models perform such tasks effortlessly thanks to their advanced power-split driveline, yet they consume as much as 30 percent less fuel and are robustly built for exceptional reliability.

Quarries, gravel pits or recycling depots: many tonnes of material have to be handled there day after day. Wheel loaders have a vital role to play in these arduous operating conditions. They must lift, load, transfer and discharge the material precisely where it's needed in the minimal time possible. Every day these machines are called upon to perform a large number of challenging tasks. Liebherr has now developed a driveline concept for its large wheel loaders that makes the job very much easier: XPower®.

Plant loading with the L 556 XPower®

The large XPower® wheel loaders that comply with Stage IV / Tier 4f emission limits feature a power-split driveline. This combines the hydrostatic transmission that gives optimum results and shorter load-cycle times with the advantages of mechanical drive that are especially beneficial over long distances and on gradients. The travel gear uses a mix of these two operating modes and varies this mix automatically and steplessly so that maximum power is always available. Fuel consumption is as much as 30 percent lower than a wheel loader with a conventional driveline can achieve.

The power-split driveline has another advantage too. Because power is developed by the interaction of the two power flow paths, they share the load between them and therefore have a longer operating life. Liebherr has also invested in component strength on the new large XPower® wheel loaders. Uprated axles and hydraulic rams and reinforced Z-bar linkage mean greater on-site operating reliability. Liebherr develops and manufactures the key components itself in cooperation with premium suppliers.

The L 586 XPower® is the largest model in the new series

The new-generation XPower® wheel loaders not only differ from conventional machines in their innovative technology but also in their design, the cabin in particular. It is not only considerably larger, more spacious and with better noise insulation, but also features a more logical interior layout with practical storage space. The displays, controls and driver's seat form an ergonomically efficient unit that makes it easy to operate these wheel loaders precisely and intuitively. The steering column has three-position adjustment. The aim of these innovations is to provide the driver with maximum comfort and convenience, in order to avoid fatigue and ensure even greater safety during day-to-day work.

Discover more:
www.liebherr-bauma.com

Developed for the Toughest Tasks

Liebherr will be exhibiting its new generation of medium-sized wheel loaders at the 2016 Bauma. The new L 526, L 538 and L 546 models uphold the values that have earned the Group's medium-sized wheel loaders an outstanding reputation as powerful, reliable all-rounders suitable for a wide variety of tasks.

Extensive reinforcement of the structural steelwork means an even longer reliable operating life

The recycling industry is an important area of deployment for medium-sized wheel loaders but it imposes exceptionally intense demands on the machines with them typically required to deal with materials that are awkwardly shaped and difficult to handle such as scrap metal, building trade rubble or glass. Work often continues across more than one daily shift and can total as many as 6,000 hours annually. Solid rubber or foam-filled tyres are frequently used in conjunction with heavy working attachments. As the wheel loaders in a recycling plant often play a key part in the entire production process, the primary need is for reliability.

Well-planned investment in their robustness enables the new Liebherr all-rounders to satisfy these intense demands. Stability has been enhanced by increasing the size of the axles on all three new models compared with the preceding generation. Extensive modifications have further strengthened the entire steel structure and prolonged the wheel loaders' trouble-free operating life, even when the most arduous tasks in industry have to be performed.

The new all-round wheel loaders are equipped with efficient diesel engines that comply with Stage IV / Tier 4f exhaust emission limits. Power output is optimally matched to the well-proven hydrostatic transmission. The Liebherr Power Efficiency system controls the engine so that the necessary power is available at the lowest possible engine speed with the clear benefits being reduced fuel consumption and lower operating costs.

As with earlier medium-sized wheel loader models, these machines can be ordered with either Z-bar linkage for standard operating tasks or parallel (P) linkage for industrial work. Liebherr's designers have strengthened both lifting arm versions thereby boosting performance still further. The LIKUFIX hydraulic quick coupling attachment system remains an option for the new model range. Developed in-house by Liebherr, it enables hydraulic tools to be attached and detached safely in just a few seconds without the operator leaving the machine's cabin.

Well-planned design details in the cabin have enhanced the comfort and convenience for the driver. The displays, controls and driver's seat form a single ergonomic unit. The new electrohydraulic equipment makes it possible as an option to programme lifting gear and bucket positions from the cab. The touch screen display can be continuously varied in height to suit individual preferences. A reversing camera is standard equipment to give a safe view of the area close to the machine and large windows that now extend further down improve visibility in all directions.

Larger axles have advantages when operating in the recycling industry

Performance data

	Tipping load (kg)	Bucket capacity (m^3)	Operating weight (kg)	Engine power output (kW / hp)
L 526	7,700	2.1	11,250	103 / 140
L 538	9,500	2.6	13,500	114 / 155
L 546	10,500	2.8	14,200	123 / 167

Material Handling

Packed with Material Handling Power

Liebherr is using the open space in front of its stand at the 2016 Bauma to display highlights from its many product ranges, including the new LH 110 C High Rise Port Litronic material handler. Who conjured up the power that this machine can deliver? Who finalised the details on the computer screen? The answer is a female member of Liebherr's design team: Sarah Wetzel, who works on the 'Material Handling – Port' product line at Liebherr's site in Kirchdorf an der Iller (Germany).

Sarah Wetzel, a qualified engineer, commented: "When you look up at the first machine you've drafted out on the computer, and see everything you've coaxed into shape from start to finish, it's a truly unique feeling!" This imposing machine, the LH 110 C High Rise Port Litronic, is the second in Liebherr's new Port line and is geared in particular to the needs of dockside bulk material and cargo handling. "Our planning focused very much on producing a versatile machine," says Sarah. She and her colleagues have certainly succeeded, the LH 110 is ideal for scrap metal handling either in the well-known 'Industry' specification or in the 'Port' version. In each case equipped with the most suitable mobile or crawler undercarriage, as a standard or high-rise design or mounted on a gantry.

The exhibit on the Bauma stand has a massive crawler undercarriage and a two-metre-high tower. Sarah explains: "This makes the LH 110 extremely stable and the operator has the best possible view of the work area." For dockside material handling the machine on display has a 13-metre-long knuckle pattern boom and a 12-metre straight dipper arm.

Sarah Wetzel is proud of the new machine

"The quick-change attachments and multiple coupling system make the machine extremely versatile. Add-on tools can be changed very quickly and safely." The patented energy recovery cylinder ERC is also standard on the LH 110.

Since joining Liebherr in 2012, Sarah has been part of a 50-strong product development team with members from Product Management, specialist technical and experimental departments and Sales. Her main responsibilities are in the technical concept area. She says: "As a small girl I must have fallen into the toolbox, and from that day on my mind was made up!" Now a qualified mechanical engineer, she has never hidden her fascination for this profession and she's glad that more and more young women are choosing it. "I'd love it if more women studied technical subjects. A bit more female power would do our profession no harm at all!"

With newly designed equipment the LH 110 Port has a load-bearing capacity of up to ten tonnes at an outreach of more than 20 metres. Depending on the equipment in use the machine's working radius can be up to 27 metres. The Liebherr six-cylinder diesel engine complies with Stage IV / Tier 4f exhaust emissions limits but can be obtained to Stage IIIA specification for use in certain countries. With a rated output of 300 kW along with the Liebherr Power Efficiency system the fuel consumption is lower and the engine operates more efficiently at high power outputs. With the ERC system in use the LH 110 Port has a system power output of 431 kW but uses as much as 30 percent less fuel than the previous R 974 C Litronic although its handling capacity is higher. The driver will find his or her work station more comfortable and convenient than before. The control consoles and driver's seat are designed according to ergonomic principles. The cabin windows, the hydraulic cabin elevating mechanism and the safety monitoring of the rear and side areas combine to make the working and surrounding areas fully visible so that machine movements can always be performed safely.

An ample source of power: the Liebherr six-cylinder engine

The new LH 110 High Rise Port Litronic is built by Liebherr in Kirchdorf an der Iller

The exhibit at a glance

- Load capacity: ten tonnes at an outreach of more than 20 metres
- Boom length: 13 metres
- Dipper arm length: 12 metres
- Working radius: up to 25 metres
- Engine power output: 300 kW
- Total system rating: 431 kW
- Patented energy recovery cylinder (ERC) ensures efficient production cycles and reduces fuel consumption
- Safe and comfortable access from the bottom
- Excellent visibility thanks to stepless hydraulic height adjustment and forward-back positioning of driver's cab and monitoring of the rear and side areas
- Liebherr Power Efficiency keeps fuel consumption low
- Low exhaust emissions: compliance with Stage IV / Tier 4f limits
- Can be ordered with mobile or crawler undercarriage or as gantry version
- Quick-change device and multi-coupling system for grapple lines ensure maximum versatility for dockside use

Discover more:
www.liebherr-bauma.com

Mining

A 200-tonne Giant for Extreme Operating Conditions

Seen for the first time on Liebherr's stand at the 2016 Bauma in Munich, this new giant in the 200-tonne class has been designed and built for exceptionally arduous duties, and complements Liebherr's mining excavator product range.

The new R 9200 combines traditional Liebherr quality with various innovations that have been developed in response to customer demand. This machine can withstand the most severe operating conditions in the mining area.

Standard equipment on the R 9200 is a 12.5-cubic-metre bucket – the largest available in the 200-tonne class. It is ideal for loading mining trucks with a capacity of 140 tonnes. It can also be operated with a backhoe or a face shovel bucket. The Cummins QSK38 diesel engine has a rated output of 810 kW (1,086 hp) and complies with Stage 2 or Tier 4i exhaust emission limits. Efficient engine operation is assured by the patented Litronic Plus system in combination with closed-circuit slewing hydraulics, with coolant and oil temperature control that can be activated when needed.

The R 9200 cabin has panoramic windows, so that the driver can see the entire surrounding area, keep the excavator effortlessly and safely under control, while operating at maximum efficiency. The electronic monitoring system can be understood intuitively and has an extensive range of functions.

Another significant advantage: the R 9200 is extremely reliable and its ease of maintenance is most welcome. This minimises downtime and keeps upkeep costs low. The points requiring routine maintenance can be reached easily and quickly from a service platform. Access to the engine area is safe and easy from the various catwalks provided. The hydraulic pumps are located behind large flaps. Diesel oil and engine oil fillers and greasing points can be serviced from ground level, and these and other items requiring maintenance are well lit, so that operation of the R 9200 is even safer in practical terms.

Discover more:
www.liebherr-bauma.com

Liebherr's First Mining Crawler Tractor

The Liebherr PR 776 will debut at the 2016 Bauma – the world's first crawler tractor in the 70-tonne class with continuously variable hydrostatic transmission. The Liebherr 12-cylinder diesel engine gives a peak output of 565 kW (768 hp), with power for the toughest mining and material recovery operations; however, fuel consumption is markedly lower than the industrial performance standard for the equivalent thrust value. This modern continuously variable hydrostatic drive concept – as used on all Liebherr crawler tractors – is new in this service-weight category, making the PR 776 exceptionally economical to operate.

Online Support for Fault Correction

The Troubleshoot Advisor is a software tool that Liebherr has introduced to assist its after-sales service teams when they are called upon to diagnose and rectify technical malfunctions. Online availability of the tool helps to minimise downtimes on mining excavators and trucks. After input of the problems described by the equipment operator, the Troubleshoot Advisor localises the technical fault step by step, using artificial intelligence procedures familiar in medicine and aviation. The application is based on a 'learning system': the database in the background of the diagnostic tool is continually enlarged and is therefore able to indicate new possible causes for technical malfunctions. The software can currently call upon more than 5,000 explanations and is being used in 20 countries.

Liebherr's Company in Zambia

The Liebherr Group's presence on the African continent already comprises seven countries with their own companies and the most recent of these is Liebherr Zambia Ltd. The head office, which is mainly concerned with finance and administrative matters, is in the capital city of Lusaka. In Kitwe, a town in the north, there is also a service operation that coordinates all the company's customer-related activities: sales, spare parts, and logistics. This is where technical support for mining operations in the copper belt region in Zambia and the province of Katanga in the Democratic Republic of the Congo is based. Thirty-five Liebherr mining excavators are at work at the open-cast copper and emerald mines in this region.

Zambia is named after the River Zambezi, and is a land-locked country in Southern Africa, neighbouring Angola, the Democratic Republic of the Congo, Tanzania, Malawi, Mozambique, Zimbabwe, Botswana and Namibia. Zambia became independent of the United Kingdom in 1964, but English remains the official language.

New Proving Ground for Mining Excavators

Alsace, a region in the east of France, is noted for its culinary specialities, for example tasty 'flammenkuche' (literally: flame tart), spicy Munster cheese, and sparkling Crémant d'Alsace wine. What this region does not possess are iron ore or copper mines. Liebherr builds its imposing mining excavators in Colmar, where the terrain is relatively flat. So where can they be tested? The manufacturer has solved this problem by building their own 'mini-mine'. The site, about 8,000 square metres in area, simulates various conditions that a Liebherr machine is likely to encounter during operation. For the central hill, which is 12 metres high, various types of stone (30,000 tonnes in all) were supplied by local quarries. The new proving ground enables Liebherr's engineers to acquire still more know-how and study the results of tests on prototypes – an immense advantage during product development.

Power and Efficiency – the T 264 Mining Truck

Following its first appearance in 2013, the T 264 mining truck is an eyecatcher on Liebherr's Bauma stand for the second time. With a load capacity of 228 tonnes, a specially developed electric driveline and an exceptionally safe, reliable operating principle, this truck has proven its worth at the world's largest mines. Together with Liebherr's R 9800 mining excavator, it makes a perfect working team.

The T 264, has an efficient Litronic Plus AC electric driveline and a powerful engine rated at up to 2,013 kW (2,700 hp), and can be driven on grade at higher speeds with no mechanical wear, thanks to optimum dynamic braking from the AC electric driveline, rated at up to 3,300 kW (4,425 hp). The Litronic Plus management system, an in-house Liebherr development, imposes optimal loads on the engine and therefore consumes fuel efficiently. Depending on operating conditions, the T 264 can work more than a 24-hour shift before having to be refuelled.

Highly efficient service is another feature of this mining truck. Despite its size, all components needing routine maintenance are easily accessible. The engine can be reached from both sides, and diesel oil, engine oil and coolant can be added from ground level without needing any additional equipment. The integrated electronic system monitors and memorises important performance data, which can be downloaded for detailed analysis.

Deep Foundation Machines

An LRH 100 is helping to build a new shopping centre in Göteborg (Sweden)

The Hammer

At the 2016 Bauma trade fair Liebherr is displaying an innovation from the world of deep foundation work: the H10L hydraulic free-fall hammer. Mounted on the successful LR 1300 crawler crane with a fixed leader system, the complete assembly is known as the LRH 600, and is especially suitable for heavy-duty pile driving at high working radii.

With the H10L, the first hydraulic free-fall hammer developed and built in-house by Liebherr, the company strengthens its position as a full-service provider for deep foundation work. This hammer is currently the largest model from the three new product lines, and has an impact energy of 225 kNm. Among the principal benefits of the add-on system are the modular weights with which the hammer can be accurately adapted to suit specific pile driving requirements. Compact length and weight make the hammer highly efficient as well as user-friendly with regard to transport and maintenance. As a standard, the pile helmet is noise-insulated.

The innovative control system is effectively integrated into the Liebherr carrier machine's system. This allows for better adjustment to suit working conditions and therefore makes operation more efficient. In addition to the LR 1300, the HS 895 HD hydraulic duty cycle crawler crane can be used as carrier machine, in both cases with only slight modification. The high engine power output of these machine types means that the hammer can be driven directly from the on-board hydraulic system – no additional power pack is required.

The LRH 600 leader elements feature pin connections which allow for especially quick and easy installation. Furthermore, the lattice design ensures a high level of stability. With the fixed leader, the LRH 600 has an effective length of 51 metres and a high maximum radius of 15 metres and leader kinematics permits inclinations of up to 14 degrees backwards and 9.5 degrees forwards. The pull force achieves approximately 120 tonnes. Thanks to the modern concept of the new fixed leader an extremely varied range of applications covering a number of the most commonly used deep foundation working methods can be performed. Apart from pile driving with either hammer or vibrator they include drilling with continuous flight auger or DTH hammer as well as various soil improvement methods such as soil mixing and cutter soil mixing.

Discover more:
www.liebherr-bauma.com

Easy to Move, Fast Start-up

The HS 8130 HD hydraulic duty cycle crawler crane takes over from the HS 885 HD, one of the most successful models in this product line for the past 14 years. When developing the new model, Liebherr paid special attention to strong, safe design capable of withstanding all the demands likely to be made of a duty cycle crawler crane, as well as an even longer reliable operating life. Other priorities were quick, easy transportation and fast set-up of the machine.

With a service weight of about 116 tonnes, a transport weight of 51 tonnes and a basic unit no wider than 3.5 metres, this duty cycle crawler crane presents no transportation problems: the railings, catwalks and pedestals on the superstructure remain in position on the machine, so that it can be prepared for operation at a new site without delay.

The two hydraulic free-fall winches are each rated at 35 tonnes line pull, about 17 percent more than the previous model. The winches also have increased rope capacity, and a two-stage motor that automatically varies rope speed in all work areas. The HS 8130 HD can be used for deep foundation work as well as typical tasks for a duty cycle crawler crane such as installation of sheet pile walls, use with a casing oscillator, material handling with a grab or dragline, dynamic soil compacting and dredging work.

New Dimensions in Size and Performance

The new LRB 355 piling and drilling rig premiered at the Bauma and introduces new size and performance dimensions. Its design principle with undercarriage, basic machine and kinematics makes use of the successful concept of the Liebherr rotary drilling rig series. A strong undercarriage with the longest crawler track units in its class ensures high stability, and the parallel kinematics give this deep foundation equipment a large working range.

The LRB 355 is available with a maximum height of 33.5 metres and a maximum weight of about 100 tonnes without working tools. It is powered by a 600 kW V12 diesel engine which complies with Stage IV / Tier 4f exhaust emission limits. As an option, the engine's power output can be increased to 750 kW. During the development phase, efficient fuel consumption was given special priority: the engine runs at a reduced speed of 1,700 rpm. Other advantages of the LRB 355 are quick mobilisation, easy transportation and the innovative BAT rotary drive, which can be individually configured according to the nature of the work to be carried out.

Liebherr provides a number of services to support customers in the deep foundation work area ranging from advice on specific site applications to simulator training and the recording, evaluation and transmission of machine data.

Mobile Cranes

The World's Most Powerful Five-axle Mobile Crane

At the 2016 Bauma Liebherr has the LTM 1250-5.1 on display, the first time it has been seen at a trade fair. This 250-tonne mobile crane is the third model to use the Liebherr single-engine driveline concept. The VarioBase and 'Eco-Mode' functions make it a safe, efficient choice for crane operators.

Every aspect of the LTM 1250-5.1's design is rated for top performance. When Liebherr developed this successor to the internationally successful LTM 1220-5.2, the aim was to achieve the highest possible lifting capacity on a five-axle chassis. The result: this mobile crane is the most powerful in its class, with about 15 to 20 percent more lifting capacity than the previous model.

The LTM 1250-5.1 is the third model featuring Liebherr's single-engine driveline concept. The Liebherr six-cylinder diesel in the undercarriage has a power output of 400 kW (544 hp) and develops a peak torque of 2,516 Nm. The superstructure is driven from the engine by a mechanical shaft. Advantages of this layout: lower fuel consumption for greater economy, reduced maintenance costs. Avoiding the weight of a second engine on the superstructure increases the crane's load capacity.

Liebherr has also developed a programme that automatically disengages the complete pump drive when the engine is idling, with an intelligent control system that reconnects it when needed. Together with the additional 'Eco-Mode' system, this minimises fuel consumption and reduces noise emissions when the superstructure is being operated.

Liebherr supplies an extensive selection of lattice fly jib combinations for the LTM 1250-5.1. The folding fly jib, for example, is 12.2 to 22 metres long, but can be lengthened to as much as 36 metres by inserting two seven-metre-long sections. Another unique feature in the five-axle crane category is that a long fixed fly jib can be attached. With this, the working radius is exceptionally long and the jib can, for instance, pass over existing buildings.

If the available operating space is limited, this 250-tonne crane's VarioBallast function alters the ballast radius easily and quickly. This system mechanically moves the ballasting cylinders, which are standard equipment, to reduce the radius by 800 millimetres, giving the LTM 1250-5.1 a choice of operating at one of two ballast radius settings.

Discover more:
www.liebherr-bauma.com

On the Public Highway with an 85-Metre-Long Crane Boom

For Liebherr's new LTM 1450-8.1, a whole series of superlatives come to mind: eight axles, an extra-long high-performance telescopic boom, excellent economy and straightforward preparation for use on the construction site. This mobile crane is licensed for road travel complete with its boom and outrigger supports, and can also make use of its variable ballast radius facility – a big advantage when on-site space is limited.

When fully extended the LTM 1450-8.1's boom is 85 metres long and can lift an impressive 20-tonne load. This very long high-performance boom makes the crane ideal when large tower cranes have to be erected, and for work at refineries or chemical production plants. Liebherr's new 450-tonne mobile crane can claim outstandingly good lifting capacities, not only at maximum outreach but also when handling heavy loads at lower radii. There are many work areas in which the new LTM 1450-8.1 can even take on jobs for which a 500-tonne crane would normally be needed. Furthermore, various lattice fly jibs can be attached for efficient results in a variety of applications, for instance maintenance work on wind power generators.

World record: the LTM 1450-8.1 has the longest telescopic boom anywhere in the world that can be carried on the crane when driving on public roads with a twelve-tonne axle load. All four outrigger supports, the 16.00 tyres, the hoisting winch, the 16 x 8 driveline, the retarder and the Telma eddy-current brake are included, making this mobile crane ready to operate without loss of time. Every aspect of the LTM 1450-8.1's design has been chosen for optimum economy and easy preparation for work on the construction site. It is so fast and so versatile that two different tasks in one working day are entirely possible.

With worldwide mobility as the objective, the LTM 1450-8.1 has been conceived to allow for different transport weights and various axle loads. Liebherr has developed suitable configurations for countries where lower axle loads and gross weight limits apply, but also for regions where more than twelve tonnes per axle are permittted. The VarioBallast principle already introduced in the five-axle category has been taken a stage further on the LTM 1450-8.1. The crane's ballast radius can be reduced steplessly from seven to five metres (the value for mobile cranes in the 200-tonne class) by means of a simple hydraulic swing-action mechanism.

For high performance the travel gear is driven by a Liebherr eight-cylinder diesel engine rated at 505 kW (687 hp) and mounted on the undercarriage. It complies with Stage IV / Tier 4f exhaust emission legislation, or can be supplied to meet the Stage III limits that apply in certain countries. The LTM 1450-8.1 is the fourth mobile crane design using Liebherr's single-engine concept, which reduces fuel consumption, the amount of maintenance needed and the vehicle's weight. This weight reduction can be used to uprate load-bearing structural elements and to increase the crane's load capacity.

Among Europe's Highest Peaks

The Matterhorn is 4,478 metres high, which puts it among the ten highest mountains in the Alps. It's hard to imagine a more picturesque setting for the LTR 1060 – even though its working site was a more modest 2,900 metres above sea level at the foot of the mountain. A Swiss crane operator used the Liebherr telescopic-boom crawler crane for construction work on the new Hirli chair lift – a chance for the LTR 1060 to demonstrate its ability to work where the terrain is extremely difficult. Reaching the site was the first big challenge. The crane was first moved by low-loader to the 'end of the road' at the Staffelalp, a height of 1,900 metres. From there it had to tackle the remainder of the journey 'under its own steam': eight arduous kilometres, including two kilometres on a 45 percent uphill gradient. The LTR 1060 completed the journey in only five hours, then spent the next three weeks installing the steelwork for the new mountain cable-car station. As if this were not enough, the LTR 1060 completed the project by performing an exceptionally difficult task without help: lifting the 16-tonne electric motor that will drive the new chairlift.

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1. The LTR 1060 is needed for construction work on the new Hirli chair lift. 2. Working against a magnificent backdrop. 3. The crawler crane on its way to an unusual place of work. 4. The machine had no trouble tackling gradients as steep as 1 in 2.25. 5. The LTR 1060 completed the journey in only five hours.

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Crawler Cranes

A Compact Heavyweight

The Liebherr LR 1500 crawler crane made its public premiere at the June 2015 Customer Days in Ehingen (Germany). Now the family-owned manufacturer has this crawler crane on display at a trade fair for the first time.

At a total weight of 425 tonnes, you won't find a heavier machine on Liebherr's Bauma stand. That's because the LR 1500 is in a class of its own – but it's still very compact for a crawler crane in this weight category: it combines the maximum load capacity of a 500-tonne machine with the compact dimensions and easy transportation that would be expected from a 400-tonne crawler crane.

Those were the features that determined the design of this model. With its maximum component transport weight of 'only' 45 tonnes, it can be moved from one site to another without restrictions on all world markets. At 7.6 metres the width across the tracks is also what would normally be associated with the 400-tonne category. And these weren't the only factors that governed development of the LR 1500: avoiding complexity and boosting economy were given top priority too. The result is a crawler crane featuring straightforward design where it counts: easy to move from site to site at low cost, and equally simple to set up and operate. The main winch has a rope pull of 180 kN and can be used for all lifts up to maximum load. This too makes operation easier, with no need for the usual second winch for dual lifting of heavy loads. A second winch with a rope pull of 125 kN is only necessary when working with a rooster sheave.

When developing its lattice boom system, Liebherr once again "added simplicity". Its designers reduced the number and variety of the components used on the LR 1500 by avoiding the use of divided lattice boom sections. This makes transportation and assembly easier and less cost-intensive. No ballast guide frame is needed: instead, ballast radius is adjusted with the Derrick boom. The LR 1500's ballast consists of the same ten-tonne slabs used for the LR 1400/2 and LR 1600/2 models – a cost-saving measure for companies that operate several of these cranes in their fleet.

Discover more:
www.liebherr-bauma.com

Premiere in the 100-tonne Class

Liebherr is exhibiting the prototype LR 1100 at the Bauma. This crawler crane, manufactured at the plant in Nenzing (Austria), will be available worldwide this summer.

The LR 1100 is an eyecatcher, with a new steel fabrication concept that resembles a tubular structure. But there are many concealed benefits too: simple transportation and assembly, user convenience and exceptional lifting capacities. These are achieved thanks to optimum force transmission over short distances and can be further increased by up to 20 percent using a swinging counterweight, which is available as an option.

When transporting the crane by road the catwalks next to the cabin and service areas do not have to be removed but simply folded down. The boom foot and crawler track assemblies remain attached. The boom foot manipulator is a patented innovation, consisting of the boom foot itself, the rope, the auxiliary A-frame and the counterweight cylinder. It avoids the need for raising the main A-frame – a genuine advantage when shipping the crane or when an underpass or tunnel has to be cleared.

Both operators and service technicians will find the LR 1100 even more enjoyable to work with. The cabin, at a height of 2.3 metres, provides an excellent view of the work area and has an orthopaedic seat and modern climate control. The FRP doors on the uppercarriage have been dispensed with, so that access for personnel from ground level and from the top of the basic machine is improved.

This crawler crane is powered by a Liebherr 230-kW diesel engine that complies with Stage IV / Tier 4f exhaust emission limits, and features modern control systems, for example the latest Litronic® generation. Integral load moment limiting calculates lifting capacities automatically during crane operation and so ensures optimum use of the machine.

Liebherr has also developed two new assistance systems that make control easier and enhance operating safety on the building site. The 'Vertical Line Finder' keeps the rope precisely vertical as the load is lifted. The second of these assistance systems is the 'Horizontal Load Path', which makes it easier and more efficient to move loads horizontally to the intended position – a major advantage when the load has to be set down at a point where it cannot easily be seen.

New Control Assistance Systems Enhance Safety and Convenience

Crawler crane models with load capacities of up to 300 tonnes have two new control assistance systems, the 'Vertical Line Finder' and the 'Horizontal Load Path'. As additions to the Liebherr Litronic® control system that has proved so successful in terms of operator convenience, they increase safety on the building site and make the crane easier to control. The 'Vertical Line Finder' ensures precise vertical lifting of the load on the ropes, which is especially important for tandem lifting operations. Diagonal pull or asymmetric centres of gravity are avoided. It also enhances safety on the building site, since keeping load movements vertical avoids accidental contact with obstacles or possible risks of injury, especially when visibility is poor. The 'Vertical Line Finder' has another advantage too: vertical lifting prevents damage to the boom, means less pressure on the steel structure and so extends the crane's reliable operating life.

'Horizontal Load Path', the second new control assistance system, increases the operational comfort of the crane. Loads can be moved more precisely and efficiently to the intended positions, even when the view is obstructed.

The new 'Horizontal Load Path'

'Horizontal Load Path' also makes load movements easier to coordinate when the lifting task is carried out simultaneously by several cranes.

Interview with Steffen Schwertle

An Elevator for 1,000-tonne Ships

In Niederfinow, in Germany's province of Brandenburg, the country's largest ship lift is due for completion in 2017. A similar device dating from 1934 is still at work there, but is now too small. Two Liebherr LR 1600/2 cranes are working on the new lift: a challenging task, as Steffen Schwertle, an engineer in the Stress Computing and Analysis department at Liebherr-Werk Ehingen GmbH, explains here.

Mr. Schwertle, what work do the Liebherr cranes have to perform in Niederfinow?
The two LR 1600/2 cranes are needed to lift the 220 counterweights that will later raise the giant trough containing the ship. Together, these concrete blocks weigh about 10,000 tonnes and are suspended from rope pulleys. To keep the stresses uniform, our cranes performed their hoisting movements more or less in parallel to avoid one-sided loads on the concrete structure; this is precision work within very close tolerances.

What was your work during the project?
Our customer sent us an enquiry for a special rooster sheave five metres long, for a payload of 104 tonnes. Our team in Ehingen developed and built this special-purpose element. My own task was to calculate and check the stresses so that the load quoted by the customer could be lifted without risk. As the project's stress analyst, I then supervised operations on the actual site.

What was the biggest challenge?
The surrounding soil was very sandy, and first had to be stabilised. This was crucially important so that the downthrust exerted by the machines could be absorbed. In addition, the two cranes had to be able to run up close to the lift, and the jib moved underneath it and positioned with great accuracy. To prevent the structure from tilting, the trough for the ship was filled with sandbags. All these precautions, as you can imagine, had to be allowed for in the stress analysis.

Steffen Schwertle (35) studied construction engineering and has worked for ten years in the Stress Computing and Analysis department at Liebherr's production site in Ehingen (Germany). Crawler cranes are his special area of responsibility.

Did you assist the customer in other ways too?
We cooperated closely throughout the planning process. When I was on the site, I was mainly concerned with supporting the work of the crane operators. I also had to prepare a specific load capacity table for the rooster sheave. This was supplied to the customer and contained precise radii and loads as an operating guide. All in all, my work on this major construction site was an exciting experience!

1. The lifting gear pivot: 5,200 sandbags in the 115-metre-long trough simulate the later weight during operation. 2. Precision work: assembly mechanics and crane driver work closely together when the load is fed into the retaining frame. 3. The yellow cranes take the strain: three Liebherr crane types are working on this major project. 4. Massive counterweights are stored on the lower level and raised in pairs. 5. A mirror image: to equalise stresses the counterweights on each side of the new structure are placed in position almost simultaneously.

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Ship lifts in Germany

Three ship lifts are currently operative in Germany: in Rothensee north of Magdeburg (Saxony-Anhalt), in Lüneburg (Lower Saxony) and in Niederfinow (Brandenburg). A ship lift can overcome a greater height than a conventional lock system. The Niederfinow lift has been operating since 1934 at a point where ships on the Oder-Havel canal, which links Berlin to Stettin (Poland), have to surmount a height difference of almost 40 metres. Technically speaking, this lift is still working reliably and raises vessels weighing up to 5,000 tonnes to a height equivalent to a 12-storey building – and that more than 11,000 times a year. An imposing example of German engineering skill, but one that has now become too small for numerous vessels that wish to use the canal. Work has therefore started in a larger ship lift, to be known as Niederfinow North. The project is currently the largest new structure of its size in Germany or even Europe as a whole. It will be 133 metres long and 60 metres high, and will be able to accept ships up to 110 metres in length and 11.4 metres wide.

Concrete Technology

Oliver Ascherl is Product Manager for the new Mobilmix 2.5 – for more information on the plant, see page 78/79

New Look for a Well-Proven Concept

The Mobilmix 2.5 is a new mobile mixing plant made by Liebherr in Bad Schussenried (Germany). In addition to the successful folding concept it is equipped with a mixer rated to produce 2.5 cubic metres of concrete in a single batch. So the Mobilmix 2.5 is comparable to a stationary batching plant with equivalent functions. Oliver Ascherl was involved in the development of the new model as a member of Liebherr-Mischtechnik GmbH's product management staff.

Mr. Ascherl, what are the special features of the new mobile mixing plant?
Increased output is one; the ability to assemble the plant and begin to operate it within two days is another. The basic elements – mixer platform, weighing unit and control-system container – are mounted on a load-bearing platform that can be moved from one site to the next on a low-loader. Thanks to the folding mechanism – another well-proven feature – the mechanical elements are assembled in just three hours. Installation of the outer panels has also been optimised, and now takes less than a day. Most of the electrical wiring is pre-assembled at the factory, so that less time is needed on site. And assembly can go ahead as no concrete foundation is needed.

What inspired this new design?
We listened closely to what our customers said, and also learned from our colleagues in Sales and Service. We evaluated all this feedback from the market and used it to draw up the new model's development specification.

What were the development priorities?
We were aiming for a mixing plant with increased output, but one that used the successful folding concept and retained its mobility. Equally important: the new keyless lock for the mixer system, which boosts operating safety and efficiency even further. If the customer prefers, the cover flap can remain open when the mixer is being cleaned. During the cleaning mode, developed by Liebherr, the mixer rotates at a very slow speed: thus, the operating personnel does not have to close the cover and move back and forth between the mixer and the control panel.

How were you involved in the development process?
My Product Management colleagues and I had the task of consulting with Sales and Service, then compiling a performance specification for the new model. We are now supporting the product launch by holding training sessions for sales staff and planning marketing campaigns. Product Management also acts as the interface between the market and our technical office.

Two Drive Units – Two Variable Agitator Speeds

The latest generation of Liebherr ring pan mixers is designed to handle even 'difficult' concrete mixes: the main mixer gear and the agitator tool speeds can be varied separately.

For customers in the precast and concrete product industries, Liebherr has introduced the RIV 2.5-D at the 2016 Bauma. This new ring pan mixer is designed for producing challenging concrete mixtures. More than 50 years of experience in construction of ring pan mixer systems have been incorporated in engineering of the new highly efficient mixer with variable agitator speeds. A new feature – the speed of the double agitator system can be continuously varied regardless of the main mixer gear. The mixing and whirl-action systems have their own electric motors and are not connected mechanically. The advantage: their speeds can be matched to the progress of the mixing process. For fast, thorough mixing in all pan zones and perfect combination of the cement and lime, the two agitators are at different distances from the main mixing tool. To prevent lumps forming, they run at high speeds.

Depending on the mixture, two frequency converters are used to set or vary the speed during mixing. In this way the mixer can be run at different speeds when filling, dry/wet mixing or emptying. The control system also takes the effective power on the motor into account; this is very useful when producing special concrete.

An additional significant advantage of all Liebherr ring pan mixer systems is the well-tried ring-shaped trough system. The special form of the ring canal guarantees that all the mix material is fed to the mixing tool and fully homogenised within a very short time. The customer benefits from short mixing times and high efficiency.

Configuring Truck Mixers Online

In future, customers and potential buyers will be able to prepare their truck mixers in the selected specification via internet with the new Liebherr online configurator. This tool has been especially developed to satisfy the requirements of potential concrete-mixer customers. How does it work? After selecting drum size and type, various packages for selected options are shown, for instance the 'light and visibility' package with rear-end working lights and a rear-view camera. The combined options in the packages are also available separately. Another interesting option is to select and display the truck mixer painted in various colours or patterns. A highlight of the system is the determination of the possible payload, which is shown in cubic metres of concrete and indicates to potential buyers how much concrete can be carried by the mixer in the selected specification. A link showing the chosen specification can be saved or sent directly to Liebherr as an inquiry. The configurator can be called up in German, English or French at **www.liebherr.com**.

Discover more:
www.liebherr.com

Mobilmix 2.5

The Advantages at a Glance

Production of the new Mobilmix 2.5 started in April 2016, and will be presented to the public for the first time at the Bauma. The new plant can easily be moved from place to place and operates with great flexibility, since it can be assembled within two days. This is a major advantage, especially on construction sites needing a supply of concrete for a limited time only.

The technology of the new Mobilmix 2.5 is based on the fundamental Liebherr concept that has proved its worth for more than 20 years on every continent, but the output volume has been increased to 115 cubic metres per hour compared with the previous model, the Mobilmix 2.25. With the latest twin-shaft mixer generation, performance and operating convenience are both comparable with an equivalent stationary concrete batching plant. Liebherr has also optimised a number of other details.

New features on the Mobilmix 2.5 include a lowered mixer platform. A slight downward slope toward the discharge hopper makes cleaning easier, creates more space and improves access to the mixer system. The Liebherr cleaning mode is simplified by a new keyless safety system at the mixer access flap. Best possible dust protection on the mixer platform is assured by a new infeed flap from the skip to the mixer, and by suitable dust filter systems. The specially designed skip track with its parallel contact surfaces and synthetic rollers on the loader hopper ensures smooth, reliable operation and minimum wear. Galvanised elements and high-quality components extend the system's reliable operating life.

Discover more:
www.liebherr-bauma.com

Assembly can be completed within two days, thanks to the folding support frame with integral control-system container for maximum electrical wiring in advance

Working surfaces are galvanised for long life

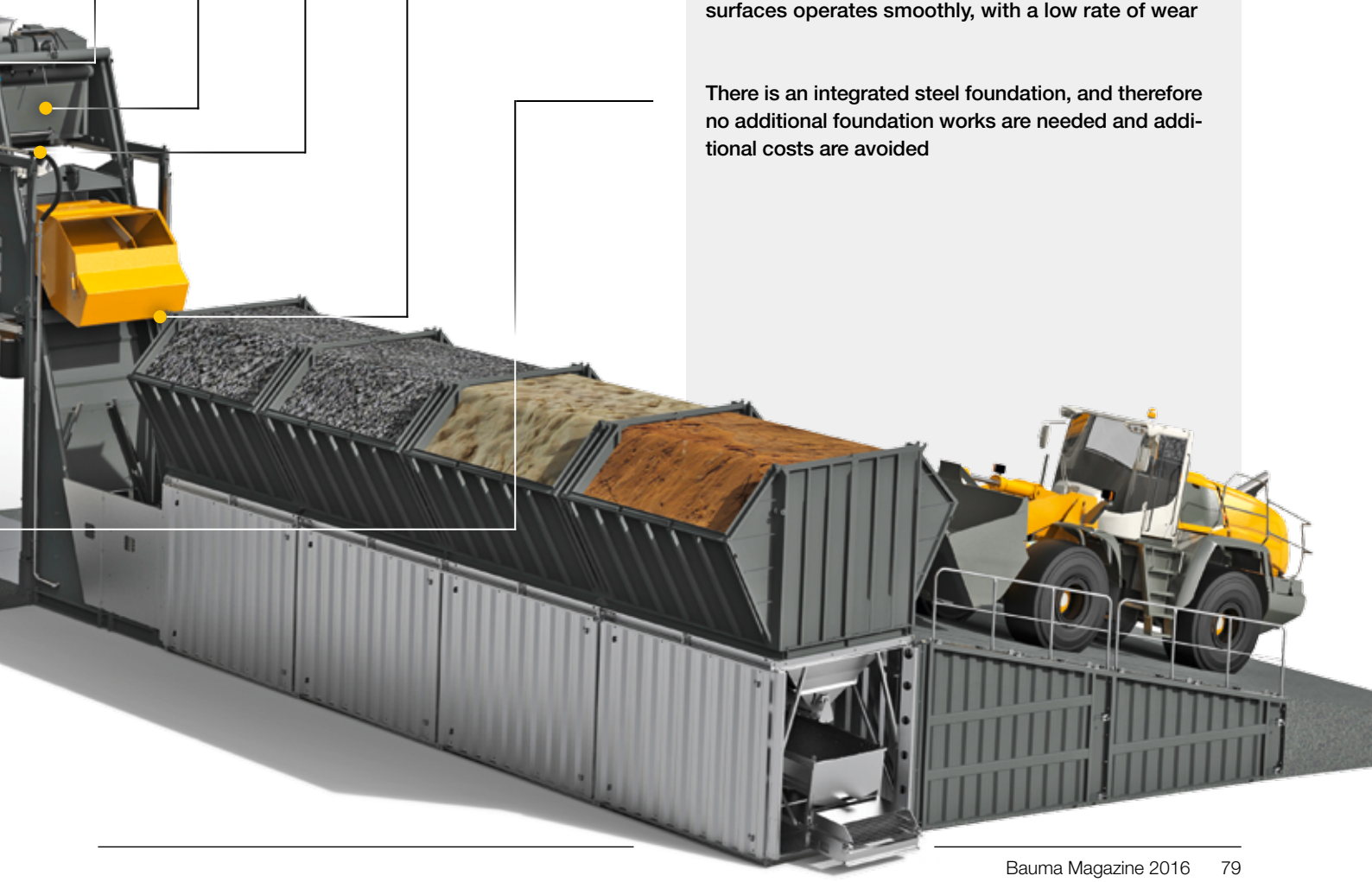
The lower mixer platform and keyless mixer lock, combined with the Liebherr cleaning mode, reduce the volume of cleaning work

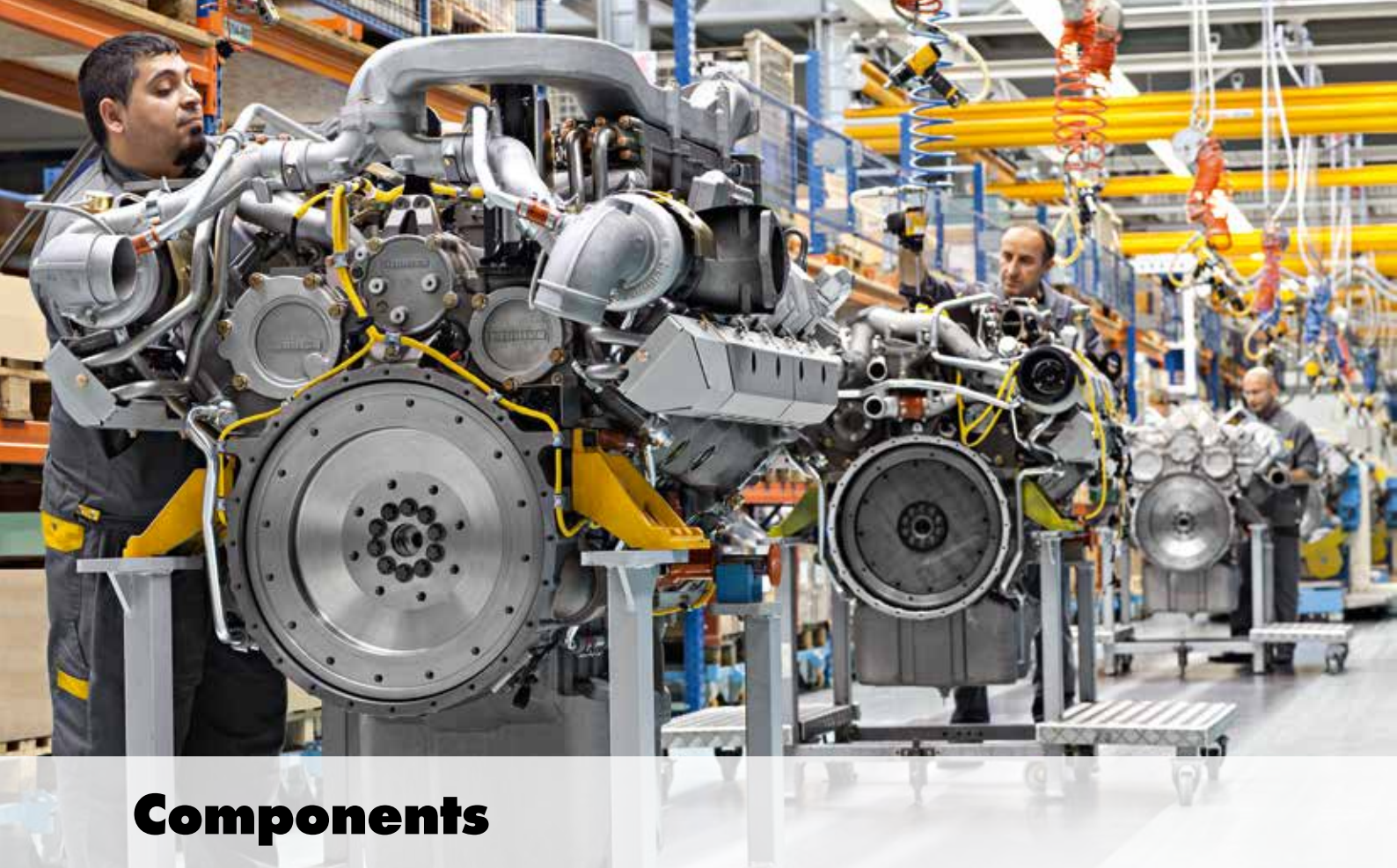
The Liebherr infeed flap from skip to mixer and the standard filter systems ensure maximum protection against dust

Liebherr water feeds distribute water efficiently in the twin-shaft mixer

The skip with synthetic rollers and parallel bearing surfaces operates smoothly, with a low rate of wear

There is an integrated steel foundation, and therefore no additional foundation works are needed and additional costs are avoided





Components

Hydraulics Complete

From manufacturer of individual items to systems supplier: Liebherr is pursuing this policy in the component area too. Liebherr-Components Kirchdorf GmbH has, therefore, added energy-efficient hydraulic power units to its portfolio. They possess a number of convincing advantages: the main components are manufactured in-house and, together with Liebherr's hydraulic cylinders, form complete, ideally matched systems. These are used, for instance, for the climbing mechanism on tower cranes such as the 357 HC-L, so that the height of the crane's tower can be increased smoothly with this 'built-in' source of power. The hydraulics can also be equipped with additional components such as sensors or a control system.

At the Bauma Liebherr is also exhibiting its new series-production hydraulic cylinders, for heavy tasks at pressures up to 350 bar. This product line consists of 20 nominal piston diameters, each of which can be combined with one of two piston rod diameters. To seal these cylinders Liebherr uses an innovative tandem sealing principle consisting of primary and secondary seals. This reduces the 'stick-slip' effect, prevents leakage and significantly lowers the amount of cylinder maintenance needed; the cylinders also have an optimised surface finish for improved resistance to corrosion.

With the standardised series-production range, customers can configure a large number of hydraulic cylinders flexibly to suit their specific needs; these items are available at short notice and on economically acceptable terms. As well as its standard models, Liebherr can also supply individual versions of its hydraulic cylinders as required by the customer.

Customised hydraulic power units by Liebherr

Discover more:
www.liebherr-bauma.com

Electric Transmission for Crawler Vehicles

Liebherr-Components Biberach GmbH has developed a new electric version of its FAT 325 travel drive specifically for vehicles with a diesel-electric drivetrain. It complements Liebherr's programme of hydraulic travel drives and not only takes the increasing demand for electrically driven crawler vehicles into account but also satisfies pro-environmental technological requirements.

The entry-level version is intended for the drivetrain of machines with a service weight of approximately 30 to 40 tonnes and travel speeds up to 5 km/h.

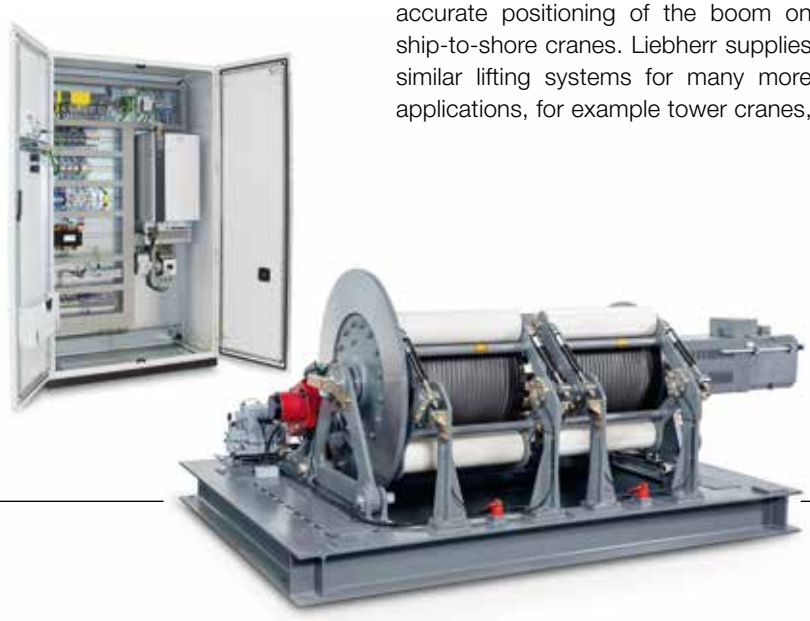
The electric motor has a rated output of 13.5 kW at 167 Hz, with permanent sealing systems to protect it against dirt and moisture. The windings are arranged in a special layout and the motor uses permanent magnet technology to obtain high torque despite its compact dimensions. These permit the transmission to be housed in the space available between the vehicle's crawler tracks. The transmissions and electric motors are manufactured at the same Liebherr production facility and, therefore, ideally match together.

The Ideal Winch from a Modular-Element System

Liebherr is demonstrating its competence in load lifting and handling systems at the 2016 Bauma. The Liebherr Group's own factories develop and manufacture key components in this area: rope drums, gearboxes, engine and control technology. These products are perfectly matched together and can be combined in various ways to satisfy specific requirements. The customer can select different degrees of integration, from planetary plug-in gearbox to a complete lifting system. Liebherr supplies these and every intermediate specification, including many options such as hardware switch-off, a secondary safety brake and either electric or hydraulic drive.

The exhibit at the Bauma trade fair, the DEW550/1916, is a complete lifting system that the customer can integrate as a 'black box' into the intended application. A genuinely valuable feature is its reduced assembly time. Individual components – motor, brakes and gearboxes – are already pre-assembled. The DEW550/1916 consists of the rope winch, a planetary plug-in gearbox with large power density throughout the speed range, the main and auxiliary electric motors, the brake and switchgear. This specific exhibit is used for accurate positioning of the boom on ship-to-shore cranes. Liebherr supplies similar lifting systems for many more applications, for example tower cranes, deep-foundation and drilling equipment, lifting gear in the steel or extractive industries and in mining.

As well as winches for specific projects, Liebherr develops in cooperation with customers individual modular rope winch systems, so that they can assemble the winches flexibly to suit various needs without loss of time. A modular rope winch system is already being operated successfully by Maerz Ofenbau AG, the worldwide market leader for lime kilns. For this winch, which pulls the skip bucket upwards to fill the kiln, Liebherr as system supplier joined forces with the kiln manufacturer to develop a modular-system solution with three electrical power categories. The winches differ not only in electrical power but also in their installed position, which can be at the bottom, centre or top of the kiln. A 3 x 3 product matrix, that is to say nine winch systems is, therefore, suitable for efficient use on all the manufacturer's lime kilns.



Modular rope winch systems are developed individually with customers

New Medium-Pressure Pump with a Modular-Element Principle

The components division of the Liebherr Group has developed a new axial-piston pump, the LH30VO, which is especially suitable for use in mobile machines. At the Bauma, it will be exhibited for the first time at a construction-industry trade fair. The new pump, with a nominal pressure of 280 bar, extends the existing product portfolio. Typical applications include steering pumps, fan drives on excavators, wheel loaders, and drives for equipment cylinders. The pump has a specific displacement of 45 cubic centimetres per revolution and is currently available with two of the most frequently used control devices: for electric fan speed control and a load-sensing system with pressure compensator. The pump with a maximum speed of 3,000 rpm is available with a through-drive option of up to 130 percent.

Since the pump was initially designed as part of a modular-element range, additional control devices will be available to suit customers' requirements. Further displacements of this series with larger and smaller nominal outputs are also planned. Many new, innovative ideas as well as know-how from existing product lines, for example from the high-pressure area, were incorporated into the development of the LH30VO.

All-Round Awareness Means Greater Safety

On the construction site, on the farm or on the road: day-to-day work can mean exposure to various risks. In particular, interaction between human beings and machines calls for a high degree of concentration on the part of machine operators and everyone else working nearby. Liebherr, therefore, develops work assistance systems that avoid these critical situations and make the work easier; as well as enhancing safety, reducing costs and boosting productivity.

A current development project in this area is an environment recognition system from Liebherr-Elektronik GmbH. Strongly built, dirt-resistant cameras, a computing unit with ample capacity and a high-resolution display help the driver avoid accidents. This is how the system works: digital image processing identifies people and objects within a defined detection area. Obstacles are outlined on the monitor screen, with a clear indication of their distance from the machine. As the distance grows smaller, the outline on the screen changes, using the familiar green, yellow and red traffic-signal colours. This enables the driver to react rapidly before the situation becomes acutely dangerous and violent contact or severe injury could occur. The system enhances operating safety and helps prevent possible accident damage. By assisting the driver in this way, he or she can concentrate fully on the task in hand.

The assistance system permits various camera positions to be adopted. Instead of a combined camera, two single cameras can be located individually. Thanks to this flexible installation, the potential detection area can be optimised according to the application of the customer. The combination with the adaptable algorithm makes the system highly versatile. Liebherr is developing its assistance system not only for new mobile machines but also for retrofitting to existing ones.

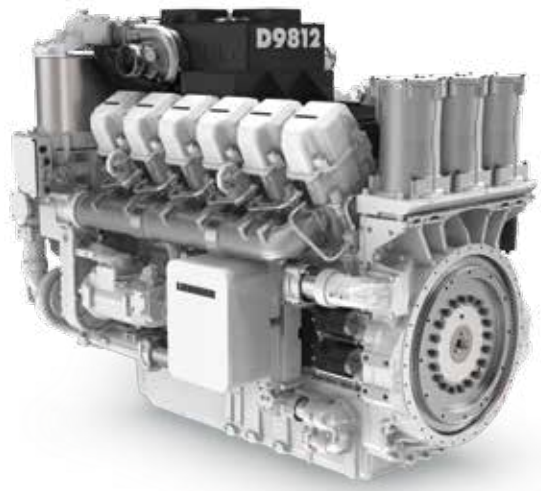
◂ Distance to the obstacle is outlined on the monitor screen

New Diesel and Gas Engine Concepts

Two new V-diesel-engine product lines – the D96XX and D98XX series developed by Liebherr-Component Technologies AG – make their first public appearance at the Bauma trade fair. Also on display is the new G946 L1 mobile gas engine, which uses gas fuel and has been developed especially for agricultural and forestry applications, but also for the construction industry, industrial and transport applications. Other innovative products on display include the new SCRFilter for the D93X, D94X and D95XX engine models.

With its D96XX and D98XX engine series, Liebherr is launching two new diesel model lines in the upper power-output category from 700 to 4,500 kW. The basic design for the D96 series is a V20 rated at up to 1,500 kW at a speed of 1,900 rpm. The cylinder banks are arranged at an angle of 108 degrees and the firing order was chosen to minimise the need for rotary vibration damping. These product features allow low-vibration motor function, which is a further advantage for customers. The new Liebherr engines comply with the EPA CARB Tier 4f exhaust emission limits and can be equipped with the SCR exhaust gas aftertreatment system. It is a Liebherr in-house development, like the new common rail 11.2 fuel injection system, which permits multiple fuel injection at a pressure of 2,200 bar. On the basis of the diesel engine D9620 Liebherr is developing a gas engine for stationary applications with a power output of 1,070 kW and thus extends its gas engine portfolio. The production of the gas engines will start at the end of 2017.

With a specific power output of up to 43.5 kW per litre, the D98 series engines have the highest power density available in this market range and set new standards in this respect. All the principal components such as the injectors, the high-pressure injection pump and the intelligent motor control system are rated for high efficiency and maximum fuel economy. The D98 series will be available in three cylinder layouts: the V12 is the first to appear, and will be followed within a short time by a V16 and a V20; all the components of these engines are scaled to ensure that the appropriate performance values are achieved. This modular designed engine allows to reduce the spare parts diversity and offers more flexibility. Thanks to an SCR system available in addition to the standard specification, both the D98 and the D96 comply with the Tier 4f exhaust emission limits. Production of these new-generation engines will start at the end of 2016 in Colmar (France) and in Bulle (Switzerland); successful field tests are already being held.



The first cylinder layout of the new D98 engine series: the D9812 diesel engine

A further new Liebherr product to be seen at the Bauma is the G946 L1 mobile gas engine. It represents more than 30 years of experience and cumulative know-how in the development of diesel engines and stationary gas-fuelled power units. It links low-emission gas fuel technology with the well-proven features of diesels by Liebherr. The new gas engine's rated power output is 330 kW at 2,000 rpm. It has been developed for use in construction machinery, in agriculture and forestry, as motive power for rails and for other industrial applications.

The new exhaust gas aftertreatment of Liebherr, the SCRFilter, is available for all engine series. Its compact dimensions are obtained by combining a DOC catalytic converter, an SCR-coated particulate filter and an SCR catalytic converter. Passive regeneration ensures reliability and lengthy operating life: maintenance is not needed until after the first 4,500 operating hours.

A Liebherr four-cylinder in-line engine with the SCRFilter exhaust gas aftertreatment system

Discover more:
www.liebherr-bauma.com

The Liebherr Group

Hans Liebherr established the company that bears his name in 1949. Since then it has grown into a Group of more than 130 companies on all continents, employing almost 42,000 people at the latest count. In 2015 the Liebherr Group achieved a total consolidated turnover of more than 9.2 billion euros.

The Group's holding company Liebherr-International AG is based in Bulle (Switzerland) and is wholly owned by members of the Liebherr family. The Liebherr Group's corporate culture has been determined from its earliest days by its family ownership. For more than 60 years, Liebherr has demonstrated what this means in terms of stability and trustworthiness, and has striven for a close long-term relationship with its customers and business associates. Liebherr shapes technological progress and aims to retain its position at the leading edge of future technology. All its activities have top quality as their

central element. This principle is upheld by all the Group's employees in their day-to-day work. Liebherr's products are the outcome of its passion and dedication: tailormade solutions that take the customer's needs and wishes wherever possible as their starting point.

Today, Liebherr is not only among the world's largest manufacturers of construction machinery, but is an acknowledged supplier of technically advanced, user-oriented products and services in many other fields of activity as well. In addition to components and systems in the mechanical, hydraulic and electrical driveline and control areas, they include maritime cargo handling, machine tools and automation systems, aerospace equipment, equipment for the rail industry, domestic appliances and hotels.

Discover more:
www.liebherr.com

A Passion for Metal

Although Jelena Leingang studied successfully in Russia, her qualifications were not accepted in Germany. Scrubbing floors was all the job agency could offer her. Fortunately she decided differently. Today she's one of the Liebherr Group's almost 42,000 employees: a master craftswoman who trains skilled metalworkers at Liebherr's Rostock plant.

"I soon discovered that my degree in thermal technology wasn't worth more than the paper it's printed on here!" reflects Jelena remembering one of her first experiences in Germany. Today the native Russian can look back on a remarkable success story and be justly proud.

It all began at a rolling mill in Kazakhstan. She started work there at the age of 17 and was fascinated by the hard work involved with cast iron. She recalls: "It wasn't long before I developed a passion for metal – something I've retained ever since."

After coming to Germany and having several job applications refused, she started her career with Liebherr in Rostock and retrained in metal construction – a traditionally male domain. "I was lucky – about this time the Liebherr Academy was established in Rostock. I was in the second retraining group and learned construction mechanics with welding technology as my special subject."

Today her in-depth experience qualifies her to train her colleagues – still mostly men! Jelena has a convincing command of the necessary specialist, technical and educational skills. "Just about everyone supported me from the start – and I was able to win over the few remaining sceptics very quickly," she reveals.

"Just about everyone supported me from the start – and I was able to win over the few remaining sceptics very quickly."

Jelena Leingang

After moving up the career ladder from retrainee to forewoman, Jelena finally took the next step and started a training course that would qualify her as a master craftswoman. For two years she studied at the Liebherr Academy's master craft school every Friday afternoon at the end of her shift, and every Saturday too. In June 2015 she successfully sat the master's

exam and now works as a coach for skilled employees. She is the first master craftswoman at Liebherr in Rostock, where in addition to ship, mobile harbour and offshore cranes Liebherr also develops and builds reachstackers and components for container cranes. Jelena Leingang works in this product area and declares proudly: “We build the components for the big ones!”

Asked about her attitude to life, Jelena provides a simple but nonetheless important piece of advice: “Never lose sight of your objectives, that way you will achieve a lot. Liebherr is special because it never puts obstacles in the way of one’s personal development and progress.”

A discussion among colleagues: Jelena Leingang’s openness is much valued

Liebherr in Rostock

Liebherr-MCCtec Rostock GmbH, founded in 2002, develops and manufactures ship cranes, mobile harbour cranes and offshore cranes. Additionally, reachstackers and components for container cranes are covered in its product portfolio. The plant’s direct access to the Baltic Sea provides optimum logistic conditions – above all for worldwide sales of large equipment with lifting capacities up to 2,000 tonnes. Furthermore, the location contributes to the strengthening of the Group’s international market position in the maritime cranes sector.

The Liebherr Academy Rostock was founded in 2009 as a competence centre for advanced trade know-how. The 8,000-square-metre site is equipped with modern instruction rooms, workshops and training units. It is state-approved and therefore open not only to Liebherr’s own trainees but also to technical and management staff from other companies in the region. Furthermore, those seeking employment are issued with a training confirmation certificate to help integrate them more effectively into the job market. Last but not least, a practical qualification programme is run for employees from other companies within the Liebherr Group.

Discover more:
www.liebherr.com/career

Back to the Future

It all began in 1949. Working from a small hut in the South German village of Kirchdorf an der Iller, Hans Liebherr paved the way for the Liebherr Group as we know it today. Gerhard Schmidtke (81) worked for him almost from the start, beginning as a metalworking apprentice. Now, 66 years later, he is visiting the Liebherr Training Centre for a meeting of the generations – with 17-year-old Marius Haisch.

Gerhard Schmidtke's eyes light up as he walks into Liebherr's Training Centre in Kirchdorf an der Iller, which opened in 2014. Marius Haisch takes him past the milling machines and lathes in the large, well-lit machine shop. Marius is 17, and currently training at Liebherr as a mechatronics specialist. A long time ago, the man accompanying him was an apprentice in Kirchdorf too, though a training centre with computer-controlled machines was a dream that only took shape very much later. Gerhard Schmidtke was one of the first apprentices taken on by Liebherr in 1950. He recalls: "I was interviewed by Hans Liebherr himself. He expected a lot from us, but always treated us very fairly." The company had a workforce of about 100 in that year; today the Liebherr Group employs almost 42,000 people.

On a tour of the Centre, in which about 80 young people are currently being trained in one of three trades, it was soon clear that the guest, though one of the company's first apprentices and having reached retirement age many years before, had not lost his passion for working with metal. "I'm still a metalworker, body and soul!" In no time at all he was to be seen, with some advice from Marius, setting up one of the lathes. The Kirchdorf plant opened a small workshop in 1952, run by a foreman who taught and instructed the apprentices. It was extremely modest compared with today's Centre, but in the intervening 66 years the vocational training system has changed enormously. Technical progress, digitised data and the sheer volume of the training programme are what awaits today's trainees. Gerhard Schmidtke, who came to Kirchdorf an der Iller from East Prussia after the Second World War, describes how things used to be: "The older apprentices used to show us how to perform various tasks. And they weren't willing to explain anything more than twice!"

Liebherr's trainees today tackle a programme lasting three years and six months. It is a combination of basic knowledge and work within the specialist departments. Marius Haisch: "The various elements of our training fit together very well. We mostly learn the practical side here in the training workshop. But we're also confronted with reality in close-up – for instance in the cylinder repair shop. This is ideal for the practical situations we will have to face later." Haisch is of course still at the very beginning of his Liebherr career, whereas Gerhard Schmidtke, who retired in 1994, saw something of the world and gained a lot of experience during his 44 years with Liebherr. In 1958, for example, he was one of a team of about 20 employees who shared in the task of building up the Liebherr plant in Springs (South Africa). The return journey was an adventure in its own right: Schmidtke travelled by ship from Durban and through the Red Sea to Venice. The rest of the journey back to Erolzheim, where he still lives today, was completed by train. After this South African interlude, he attended the Technical College in Stockach on Lake Constance from 1962 on, before moving in 1966 to the work preparation department of the Ochsenhausen production site. He remained in the production control department there until his retirement.

Gerhard Schmidtke travels back in time with Marius Haisch

"Among the biggest differences between today's trainees and ourselves are the greater concentration and responsibility we

The articles of apprenticeship signed by Hans Liebherr

The two trainees have a lot to tell each other

expect from them. In our time, more physical effort was called for," says Schmidtke. This can be seen when the two of them reach a CNC milling machine. The computer-controlled terminal provides almost unlimited scope for setting up the workpieces. Schmidtke: "By the time the machines began to be digitised, I was drawing my retirement pension!" Today, Liebherr's Centre in Kirchdorf trains mechatronics specialists and also industrial mechanics and machine operators. Why is the young Marius Haisch so enthusiastic about the training programme? "Because Liebherr is a highly reputable family-owned company with its roots in the region. And the mechatronics training course allows me to combine electronic and mechanical know-how." The basics of metalworking still have to be acquired and practised, however: trainees spend several months learning the correct drilling, filing and sawing techniques.

Gerhard Schmidtke had to get on his bicycle and ride from his home in Erolzheim to the trade school in Memmingen, but trade school classes are now held in Biberach an der Riss. Trainees can not only familiarise themselves with model excavators but are also able to work on actual small-volume orders. One thing at least hasn't changed after all these years, as Gerhard Schmidtke readily confirms: "There was always a sense of comradeship among the employees." Even today he likes to attend the Christmas party held for retired staff. Current trainees can also choose from a range of contacts organised by the Group: exchanges with trainees at other Liebherr locations and a variety of activities with young people outside the training programme – a chance to communicate the fascination of Liebherr.

Discover more:
www.liebherr.com/career

Domestic Appliances

Smart Efficiency

This spring, Liebherr-Hausgeräte GmbH introduced its 'BluPerformance' series, a new refrigerator and freezer range that operates with higher energy efficiency. These new appliances further set themselves apart with their premium-quality workmanship, precision touch electronics, and optimised usable net capacity. The new 'BluPerformance' range was revealed to the public for the first time last September, at the IFA 2015 in Berlin. Alongside enhanced efficiency, Liebherr focussed on remote networking capabilities during the development of these models (i.e. 'connectivity', as it is increasingly becoming known). With the new 'SmartDeviceBox', these refrigerators and freezers can easily be integrated via Wi-Fi into smart homes, and therefore be conveniently controlled whilst on the go from a smartphone, tablet and other mobile devices.

Gear Technology

Bespoke Chamfering

Liebherr's Gear Technology product area supplies the LCD 300 ChamferCut as a stand-alone solution for what is known as the chamfering production process. The ChamferCut principle that the machine uses is now in increasing demand. At the EMO trade fair in 2013 Liebherr introduced for the first time an integrated machine intended for the automotive industry, with gear hobbing and chamfering by the ChamferCut process in parallel during the main machining time. Before long, there were inquiries for a machine devoted solely to the ChamferCut process, which Liebherr satisfied by developing the standalone LCD 300 ChamferCut.

ChamferCut is growing in popularity compared with press-deburring and tapered-end mills, since this process involves the lowest chamfering costs. The special tools are very durable and simple to regrind. Precise, repeat-accuracy chamfers combined with long tool lives speak also for the ChamferCut process. Given the high quality it delivers, the process is particulary popular with car and commercial vehicle manufacturers as well as gearbox and engine manufactures.

Maritime Cranes

The World's Most Powerful Mobile Harbour Crane

The new LHM 800 can claim a long list of superlatives: eight months' production time, a boom 64 meters long weighing 63 tonnes, 18 axles, 144 wheels, a maximum lifting capacity of 308 tonnes and a total weight of 820 tonnes. It sets new standards. From Rostock (Germany), where it was built, Liebherr shipped the first of these cranes at the end of 2015 in fully assembled form to the port of Bronka in St. Petersburg. Situated on the south shore of the Gulf of Finland, this seaport is becoming an increasingly important freight handling location on Baltic shipping routes. To enable larger ships and heavier industrial goods to be handled, the authorities there decided to order the largest current model in Liebherr's mobile harbour crane programme.

Compared with the LHM 600, previously the most powerful Liebherr mobile harbour crane, the LHM 800 can handle approximately 100 tonnes more. It is also prepared for use with the Liebherr-Sycratronic® tandem lift system: a single operator can control two of these cranes simultaneously.

Aerospace

A Strong Partnership: Liebherr and Rolls-Royce

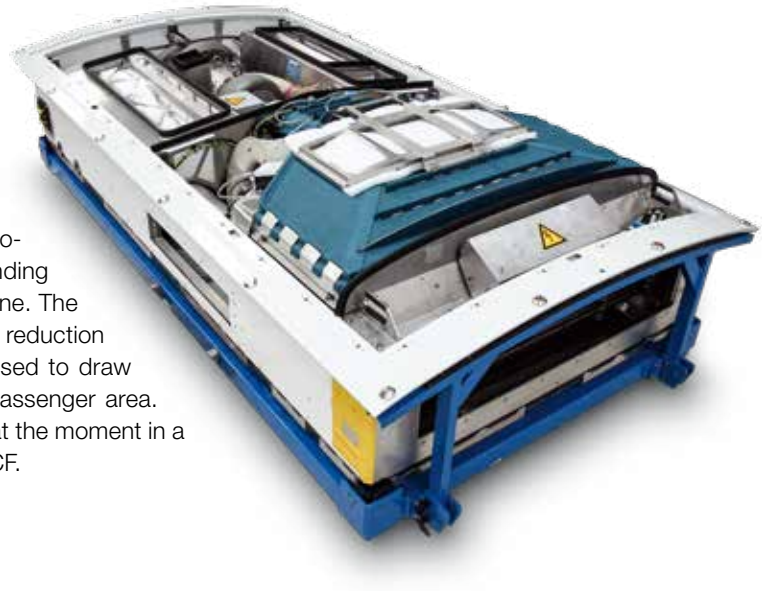
In Friedrichshafen, a town on Lake Constance (Germany), a new company began to operate just over six months ago: Aerospace Transmission Technologies GmbH. It is a joint venture undertaken by two well-known names: Liebherr and Rolls-Royce, to develop manufacturing capability and capacity for the power gearbox on Rolls-Royce's new UltraFan™ engine. Compared with the first-generation Rolls-Royce Trent®, fuel consumption is at least 25 percent lower. The new power gearbox will enable the UltraFan to deliver efficient power over a range of take-off thrusts for high bypass-ratio engines. In the versions with the highest thrust, a single gearbox of this type can handle power equivalent to more than 500 midsize cars. The initial team consists of nearly 30 employees, most of them from the two parent companies, and is co-led by two general managers, Heike Liebe from Liebherr-Aerospace and Dr. Rob Harvey from Rolls-Royce.

Josef Gropper (Managing Director Liebherr-Aerospace & Transportation Systems), Dr. Norbert Arndt (Executive Vice President Rolls-Royce), Arndt Schoenemann (Managing Director Liebherr-Aerospace Lindenberg) and Dr. Rainer Hönig (Managing Director Rolls-Royce Germany) at the power gearbox joint venture's opening in Friedrichshafen (from left to right)

Transportation Systems

Air Cycle Air Conditioning Systems for Rail Vehicles in Germany and France

In March 2015 Liebherr supplied its first air cycle air conditioning system to Deutsche Bahn (German Rail) for its ICE-3.1 redesign programme. It was then successfully tested in passenger service up to and including December of that year. Air cycle technology is a new generation of heating, ventilation and air conditioning technology originally developed for aircraft. By using air instead of a chemical refrigerant, air cycle technology improves the ecological balance sheet. Process air is taken from the surrounding area and expanded by an electrically powered cooling turbine. The resulting reduction in pressure generates a simultaneous reduction in temperature. After this an air-to-air heat exchanger is used to draw energy from the inflowing air, which is then fed into the passenger area. Liebherr's new air conditioning system is also being tested at the moment in a regional train operated by the French railway company SNCF.



Completely renovated: the Löwen-Hotel Montafon

Hotels

Latest Hotel News

The Liebherr Group owns six hotels in Germany, Austria and Ireland. The four-star superior Löwen-Hotel Montafon (www.loewen-hotel.com) in Schruns (Austria) has been completely renovated. Generous use of wood and warm colours create an agreeable ambience (picture on left). Rooms furnished to the most modern standards and the new lounge are sure to meet the approval of every guest.

The Interalpen-Hotel Tyrol (www.interalpen.com) in Telfs (Austria) has a firm place among the 'Leading Hotels of the World'. The 'Hofburg' was opened in 2014 (picture below). This new event location in the hotel is chic, stylish and exclusive.

The 'Hofburg' in the Interalpen-Hotel Tyrol

Liebherr on the Ball

Table tennis is a sport that Liebherr has supported for more than 20 years, as a competent partner for the German first division club TTF Liebherr Ochsenhausen and also the German and Austrian national teams. Liebherr also sponsors international highlights, for instance the Liebherr Men's World Cup to be held this October in Saarbrücken (Germany) and the Liebherr World Table Tennis Championship that will take place in 2017 in Düsseldorf (Germany).

At the 2016 Bauma as well the fast-moving white ball will be the centre of attention on April 12, the second day of the trade fair – at an unusual place on Liebherr's stand, the giant dump body of a T 264 mining truck. Top players from Germany and Austria will meet for a show match. For the home team this will be an opportunity to make up for losing the European championship final in Yekaterinburg (Russia) in 2015, when they were favourites but the Austrian men's team scored an unexpected, though certainly not undeserved, victory.

Even for German table tennis star Timo Boll, the 'Match in the Mining Truck' is quite special. "I've played table tennis in halls all over the world," says the 35-year-old record-holding European champion. "But this is not only impressive, it's unique!" The event can be seen on large LED screens, and will be introduced by Norbert König, the sport commentator from German Television (ZDF). At the Bauma the two teams will not only display their skills at the table but also sign photos for visitors.

"Table tennis is the perfect blend of dynamism, passion and excitement, and the essence of fairness in sport," says Andreas Böhm, a member of the Liebherr-International AG board of directors. "This combination, together with the precision and strategic intelligence that are so important in table tennis, ideally matches the Liebherr Group's corporate culture."

Liebherr also attaches special importance to encouraging young players. The family-owned company therefore sponsors the Liebherr Masters College in Ochsenhausen (Germany), one of the best-known training establishments in Europe for up-and-coming table tennis stars.

Timo Boll is looking forward to the 'Match in the Mining Truck'

Liebherr sponsors the German national team

The family-owned company supports Austria as well

The 'Match in the Mining Truck'

- Who? The German and Austrian national table tennis teams
- What? A friendly match between the 2015 European Championship winners and runners-up
- Where? In the big dump body of Liebherr's T 264 mining truck, open-air stand 809-813
- When? April 12, 2016, 12 p.m.

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