LIEBHERR

InnoTrans 2014

Experience the Progress.

F.l.t.r.: Heiko Lütjens, Josef Gropper, Francis Carla, Nicolas Bonleux

Dear reader,

InnoTrans in Berlin is for Liebherr-Transportations Systems an event of the utmost importance. As we did in the past, we are again participating with enthusiasm in this year's trade show to present our state-of-the-art products and technologies.

Our long-term development strategy has enabled us to weather the recent ups and downs of the rail industry and to continue enjoying sustainable growth. We have a new Board of Management that will further drive the development of our activities and consolidate our presence as a key player in the markets worldwide.

Our customer service activities have shown substantial growth thanks to our global service stations, which we continue to expand. At our production sites, we have started several processes to improve our operational efficiency. Moreover, at our main site in Korneuburg (Austria), we have developed engineering and production expertise for highly efficient hydraulic systems derived from the technologies we designed for the aerospace industry. Of course, we also continue investing in environmentally friendly technologies such as air cycle air conditioning as well as in other solutions that feature reduced noise emissions, lower weight and lower energy consumption. Our efforts in research and development have been fruitful: Last year, we launched our latest innovations such as our cooling system for li-ion batteries or our anti-kink system for trams.

Finally, we are very pleased that several new customers in Europe, China and the Americas have shown confidence in our company by awarding us contracts for highly promising projects.

Liebherr-Transportation Systems is thus well prepared to meet the future challenges of the rail industry, which still shows considerable growth potential in the medium and the long term.

Enjoy reading and have a successful InnoTrans 2014.

Best regards,
the Executive Board of Management of
Liebherr-Aerospace & Transportation SAS

Nicolas Bonleux
Managing Director and Chief Sales Officer

Francis Carla
Managing Director and Chief Technology Officer Air Management Systems

Josef Gropper
Managing Director and Chief Operating Officer, Production, Purchasing and Asset Investments

Heiko Lütjens
Managing Director and Chief Technical Officer, Flight Control and Actuation Systems, Landing Gear Systems and Hydraulics

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Information for Visitors

InnoTrans 2014 – Welcome to Liebherr-Transportation Systems

As one of the leading manufacturers of equipment for the rail industry, Liebherr is a confirmed name among the exhibitors at the InnoTrans trade show. From September 23 to 26, 2014, the company is presenting innovative solutions such as environmentally friendly air conditioning systems and highly reliable hydraulic actuation systems as well as a heavy-duty rail excavator. Moreover, Liebherr will be providing information about career opportunities.

Stand

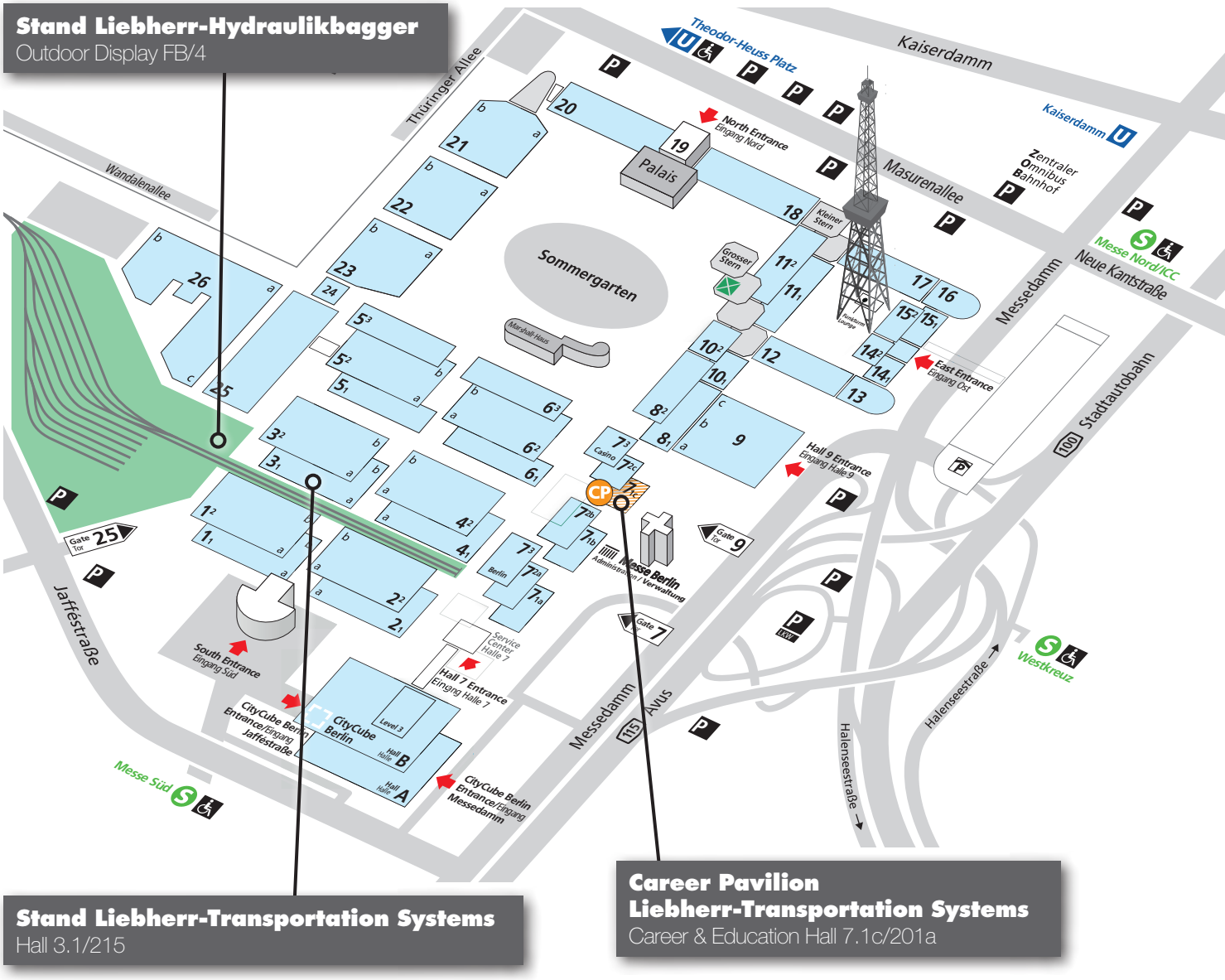
At stand no. 215 in hall 3.1, Liebherr-Transportation Systems is exhibiting, among other things, a heating, ventilation and air conditioning system for driver cabins as well as electro-hydraulic actuators as examples of a new generation of compact, maintenance-friendly actuators. Not only experts from the areas of development and sales are available to answer visitors' questions, but also representatives from customer services.

Career Pavilion

In the Career & Education Hall 7.1c, pupils, apprentices and students can find out about careers in the rail industry. In the Career Pavilion, representatives from the human resources department of Liebherr-Transportation Systems are giving information about apprenticeship opportunities and professions at Liebherr and are answering questions.

Outdoor Display

At stand FB/4, Liebherr-Hydraulikbagger GmbH is presenting its wheeled excavator A922 Rail Litronic for track bed works. The dual-purpose excavator with swivel frame can be driven either on the road or on tracks. Beside the standard design, a narrow track design and a friction wheel design are also available.



- Halls
- Outdoor display
- Career & Education Hall
- Parking area
- Metro station
- Suburban train station

InnoTrans

International Trade Fair for Transport Technology

23.–26.09.2014

Opening Hours
Trade Visitor Days 9:00 am – 06:00 pm
Private Visitor Days 10:00 am – 06:00 pm (Outdoor display only)

23 – 26 September 2014 – Trade Visitor Days
27 – 28 September 2014 – Private Visitor Days (Outdoor display)

Career Pavilion
23 – 26 September 2014
9:00 am – 06:00 pm

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Programs and New Contracts

Greater Ride Comfort and Less Wheel Wear with Anti-Buckling Systems

The hydraulic anti-buckling system, which Liebherr-Transportation Systems has developed specially for low-floor trams, fulfills a safety-critical function: it guarantees that the specified clearance profile is maintained at all times. In addition, it improves ride comfort and reduces wear on the wheels because the car bogies are hydraulically coupled. The complete anti-buckling system includes hydraulic actuators and an integrated electronic controller.

Zhuzhou Electric Locomotive Co., Ltd. of Zhuzhou (China) is the second Chinese rail vehicle manufacturer after Tangshan Railway Vehicle Ltd., Tangshan, to select Liebherr-Transportation Systems as the supplier of anti-buckling systems. A prototype vehicle has already been equipped with the system and will be tested by the end of 2014. Series production of the low-floor trams is due to begin in Zhuzhou after the test phase.

Liebherr-Transportation Systems has also secured an important contract in Europe. The company is set to supply anti-buckling systems for a total of 18 low-floor trams to the Polish manufacturer Solaris Bus & Coach S.A. of Owińska (Poland). These trams will be operated on the network of the Braunschweiger Verkehrs-AG in Braunschweig (Germany). This contract – like the contracts from China – has impressively demonstrated the competitiveness of Liebherr-Transportation Systems' solutions in the field of hydraulic actuation systems.

Anti-buckling system

Bogie Coupling Systems for Alstom's H3 Hybrid Locomotives

Liebherr-Transportation Systems has delivered the first hydraulic bogie coupling system for the new three-axle H3 hybrid shunting locomotives to ALSTOM Lokomotiven Service GmbH, Stendal (Germany).

Liebherr is responsible for the manufacturing of the system, which was jointly developed by Liebherr and Alstom. It couples the three axes of the locomotive so that the vehicle can round curves easily despite large axial distances. Thus, the bogie coupling system helps to reduce wear on both wheels and tracks, and also to decrease noise emissions.

The H3 hybrid locomotive can be used for especially heavy shunting operations thanks to Liebherr's technology. Liebherr-Transportation System's bogie coupling system is hence another application that gives proof of the benefits and the efficiency of electro-hydraulic actuators.

Components of the bogie coupling system

© Alstom

Liebherr Equips Additional FLEXITY Classic Trams with HVAC Systems

Liebherr-Transportation Systems is supplying heating, ventilation and air conditioning (HVAC) systems for another four of Bombardier Transportation's FLEXITY* Classic 6NGTW Series trams. The delivery is based on a contract both companies signed in October 2012.

For each one of the four trams, which will be operated by the city of Plauen (Germany), Liebherr is supplying two driver cab units and one saloon unit. The high-efficiency, high-reliability and low-weight HVAC systems offer optimal comfort for the driver and the passengers, and reduce power consumption and maintenance costs.

**FLEXITY is a trademark of Bombardier Inc. or its subsidiaries*

Flexity Classic 6NGTW tram

Air Conditioning Systems for Thameslink Rolling Stock Program

Liebherr-Transportation Systems GmbH & Co KG, Korneuburg (Austria), signed a contract for the delivery of air conditioning systems with rail vehicle manufacturer Siemens and operator Cross London Trains (XLT). These systems are meant for the Thameslink Rolling Stock Program, which is led by the UK Department of Transport.

The 1,140 passenger compartment units and 230 driver cab units covered by the contract are lightweight and maintenance-optimized, and feature low power consumption.

Driver cab air conditioning unit

Making Boarding and De-boarding Easier

Bombardier Transportation North America, Montreal (Canada), has selected Liebherr-Transportation Systems to supply leveling systems for 14 trams. The vehicles are to be operated in Waterloo (Canada) by Metrolinx. Supply has been planned for the fall of 2014.

The leveling systems, which Liebherr manufactures at its production site in Lindenberg (Germany), will be installed in the bogie of the rail car. It adjusts the entrance height of the vehicle to the level of the platform, which makes boarding and de-boarding easier for mobility-impaired people, in particular.

Thanks to the new project, Liebherr is able to further develop its partnership with Bombardier, which is aimed at designing a family of hydraulic systems for rail vehicles.

Efficient Cooling of Li-Ion Batteries

Liebherr-Transportation Systems has been selected by the rail vehicle manufacturer Bombardier Transportation GmbH of Mannheim (Germany) to develop and produce a compact and reliable cooling system for an innovative Li-Ion battery. These batteries will be employed in the next generation of electric drive systems, which are set to power urban transit buses and light-rail vehicles in the future.

The highly efficient cooling system will ensure that the battery runs under optimal thermal conditions. Prototypes of the system are being tested both at Liebherr's ultra-modern test facilities and on demonstrator vehicles at Bombardier.

The Li-Ion battery is an integral component in Bombardier's highly innovative inductive battery charging system PRIMOVE. This system enables the main battery of the electric drive system to be recharged without contact to the trolley wires, so the vehicle does not have to interrupt its operation. The battery charging system will play a major role in reducing CO_2 emissions in urban traffic.

Light-rail vehicle with charging system PRIMOVE

Technology

The Time for Air Cycle Has Come

The discussion about the refrigerants of the future has kept the rail industry busy for years, with no recognizable trends or even significant signs of progress. One thing is clear, however: Continuing to use chemical substances will be still less tolerated in the rail traffic sector due to their potentially harmful effects on the environment. On the other hand, there are still no alternative synthetic refrigerants that not only meet the requirements of environmental protection, but also satisfy the specific provisions for rail operation.

Ultimately, the path leads clearly towards refrigeration by means of natural gases that do not contribute to the greenhouse effect: cold air technology, also known as air cycle technology, is currently the only future-proof and environmentally friendly alternative that, over the years, has proven successful in passenger transport.

Absolutely environmentally friendly technology

Right at the start of its business activities in the rail industry more than 15 years ago, Liebherr began to develop an air cycle air conditioning system for rail cars based on this technology. Air cycle technology is absolutely environmentally friendly because it operates entirely without refrigerants. Instead, it simply uses fresh air from the surroundings for cooling.

The air is first drawn in and compressed by a turbine operating at high speed, before it expands again in the open circuit of the air cycle air conditioning system and cools down in the process. The cold air is then passed through a heat exchanger and added to the air supply for the passenger compartment. Since the air cycle air conditioning system only has a few components, it is also very easy to maintain.

Compared with refrigerants, air has many advantages: It does not have to be generated, but is available everywhere. For this reason, it requires neither complicated storage nor disposal measures after use. Moreover, possible leaks are uncritical because air has absolutely no negative effect on the environment and does not pose any potential threats. While staff have to be trained on the use of refrigerants in air conditioning system production and for rail operation, no special training is necessary for a system that uses air.

Successfully in operation

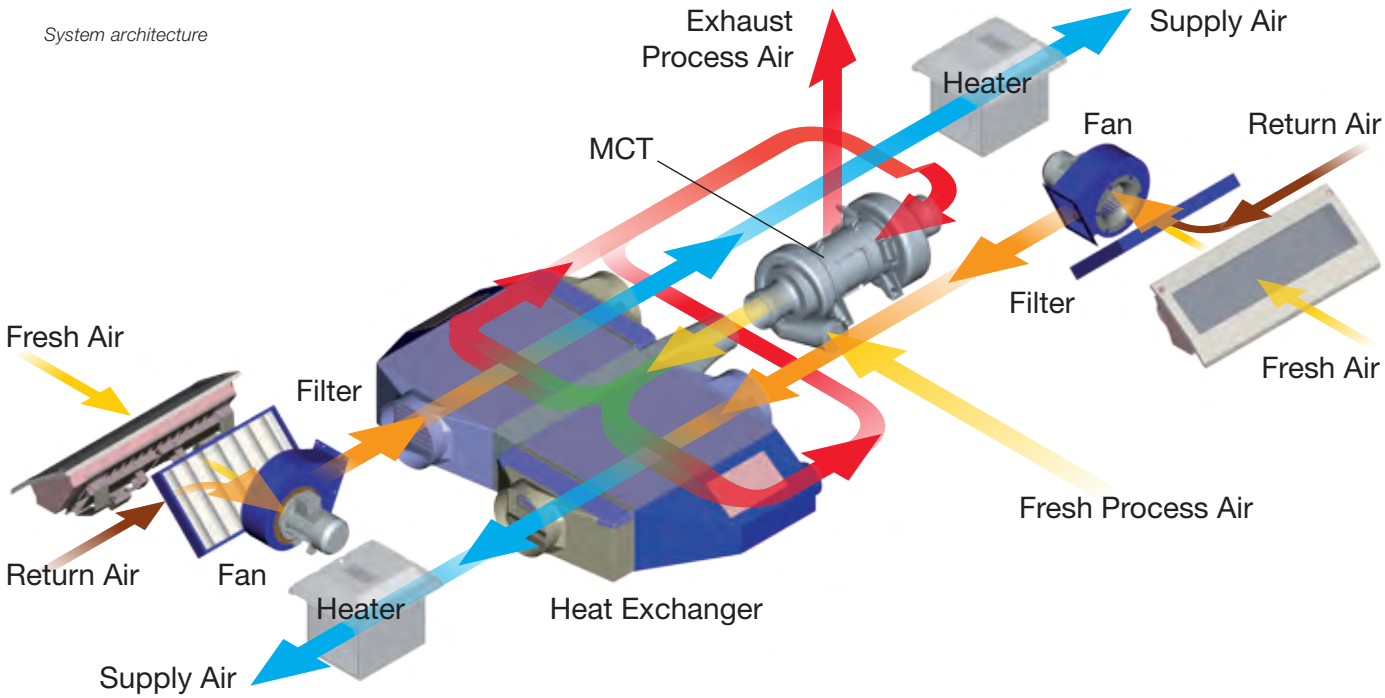
Originally, air cycle technology was developed for the aerospace industry, where it has been used for more than four decades for air conditioning in aircraft. As one of the very first companies, Liebherr also began employing this technology in rail vehicle equipment. As far back as 2002, Liebherr-Transportation Systems fitted the first

train of German operator Deutsche Bahn AG (DB) – an ICE 3 – with air cycle air conditioning systems. Additional fittings for the first model series as well as 13 eight-car trains of the second model series of the ICE 3 followed.

Since then, the systems have proven extremely successful in DB's daily passenger transport operations. They are characterized, in particular, by their robustness and low operating costs. Furthermore, the energy consumption of air cycle air conditioning systems is extremely low compared with conventional systems. This has been verified, among other ways, through comparative measurements by DB.

The very pleasing results of the air cycle air conditioning systems are not only an affirmation for Liebherr-Transportation Systems, but also an incentive to work intensively on further developing air cycle technology and to make it usable for a wider spectrum of applications.

System architecture



HVAC System Tested Under Extreme Conditions

This year, the heating, ventilation and air conditioning (HVAC) system that Liebherr-Transportation Systems had developed for Siemens' Thameslink rail cars successfully completed a set of tests at the climatic testing facilities of RTA Rail Tec Arsenal in Vienna (Austria). Installed in the vehicle, the HVAC system underwent various trials simulating extreme climatic conditions it may be exposed to during operation, such as extremely high and low outside temperatures from +45 °C to -25 °C, heavy rain, hail, strong wind and other severe weather conditions as well as different temperatures inside the vehicle. Moreover, for several days, the HVAC unit was tested under various conditions in parallel to demonstrate its robustness on board the train.

The trials at RTA Rail Tec Arsenal were part of the certification process of the Thameslink rail vehicle. They completed the temperature and performance tests Liebherr-Transportation Systems had carried out at its own test facilities in Korneuburg (Austria), before the HVAC unit was installed in the vehicle.

Designed to meet the highest quality standards and reliability requirements even under extreme operating conditions, Liebherr's HVAC systems contribute to the safety and comfort of rail transport.

New Actuator Family in Operation

A few years ago, Liebherr-Transportation Systems started to design a new family of highly integrated electro-hydraulic actuators for rail cars. Meanwhile, the company has successfully completed the first article inspection (FAI) of two versions of these actuators and started to produce them in series at its plant in Korneuburg (Austria). One version is used for active roll compensation in the new TWINDEXX* Express double-deckers, which Bombardier delivers to Swiss Federal Railways (SBB). The other design is applied to active yaw suspension of Bombardier's* ZEFIRO* high-speed trains manufactured for Italian operator Trenitalia.

Bombardier V3000 ZEFIRO high-speed train

The new actuators significantly improve ride comfort and reduce wear on both wheels and tracks. Contributing to the reduction of the lateral forces on the bogie, the ZEFIRO version actuators increase ride comfort at high speeds, in particular. The TWINDEXX actuators slightly tilt the train in curves, thus compensating the so-called roll effect and allowing higher travel speeds on winding tracks.

Advanced control and software design

Compared to previous designs, an actuator of the new family incorporates not only the entire electro-hydraulic circuit, but also an advanced electronic control board, which regulates and monitors each single unit almost autonomously. The overriding TCMS (train control and management system) merely controls the individual actuators among each other by means of a robust CAN (controller area network) bus network. As a result, even the requisite cabling per actuator is reduced to a minimum.

The software of the electronic control board is based on generic coding. This makes using a given actuator for another application very easy – even on board a different type of train – because the software does not need to be modified. What remains to be done is to connect the actuator to the CAN bus network and download the correct parameters from the respective TCMS. As a result, commissioning and train downtime can be kept at a very low level.

Easier to install and maintain

As the new actuators are very compact, they can be fully integrated into the bogie. The actuator is simply slid sideways into the opening, which ensures optimal accessibility after installation. The electronic control board or individual hydraulic elements can therefore be exchanged within a short time and without the actuator itself being removed.

Another advantage of these devices is their maintenance-friendly design. All components which could potentially fail can be replaced quickly and easily. The parts subject to wear were reduced to small assembly modules. Finally, to keep maintenance and overhaul costs at a minimum, the new actuators are not coated.

Liebherr's new actuator family is part of an integrated product platform, which comprises various active and semi-active elements for radius steering, lateral suspension, tilting and level control, and serves as a basis for a wide range of future applications. This concept clearly supports the ongoing standardization and modularization activities within the rail industry. In future projects, it will also help to reduce both lead times and technical risks.

**Bombardier, ZEFIRO and TWINDEXX are trademarks of Bombardier Inc. or its subsidiaries*

Prize for the Best Technological Innovation Goes to Liebherr and Bombardier

Electro-hydraulic actuator

Liebherr-Transportation Systems and Bombardier* Transportation received the "European Rail Congress Award 2013" in the category "Excellence in Technology" for their jointly-developed roll compensation system FLEXX* Tronic WAKO*. The prize for the best technological innovation in Europe was awarded at the European Rail Congress, which was held in London in November 2013.

The FLEXX Tronic WAKO system features integrated active lateral suspension including electro-hydraulic actuators that were developed and manufactured by Liebherr-Transportation Systems. Additionally, it can be upgraded with active radial steering (FLEXX Tronic ARS).

During curves, rail cars tend to tilt inwards. The FLEXX Tronic WAKO system compensates for this roll movement, thus reducing wheel and rail wear and improving ride comfort. Thanks to roll compensation, speed can be increased and travel time reduced. The first Bombardier double-deck trains with this innovative bogie technology, the Bombardier TWINDEXX* Express, will be operated by Swiss Railways (SBB).

**Bombardier, FLEXX, WAKO and TWINDEXX are trademarks of Bombardier Inc. or its subsidiaries*

Successfully in Operation: Air Conditioning Systems with Heat Pumps

The next generation of heat pump technology developed by Liebherr-Transportation Systems has proven itself: the heating, ventilation and air conditioning (HVAC) systems with integrated heat pumps have been in operation in some DPZ+ double-decker trains of Swiss National Railways (SBB) for several months. The railway operator is equipping all of its 115 DPZ+ trains with the new Liebherr HVAC systems. This process is scheduled for completion in 2017.

The new pump technology allows the system to switch between cooling mode and heating mode. The same components that are normally used for cooling can now also be used to generate heat. For heating, the new HVAC system, whose electrical heating elements are smaller, requires far less energy input than an HVAC system without a pump, which means a substantial reduction of CO_2 emissions.

Moreover, the Liebherr systems with heat pumps are lighter in weight and incur lower operating and maintenance costs.

Air conditioning system with heat pump

Sites

Continual Expansion of Production in Bulgaria

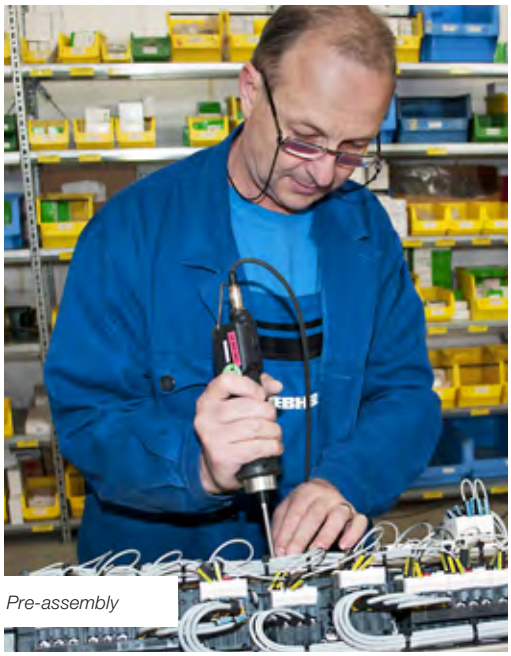
Liebherr-Transportation Systems GmbH & Co KG, based in Korneuburg (Austria), has been advancing the strategic orientation of its production network for several years. Part of this process is the continual expansion of the activities of Liebherr-Transportation Systems Marica EOOD, the production facilities in Marica, near Radinovo (Bulgaria): In 2004, production of components such as ducting sets and heaters commenced on an area of 300 m². This area was enlarged to 10,000 m², and since 2010, complete heating, ventilation and air conditioning systems (HVAC systems) for rail cars have been produced there.

Today, Liebherr-Transportation Systems Marica EOOD is responsible for the series production of air conditioning systems and additional parts for all major contracts that Liebherr is awarded worldwide. The production range is being continually expanded: Besides the necessary know-how, the infrastructure has also been expanded so that in the future, it will also be possible to build battery cooling systems in series production on an area of 10,000 m².

The employees play an essential role in the growth and success of the company at Marica, as do the management and production systems. The latter guarantees fluid production, transparent processes and safe products, and includes a continual improvement management system.

Enhanced applications include, for example, "synchronized logistics" or the "supermarket system". Synchronized logistics means that in final assembly, production runs in the same rhythm as it does at the Liebherr-Transportation Systems customers, the rail vehicle manufacturers. With the "supermarket system", the employees in production take pre-selected parts from a shelf, upon which the employees in the warehouse immediately refill the shelf with new parts. This simplifies management of the materials substantially and allows a continuous workflow with reduced lead time. Moreover, improved transparency guarantees a high level of process reliability.

Brazing



Pre-assembly

Functional testing

Thanks to the continuous expansion of production capacity and investment in the infrastructure, more than 1,950 HVAC systems could be assembled in Marica in 2013. In addition, the approximately 270 employees were able to celebrate the milestone ten-thousandth air conditioning system in the autumn of the past year. These systems are sold not only to customers in Europe, but also overseas. In addition to these successes, Liebherr-Transportation Systems Marica EOOD was able to successfully renew its certification according to the International Railway Industry Standard (IRIS) and is now preparing for certification in accordance with the international standards DIN EN ISO 14001 and BS OHSAS 18001.

IRIS Certification for Sites in China and Bulgaria

Liebherr Zhongche Transportation Systems Co., Ltd. based in Zhuji (China) has for the first time been certified in accordance with the International Railway Industry Standard (IRIS). The company – a joint venture between Liebherr-Transportation Systems GmbH & Co KG, Korneuburg (Austria), and Guangzhou Zhongche Railway Vehicles Equipment Joint-Stock Co., Ltd., Zhuji (China) – develops and produces air conditioning systems, supplying these primarily to Chinese rail vehicle manufacturers. The successful IRIS certification is an important step in the further expansion of the business activities of the joint venture.

Liebherr-Transportation Systems' Bulgarian site, Liebherr-Transportation Systems Marica EOOD in Radinovo, successfully renewed its IRIS certification in 2013. The auditors of the German certification agency DQS GmbH, which performed the audit, praised the improvement processes implemented and extended the certificate until December 2015. The company's overall rating by DQS GmbH has also improved.

Customer Service

New Maintenance Workshop in London

Liebherr-Transportation Systems supplies heating, ventilation and air conditioning systems (HVAC) for many trains of the latest generation that run on the lines of Stansted Express, Southern Railway and Thameslink as well as other passenger transport lines in Greater London. To continue its successful collaboration with the train manufacturers and operators in United Kingdom, the company opened a new maintenance workshop in London Gatwick in May of this year.

The close vicinity to the rail transportation companies of London enables Liebherr-Transportation Systems to improve its customer services in particular: Both the transportation and turnaround times for the repair and maintenance of HVAC systems are now considerably shorter.

On a surface area of 900 m², the service center not only houses a repair workshop, but also a spare parts store and office space for the customer service team. The team ensures seamless operation of the rail operators' trains during their operating hours and is responsible for optimizing reliability and operating costs.

The new branch in London Gatwick supplements the Sunderland site of Liebherr-Transportation Systems in the north of England, which coordinates the activities of the company in the United Kingdom.

F.l.t.r.:
Dirk Junghans, Managing Director Liebherr-Transportation Systems GmbH & Co KG, Neil Briggs, Manager of the maintenance workshop in London Gatwick, as well as Alan Lepatourel, Sales Director United Kingdom, at the opening

Support for the Customer Service Team from Stadler Pankow

German rail vehicle manufacturer Stadler Pankow GmbH selected Liebherr-Transportation Systems to maintain the air conditioning systems of twelve trams. These vehicles of the Variobahn series are used for public transport in the inner city of Bergen (Norway). Liebherr-Transportation Systems is supporting the customer service team of Stadler Pankow, which is responsible for maintaining the fleet of trams at the Bergen depot.

The contract with the rail vehicle manufacturer again demonstrates Liebherr-Transportation Systems' competence in the area of customized and competitive customer service solutions.

Driver cabin air conditioning unit

Liebherr offers a wide range of customer services.

People and Opportunities

Successful Taster Sessions in Korneuburg

Watch, ask questions and carry out easy tasks under professional supervision – young people can do all this during their short work experience placements at Liebherr-Transportation Systems GmbH & Co KG in Korneuburg (Austria). The five-day taster sessions, which the company has been offering for more than five years, give students from 14 years of age the chance to get a taste of technical professions in production and daily operations in the organization.

After induction training on health and safety, the interns are fitted out with work wear. Then they set off: Under the supervision of experienced staff, they bend and braze copper pipes for the first two days. On the remaining three days, the boys and girls assemble and screw together individual parts at a repair station.

Of the 30 young students that took this opportunity to experience working life at Liebherr-Transportation Systems, some were so impressed that they

After her taster week, Jaqueline Gerstl applied for an apprenticeship.

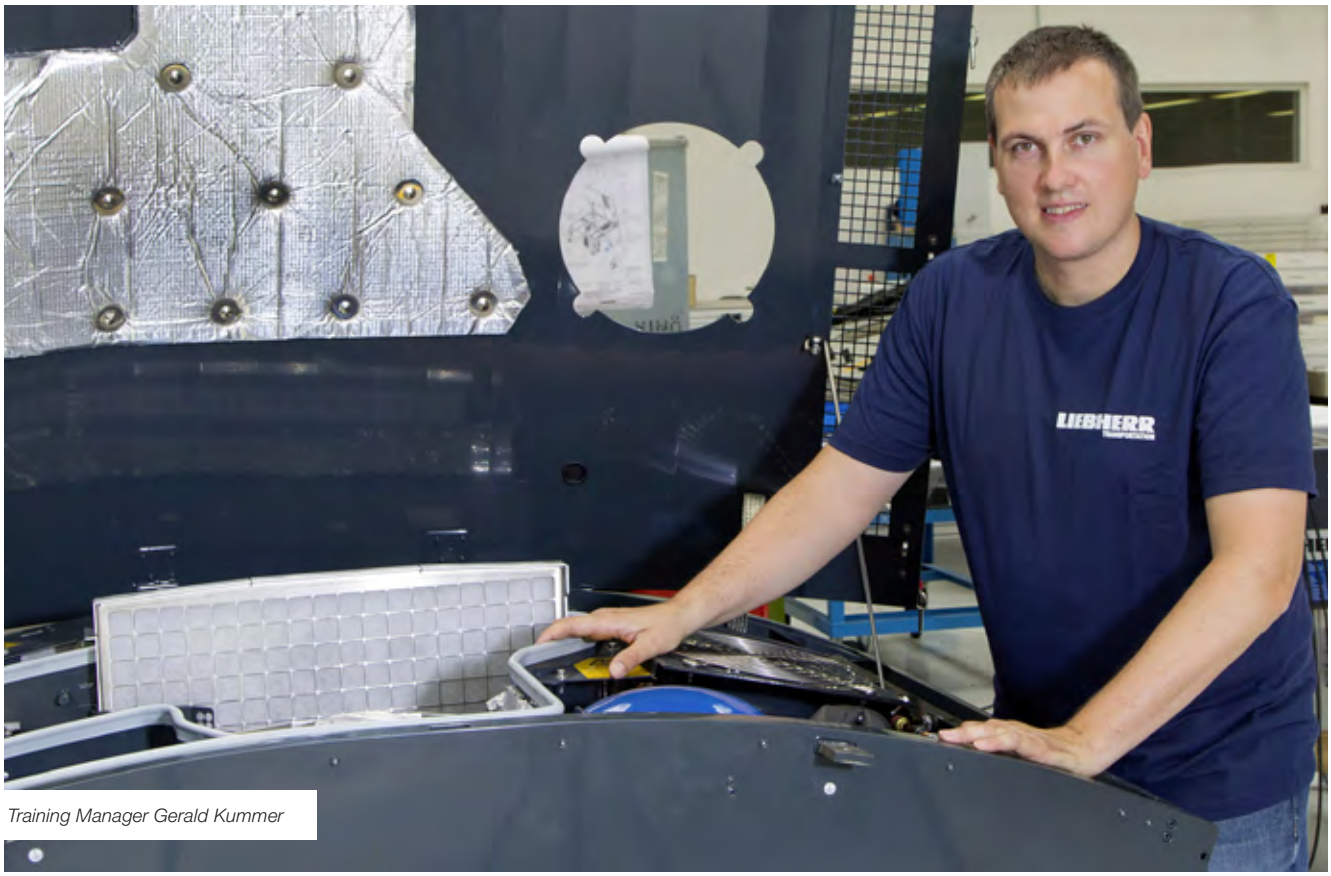
applied for a position after finishing school. Jaqueline Gerstl is one of them – she applied for an apprenticeship after her short work experience. The 21 year old is now in the third year of her apprenticeship to become a technician for cooling systems.

More young women for technical professions

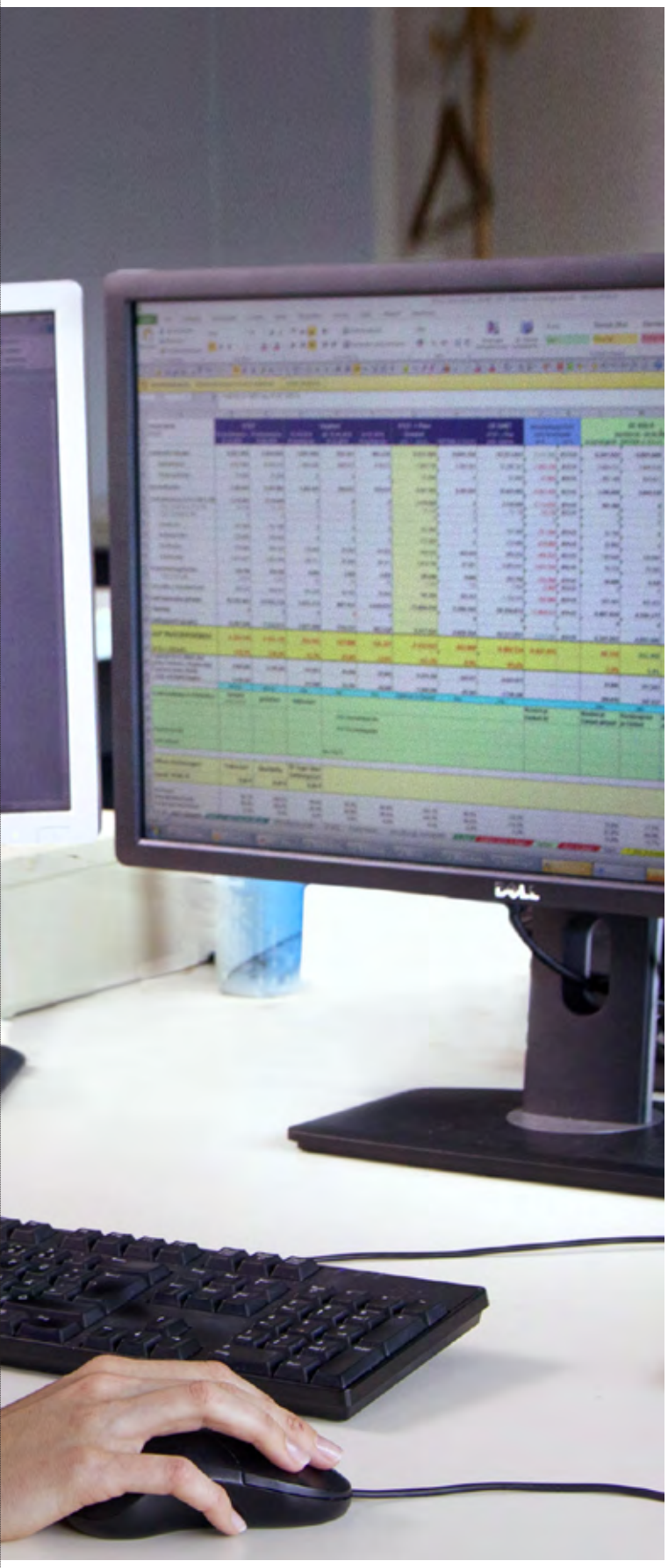
"My taster week was a brilliant experience. Right at the start, a member of staff from the production line showed me all parts of the air conditioning system with all its cables and connections", Jaqueline Gerstl says. "Then I was allowed to cut the insulating strips for the cables in the air conditioning unit myself, which were fitted straight afterwards. I saw and did a lot throughout the week – and I soon realized that I wanted to train for this profession." For Liebherr-Transportation Systems, the aim of the short work experience scheme is not just to find potential employees: The company is interested, above all, in finding more young women for technical professions.

Training Manager Gerald Kummer believes in short work experience placements: "In such informal, but also real situations, I am able to watch really well if an intern might be right for the company. Also, I can see what their manual skills and powers of comprehension are like. Of course, the fun doesn't just stop there. We laugh together when little accidents happen and "celebrate" when, for example, a brazing attempt is successful. The youngsters are very proud of themselves when they take home the work pieces they have made.

Taster weeks take place at the Korneuburg site at unscheduled times. Young students who are interested can get a form for it from their school, which they should fill in and send to the company. An appointment will then be agreed for the start of the taster week. The advantage here is that Gerald Kummer can give one-to-one training to an intern if only one registers.



Training Manager Gerald Kummer



3 Questions for Kerstin Höfel

Head of Controlling,
Liebherr-Transportation Systems GmbH & Co KG

What are your tasks and responsibilities?

As Head of Controlling, I am mainly responsible for budgeting, reporting and project controlling at the Korneuburg (Austria), Marica (Bulgaria) and Mannheim (Germany) sites. When it comes to budgeting, my team and I coordinate not only the creation and consolidation of individual budgets of all areas, but also the monitoring of the budgeted values for the current year. We are also responsible for generating the company figures and for further developing the internal and external reporting systems. Our main tasks in project controlling are to ensure observation of a project in its entirety from start to finish, deviation analysis as well as reporting to the management.

Why did you choose to work for Liebherr?

My parents both worked for Liebherr, so I have been familiar with the company since my childhood. My own professional career at Liebherr started with a placement for my diploma thesis.

The varied, challenging range of tasks that Liebherr offers me was and is important to me and so, too, are good career opportunities.

Another reason for my decision was that I wanted to work for a family-run business, which is not just focused on the shareholder value, but reinvests the profit that it gains, meaning that its central approach is long-term and future-orientated. The down-to-earth and hands-on mentality of the Liebherr family also appealed to me.

What is especially important to you in your job?

I consider a fair working environment and a corporate culture in which every individual member of staff is acknowledged and appreciated to be very important. I also rate a good work-life balance and the compatibility of career and family very highly.

Other important aspects for me are individual promotion according to performance and potential, independent, self-reliant work and also the greatest possible freedom in organizing and carrying out my activities.

3 Questions for Heinz Holzer

General Co-ordinator of Production, Liebherr-Transportation Systems Marica EOOD

What are you responsible for in your job?

As the General Co-ordinator for our Bulgarian site, I am – in agreement with the management – responsible for its alignment and further development according to the tasks and objectives that have been set for us. This includes breaking down the objectives of the site for the individual departments and pursuing them, drawing up the budget, investment and capacity planning as well as reporting to the management on a monthly basis.

I am in charge of ensuring that our production system is expanded and optimized regarding the ongoing improvement process, quality, which means safe products and processes, and "synchronized logistics". I also have to make sure that our two sites in Korneuburg (Austria) and Marica (Bulgaria), near Radinovo, develop at the same pace. They are strongly linked to each other: While Austria is the location for development, sales, service, project management and prototype construction, series production takes place in Bulgaria. Moreover, I have to ensure that the workflows and processes in Korneuburg and Marica are the same and that communication between these sites works exceptionally well.

Why did you choose to work for Liebherr?

After working for a listed company for many years, I am pleased to have a job with a family-run business such as Liebherr. The decision-makers in the company and, above all, the proprietors themselves think long-term and are not just interested in making short-term gains. As a globally active, heavily diversified company, Liebherr offers its employees both career opportunities at the international level and the chance to gain experience in various areas.

What motivates you most?

My biggest motivation is being involved in the development of the Marica site. In the years before I joined Liebherr, I gained a lot of knowledge and experience in setting up and developing organizations, which I can put to good use here. Being able to bringing forward and implementing ideas and working on the optimization of the site in order to safeguard it in the long term, spurs me on tremendously. Due to my responsibilities, I spend three weeks a month in Bulgaria. This is only possible if you are able to identify with your task and enjoy your work.

3 Questions for Thomas Poiger

Team Leader for Training and Service Documentation,
Liebherr-Transportation Systems GmbH & Co KG

What are you responsible for?

As an “old hand” I have several roles: My primary focus in the area of customer service is conceptualizing internal and external training programs for servicing air conditioning systems as well as coordinating and running training courses at our customers’ sites around the world. My other focus is the modularization and development of service documentation based on the experiences that I have collected during training courses, trial disassembly of equipment and my own activities in development. Also, I support our quality management team as an internal auditor in making internal processes leaner and more efficient.

What, in your opinion, is especially important in your job?

The very positive feedback from our customers and training participants shows that personal commitment and the appreciation of different cultural etiquette and habits of the customers pays off. Many customers register with us for additional training, which I am personally very pleased about. I also try to support young colleagues from the technical areas by sharing with them the experience I have acquired over 24 years at Liebherr and by passing on my knowledge. I believe that a combination of experience from long-serving staff and new ideas from young colleagues is what moves Liebherr forwards.

You have been in the company for almost 25 years. Why did you decide to start at Liebherr and what has made you stay ever since?

Working on technical solutions is what I enjoy, and here, I have been able to extend my interest in climatization technology. The second reason was and is the career opportunities within the company. My career path at Liebherr has taken me from the mechanical development of modular air conditioning systems for rail cars to the position of project leader in this area and that of head engineer for various projects in the area of customer service. There I built up the areas of training and documentation. The third reason is the challenges that come with every new project. My motto is: "There is no such thing as can't". There is a solution for every problem. Fourthly, it is the colleagues at Liebherr. We get on really well and also do a lot together socially because, after all, challenges can only be mastered as a team.

3 Questions for Filip Kitanoski

Product Manager, Liebherr-Transportation Systems GmbH & Co KG

What are your responsibilities?

I am working on virtual product development concepts with a focus on numerical simulation within the advanced R&D department. I mainly research and develop new technologies, methods and numerical tools concerning virtual prototypes with the aim of optimizing energy flows and analyzing their dependencies. Also, I am responsible for defining and managing virtual product development tools that support engineering processes and our major products. So, in this field, research and product development are rather closely linked than separate realms.

What is most challenging in your job?

The biggest challenge is to establish communication between teams of different departments in different organizations and scientific entities that are, in some cases, thousands of kilometers apart from each other. This also includes creating a common understanding of the problem that needs to be solved.

Last year, I was encouraged to work on a business model for a new product. Being responsible for the strategic product definition and for addressing the specific needs of the customer and market, I really enjoy this position. It was exactly the job I had envisioned, a job combining strong engineering and management skills.

Why did you choose to work for Liebherr?

As my father worked in the construction business, I have known the brand “Liebherr” since my childhood. Liebherr has always been associated with quality, product safety, professionalism, innovation and customer loyalty, which is in line with my own values. Working with experts from different backgrounds who share the same vision makes tackling the challenges of the highly demanding rail industry easier.

Thanks to the Liebherr Group’s decentralized and lean management structure, every employee can make a difference in some way and use their competences and talents for something that is important to them, to the company and to society. As a global enterprise operating in many industries and markets, Liebherr offers me and my colleagues a variety of opportunities to continuously broaden knowledge and skills, and to achieve our career goals.

3 Questions for Roland Friedrich

Regional Sales Manager, Liebherr-Transportation Systems Mannheim GmbH

What are your tasks and responsibilities?

Being in charge of sales in Germany, the Benelux countries and Denmark, I am responsible for the needs of more than 120 regular customers in these markets. My team from Mannheim coordinates the measures necessary for this and implements them. Not only do I manage our service activities with the operators and manufacturers of rail vehicles in the respective market, but I am also responsible for the sale of new units and systems.

I am particularly proud of the successful sales of innovative solutions such as cooling systems for high performance batteries and electro-hydraulic actuators.

Why did you choose Liebherr as your employer?

Liebherr offers me the opportunity to be entrepreneurial, a leader and creative in a small but efficient organization – for the benefit of our customers. In the rail industry, which is dominated by large companies, Liebherr-Transportation Systems stands expressly for the sustainable spirit of a middle-sized company, dynamic innovation culture and sophisticated products.

Moreover, when I got in touch with Liebherr for the very first time, I immediately realized that this company understands its customers and their needs and really committed to the rail market.

What is the biggest challenge for you in your job?

For me, the most important challenge is the long-term success of our site: In my position, I also represent the new alignment of Mannheim site. In the last two years, we have changed from being an organization with development and project management into a sales and service company. This means that we now have to meet the high expectations of our customers in a smaller but stronger organization.

Aside from repair, maintenance or spare parts supply, we therefore also rely increasingly on the reduction of life cycle costs in the area of service. For example, we have developed solutions that allow us to reduce the annual energy consumption of air conditioning systems by up to 15 %.

Liebherr-Aerospace

Subjected to Stringent Tests: The Systems for the Bombardier CSeries Aircraft Family

For Bombardier's CSeries* family of aircraft, the first completely redesigned single-aisle aircraft family, Liebherr-Aerospace supplies two highly complex systems: the air management system and the landing gear system. Due to the aircraft's innovative configuration, developing and testing these systems was particularly challenging. Both systems underwent rigorous trials at Liebherr-Aerospace's test centers and also at Bombardier. The goal was to ensure the functionality of the systems and thus the safety of the passengers on the ground and in the air.

The Landing Gear System

For the CSeries aircraft family, Liebherr-Aerospace developed a state-of-art landing gear system. The system includes nose and main landing gears, hydraulic actuation components for extending and retracting the landing gears and steering the nose landing gear, a computer and related cockpit controls. Testing, qualifying and certifying such a highly complex system – thus ensuring that it operates flawlessly on board the aircraft – is a joint effort that demands a lot of hard work, technical expertise and cooperation between the supplier and the aircraft manufacturer.

Testing the landing gear started in an early development phase of the system. First, engineers carried out trials on prototype landing gear components in order to validate their design concepts and to develop standard components. After these components had been manufactured and tested, technicians and engineers integrated them into subsystems and systems. The latter, in turn, underwent various structural, performance, endurance and environmental trials at Liebherr-Aerospace's test and qualification center in Lindenberg (Germany).

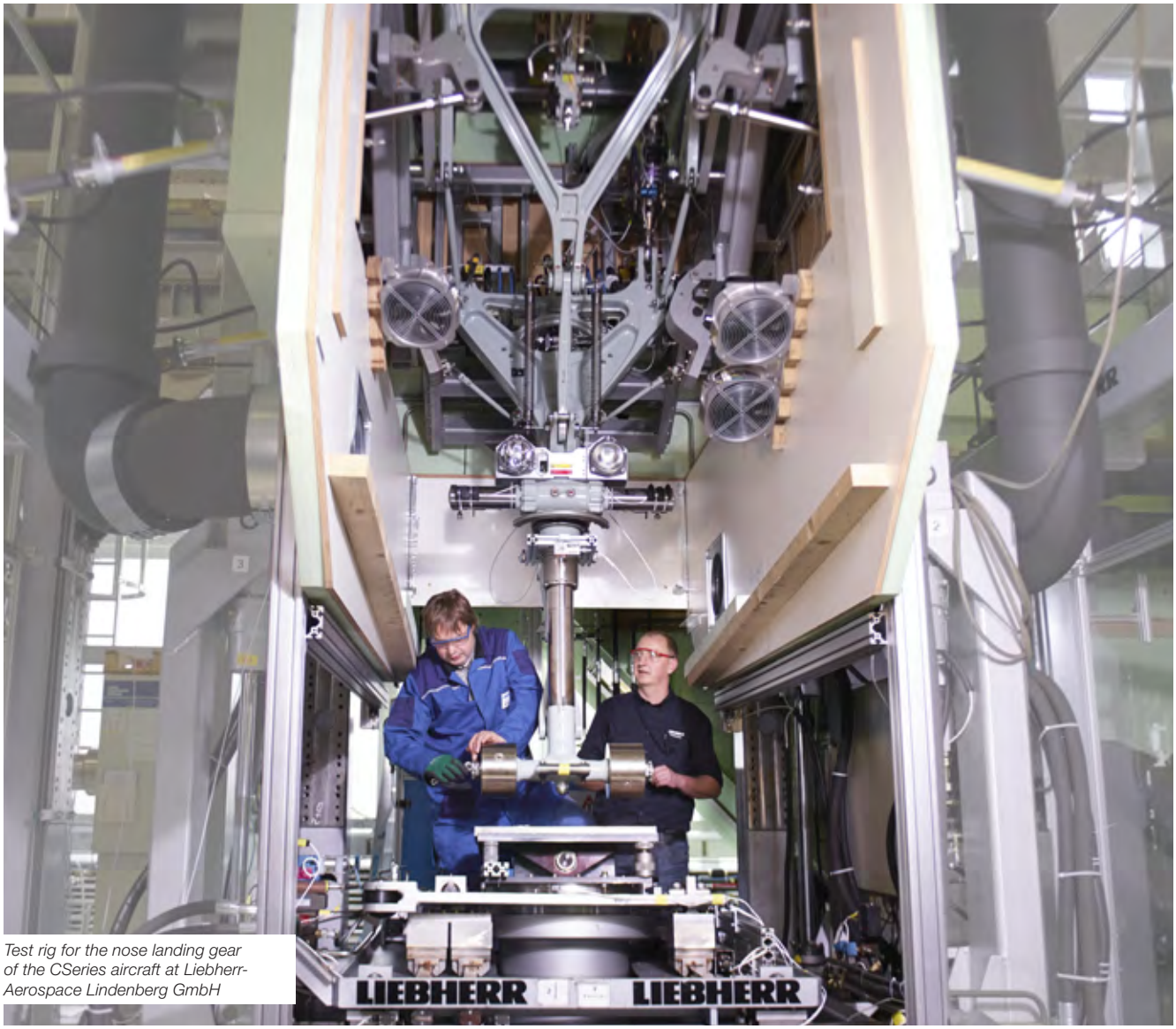
Functionality meticulously tested

In a nutshell – what exactly did the company's specialists examine in all these tests? Structural tests, for instance, were conducted to verify if the legs of the landing gear were robust enough to support the enormous loads that act on them when the aircraft touches down. In order

to carry out performance trials, technicians installed the landing gear system in a huge test rig that simulated the CSeries aircraft. This way they checked if the gear could be extended and retracted quickly enough – that is within the specified time. In endurance tests, the extension and retraction process was repeated several thousand times to verify that the mechanisms would function throughout the entire life of the aircraft. Would the landing gear system operate without any problems if the aircraft was hit by hail, or if it was exposed to sand and dust, or extreme temperatures ranging from a scorching +70 °C to a freezing -55 °C that caused icing? All these conditions were simulated in environmental tests to ensure that the landing gear system would operate in any such scenario.

Taxiing, taking off and landing safely

In parallel to the trials at the Lindenberg test center – months before the first flight of the CSeries aircraft – several engineers, technicians and mechanics joined Bombardier's engineering and test teams in Montreal and Mirabel (Canada), where the aircraft manufacturer's headquarters and final assembly line are located. They supported Bombardier's specialists in integrating the landing gear system into CSeries flight test aircraft as well as in testing these aircraft on ground and airborne. In low and high speed taxiing trials, for example, they checked if the nose landing gear could be steered smoothly and precisely, and if the wheels shimmied. During the first flight and the following flight test campaign, tests were conducted to verify that the extension and retraction mechanisms would work



Test rig for the nose landing gear of the CSeries aircraft at Liebherr-Aerospace Lindenberg GmbH

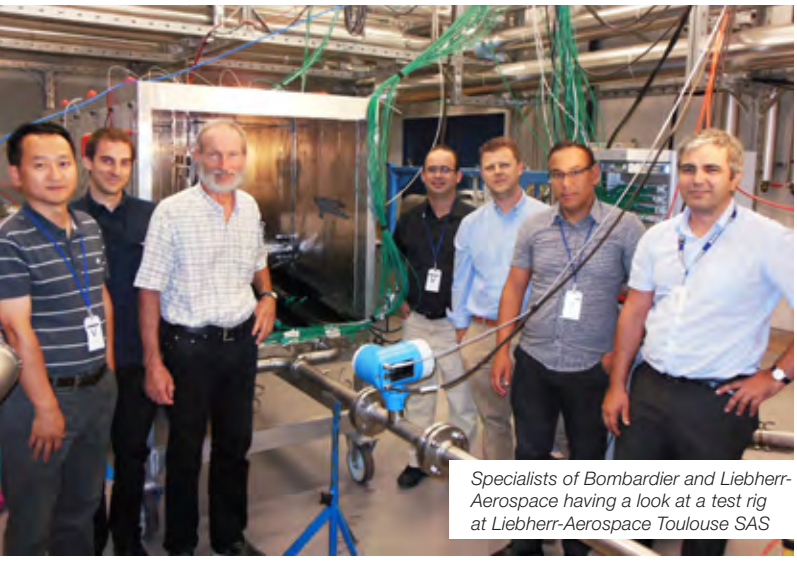
in the extreme case of hydraulics failure. All these tests served one purpose – to make sure that future passengers of the CSeries aircraft would take off and land safely.

Finally, the joint effort in the final assembly and test phases of the aircraft has proven beneficial to both companies. Bombardier has gained from Liebherr's experience and competence. And vice versa, by working face-to-face with Bombardier's technicians and getting immediate feedback, Liebherr's specialists have been able to remain up-to-speed with aircraft development and to make enhancements to the CSeries aircraft's landing gear system.

The Air Management System

The bleed air and environmental control systems, the cabin pressure control system, the air distribution, the avionics cooling and extraction systems, the wing ice protection system and the overheat detection system – all these systems are part of the integrated air management system that Liebherr-Aerospace designed for the CSeries family of aircraft.

In order to obtain the certification for this high-tech system, engineers and technicians performed integration testing at the company's test center in Toulouse (France). There, development, qualification and maturity tests for all types of air management systems and key system components such as air cycle machines, valves, air conditioning packs, heat exchangers, motors and power electronics can be carried out on a 7,000 m² test area. The center is equipped with state-of-the art test benches and chambers in which environmental conditions relating to pressure, temperature, air flow rate and humidity are simulated.



Specialists of Bombardier and Liebherr-Aerospace having a look at a test rig at Liebherr-Aerospace Toulouse SAS

Extreme temperatures and pressures

Single parts, subsystems or complete systems can be tested in two high-altitude chambers, with a volume of 70 m³ and 120 m³ respectively. Connected to a high-output compressed air and vacuum circuit, these chambers enable the simulation of all environmental conditions that may be encountered in flight, with temperatures from -60 °C up to +600 °C and pressures from a few mbar to 40 bar. Testing specialists validated the CSeries aircraft's air management system architecture in real aircraft configuration with full pressure and temperature operation conditions. This was particularly important, as the CSeries aircraft is equipped with new Pratt & Whitney engines (PW1000G), which differ from previous engines in terms of bleed pressure, bleed temperature and fan pressure.

Moreover, the CSeries aircraft's leak detection system was successfully tested at the Toulouse facilities. As the aircraft's wings are made of innovative composites, it was crucial to ensure that the composite surfaces would never be exposed to bleed air that reaches a temperature of 600 °C. Liebherr-Aerospace has therefore developed a new, optimized leak detection system that traces leaks in the bleed air system and monitors the temperature in the zones made of composites.

© Bombardier

A low acoustic level

In order to ensure that the acoustic level inside the aircraft's cabin would be low, specialists tested Liebherr-Aerospace's latest-generation outflow valves in an ultra-modern anechoic chamber. With its cut-off frequency of 90 Hertz, its low residual noise level of 20 dBA and, in particular, with its capacity to test air systems in real environmental conditions, this chamber is unique in Europe. The air intake temperature can range from -40 °C up to +160 °C and the ambient temperature from -40 °C up to 85 °C. Specially designed for the CSeries aircraft, the outflow valves with smart actuators are installed at the main entrance of the jetliner's fuselage fairing. This resulted in a totally new configuration for the CSeries aircraft, which was reproduced for the tests in the anechoic chamber.

Furthermore, due to the complexity of the systems and the tight program schedule, Liebherr-Aerospace set up a so-called "Hardware-In-the-Loop" (HIL) test bench. It is used to test real hardware system controllers with all relevant electric components and actuators, and it simulates all system control logics. The HIL is a major improvement that permits software innovations to be validated in an early development phase.

Air conditioning pack on its test bench

In September 2013, Bombardier reached a significant milestone in the development of its new jetliner: The CSeries aircraft safely completed its first flight.

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Construction Progress at the Lindenberg Site on Schedule

The Lindenberg site is growing. In order to boost production capacity for the long term and thus meet the increasing demand, Liebherr-Aerospace Lindenberg GmbH, Lindenberg (Germany), began a large-scale expansion in the summer of 2012. At the end of 2013, the first buildings were completed to schedule. On a ground area of some 15,700 m², a hall was built for the logistics department and flight control systems assembly. Sales and customer services will also move into new offices in this building. In addition, a building with a ground area of 2,900 m² was constructed to accommodate – amongst other things – landing gear assembly and the fire-fighting service.

Logistics, which includes the incoming goods section, the warehouse, the shipping section and customs section, moved into the new hall at the beginning of 2014. Due to the growing order volume and increasing customer requirements regarding lead times, it was not only necessary to increase the capacity of the warehouse, but also to adjust the processes employed. In the small parts store, which now has space for 45,000 containers, up to 1,232 containers per hour will be processed in the future by the four storage and retrieval systems. The new large parts store has capacity for 7,000 euro-pallets. There, up to 234 pallets an hour can be moved by three storage and retrieval systems. The containers and euro-pallets are conveyed fully automatically from the fourth basement level of the warehouse, which is 20 m underground, to the ground floor for order picking.

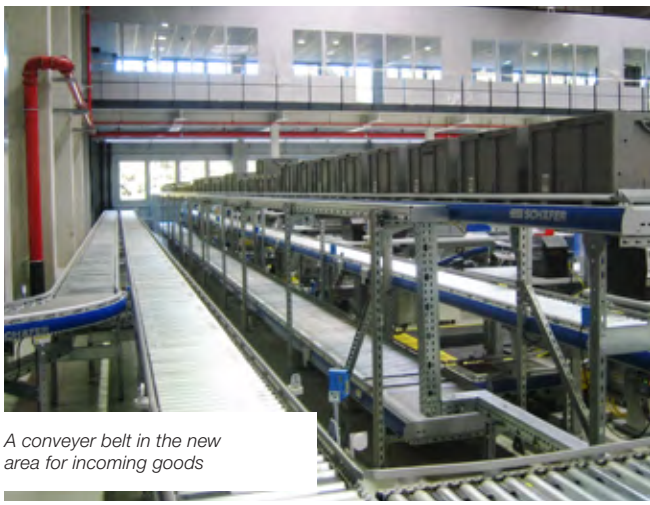
In the background: the two new buildings of Liebherr-Aerospace Lindenberg GmbH

The relocation of the assembly section is well underway. Dismantling and reassembling more than 130 test benches and taking them into operation again are the greatest challenges there. At the start of the year, the first work stations for the assembly of flight control components were set up in the hall. Using the "cardboard engineering" method, employees designed their work stations themselves. They developed new assembly lines, which were set up as cardboard models, true to scale with fine detail. Simulating the work processes and documenting the requirements to the supporting sections such as methods services, design of manufacturing equipment, logistics, IT, procurement and scheduling enabled an optimal logistical process to be developed.

In the planning of the hall, importance was attached to sustainability. The entire building has a green roof, which allows rain water to be collected and fed into a newly built reservoir. Moreover, a heat pump is used to generate energy for heating from process heat.

The previous assembly halls are being renovated and converted, and will be used for production in the future. Once construction work is completed in 2018, the plant of Liebherr-Aerospace Lindenberg GmbH will have grown from its original size of 127,000 m² to more than 160,000 m². The production area, currently 65,000 m², will then cover 75,000 m².

Test benches for flight control components in the new assembly hall



A conveyer belt in the new area for incoming goods

The Liebherr Group

Maritime Cranes

New Fixed Cargo Crane Lifts Passenger Tour Boats at Niagara Falls

The new Fixed Cargo Crane (FCC) from Liebherr completed its first job at a famous location. On 31st October 2013, the crane lifted passenger tour boats of the local company Maid of the Mist out of the water for winter storage at the foot of the Niagara Falls.

With a lifting capacity of 441,000 lb (200 tonnes) at a radius of 49 ft (15 m) this FCC is the first of its kind for the heavy lift crane segment.

A short time before the crane was installed on the new drydock facility on the US side of the river. Since this facility is located in a gorge below the waterfalls, the FCC is the perfect crane for this site. It is fitted on a fixed pedestal and provides a space-saving solution for installation on narrow docks thanks to its slim design.

In the run-up to this lift especially the last part of the transportation proved to be challenging. Due to the gorge's limited road access the single parts of the FCC had to be lowered to the crane's final position with the help of a ring crane. The new heavy lift crane is part of a 32-million-dollar project for the construction of the new dockside. The facility is planned to be completed in summer 2014.

Mining

The Transport of a Liebherr R 996 B Sets Records

The transport of a fully-assembled Liebherr R 996 B hydraulic mining excavator between two mine sites proved to be the largest complete excavator moved in Australian history. Six Prime mover trucks were required to tow and push this 675-tonne (744-short ton) machine from the Fortescue Metals Group (FMG)-owned Christmas Creek mine site to its Solomon mine site. Fortescue contracted Mammoet Australia for this undertaking, and 20 Mammoet employees were required to load the machine onto 24 twin-axle (384 wheels) Goldholfer platforms and move it to its new work site. Traveling up to 12 hours per day at 4 km/h (2.5 mph), it took a total of six days to move the R 996 B the 230 km (142 miles) to the Solomon mine. This newly-commissioned excavator will join thirteen other Liebherr mining machines at work at the Solomon mine site.

The completed R 996 B hydraulic mining excavator prepared for transport

Domestic Appliances

HCB 2060 Refrigerator with GlassLine Shelving

Show off the materials and design of your custom kitchen to the fullest with the stylish fully integrated HCB 2060.

The new 36” (91-cm) single door model features strong hinges for a convenient closing of doors as well as LED lighting and elegant GlassLine shelving including door storage of gallon containers. The two BioFresh drawers are individually usable as HydroSafes with high humidity or as DrySafes with low humidity to enable versatile storage. In this way the ideal climate is provided for all varieties of food.

An automatic IceMaker featuring the most technically advanced water filter provides an ample supply of perfect ice cubes.

The HCB 2060 features two BioFresh drawers individually usable as HydroSafes or DrySafes.

Tower Cranes

Derrick 200 DR 5/10 Litronic Dismantling Crane Removes Luffing Jib Crane From Hotel Roof

The Liebherr Derrick 200 DR 5/10 Litronic carried out a job at an extreme altitude on the roof of the newly built Courtyard Marriot Hotel in Montreal (Canada). The crane operated in a very constricted space to remove the Liebherr 355 HC-L 12/24 Litronic luffing jib crane safely and reliably.

The 355 HC-L climbed with the IC tower system in the building to a final hook height of over 427 ft (130 m). After completing the hoisting work, the rigging team dismantled the 355 HC-L within four days from the hotel roof using the derrick crane. In contrast to conducting dismantling work from the ground, this job did not require any major roadblocks which would have adversely affected the other construction work.

The heavy components of the luffing jib crane were lowered safely and at an adequate distance from the building since the 200 DR has a variable radius of up to 82 ft (25 m).

Subsequently, the derrick crane was used for a further two months on the hotel roof to help with the roofing work. Afterwards the Derrick 200 DR 5/10 Litronic was also dismantled. Its low package weights and compact dimensions meant that the crane components could be lowered to the ground using a load elevator.

The derrick crane can be used to dismantle tower cranes in 100 mt, 200 mt or 300 mt and more load capacity. The supports on the crane can be swiveled and adjusted to the static situation of the sub-structure on the surface to ensure excellent distribution of the support forces. Depending on the requirement, this special crane can be used with or without supports, its so-called stiff legs.

The safety PLC controller of the Derrick 200 DR 5/10 monitors all the movements with the time-tested functions of Liebherr luffing jib cranes. Sensors monitor the hoist height, load moment, jib angle and slewing gear and keep them to safe levels. The remote control enables the crane driver to operate the machine from the best possible location. So safety is guaranteed, even in heights of several hundred meters.

Machine Tools and Automation Systems

Palletizer Cell Allows Modern Production Concepts

How can we optimize logistics for raw parts and finished parts? Standardized transport containers with basket technology harmonize the logistics and allow a flexible production sequence. Throughout the entire material flow, the work pieces remain in a wire basket or work piece carrier, allowing the interface between the machine and the automation device to be harmonized with substantial cost reduction potential. The Liebherr palletizer cell enables machine capacities to be greatly increased compared to less flexible production systems. Stacks of finished parts are formed and transported to the next processing point or to a station for automatic onward transport with materials handling equipment. The logistics concept allows the following operation to be individually defined, depending on the processing task and work piece concerned. Thanks to a modular building block concept, the palletizer cells are particularly flexible. Depending on the production process concerned, Liebherr offers versions with two, three or four cells with additional functions. Particular attention was paid to the graphic visualization of the palletizer cell. The intelligent control supports the user in exchanging a work piece and makes it easier to monitor the overall process. The result: Short exchange times, fast production start-up and high levels of acceptance.

Earthmoving

New Logistics Center

In July 2013, the Liebherr Group began construction of a new logistics center near Kirchdorf an der Iller (Germany). In future, this will be the point from which spare parts for Liebherr earthmoving machinery will be supplied around the world. In the long term, spare parts logistics for other construction machinery divisions will also find its home there.

It is currently anticipated that the first building extension phase will be completed in the third quarter of 2014. This phase covers, for example, site development, erection of a logistics warehouse over an area of approx. 505,903 ft² (47,000 m²) as well as the construction of a separate administrative building. The site should be operational within the first quarter of 2015.

In the final extension phase, Liebherr will have a warehouse area of about 1,829,864 ft² (170,000 m²) as well as an administrative building covering an area of 48,437 ft² (4,500 m²) on the 3,875,007 ft² (360,000 m²) site.

Several factors were decisive in selecting this location. Among these, for example, were the proximity of the A7 autobahn as well as the available area for further expansion. Another important factor was also the large number of Liebherr construction machinery plants in Southern Germany, Austria and France.

For efficient storage of the spare parts, a high-bay store with 60,000 spaces for pallets and a height of approx. 125' (38 m) will be built. In total, this warehouse will offer an area of 505,903 ft² (47,000 m²) to store spare parts. For logistics on the premises, there will also be an innovative 95'-high (29-m-high) container warehouse for 122,000 containers and a potential goods handling output of 3,500 containers per hour.

In the remaining 65'-high (20-m-high) part of the building, provision is to be made for manual storage areas with 25,000 pallet spaces and a storage zone as well as workspaces for customer-specific consignment, packaging and dispatch. Using 22 transport loading bridges, the spare parts are then loaded onto HGVs and vans and sent to customers and dealers via the quickest route possible.

Vladimir Chagin, team leader and coach of Kamaz Master, and Eduard Nikolaev, Kamaz Master driver, in front of the racing truck no. 500 at Liebherr Machines Bulle SA. The truck with the Liebherr V8 engine won the third place in the Rallye Dakar 2014.

Components

Successful Rallye Dakar Racing Team Visits Liebherr Machines Bulle SA

Among the 71 trucks that started in the Rallye Dakar in January 2014 were five trucks from Kamaz Master, the racing team of the Russian company Kamaz OJSC. Three of the trucks were equipped with 8-cylinder Liebherr diesel engines. Two of the trucks came in third and fifth in the overall ranking. The third truck had to drop out in the second stage due to an accident on extremely difficult terrain. On March 12th, one of the trucks that participated in the rallye and its driver Eduard Nikolaev visited Liebherr Machines Bulle SA, where the engines had been developed and built.

The Rallye Dakar is one of the toughest challenges for drivers, vehicles and their components and has taken place in Latin America since 2009. The Kamaz Master team has been dominating the race in the truck competition for years and has won the race twelve times in total – in 2013 with the team built around driver Nikolaev and in 2014 with team Karginov.

For the Rallye Dakar 2014, three out of five trucks of the racing team Kamaz Master were equipped with Liebherr V8 engines model D9508 A7 with 16.2 liters displacement. Both companies jointly developed a racing configuration with a special turbocharger. In this configuration, a nominal power of 720 kW (965 hp) and a maximum torque of 4,000 Nm could be achieved. The engine accelerates from 0 to 100 km/h in 10 seconds. The average speed during the race varied between 20 and 140 km/h.

During their visit, the Kamaz Master representatives stressed their enthusiasm for the straightforward, cooperative partnership with Liebherr. They also praised the outstanding performance and superb reliability of the engine during the rallye.

For the Rallye Dakar 2015 Kamaz Master plans to use Liebherr engines in all of its racing trucks. The preparations have already started.

Deep Foundation Machines

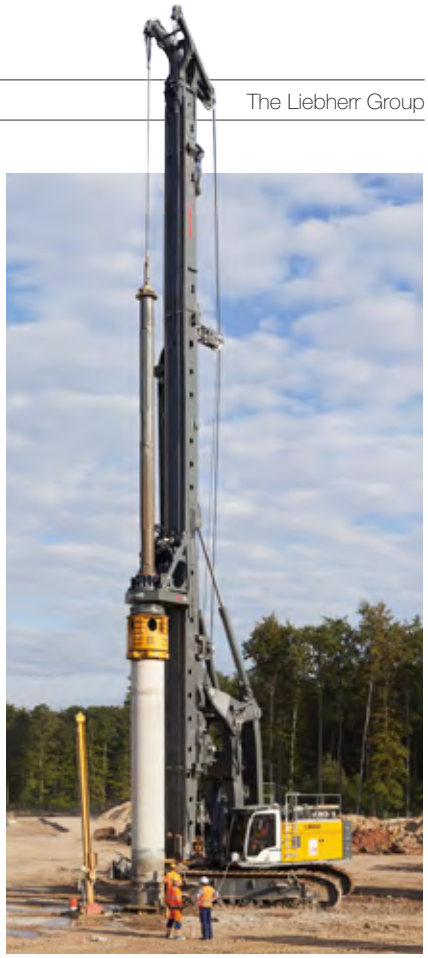
New Rotary Drilling Rig LB 44

The 381,000-lb (173-tonne) heavy LB 44 expands Liebherr's series of rotary drilling rigs at the upper end of the scale. It is driven by a V8 diesel engine offering 677 hp (505 kW); this engine complies with the exhaust certification Tier 4i/IIIB. Possible applications are Kelly drilling, drilling with double rotary head, continuous flight auger and full displacement tool. The innovative rotary drive offers a torque of 376,000 lbf-ft (510 kNm) and is thus one of the most powerful drilling rigs currently available. The main advantages of the hydraulic drive manufactured by Liebherr are automated torque adjustment, continuous speed optimization and four electronically adjustable speed ranges.

The high-performance rope crowd system with its pull force of 123,000 lb (56 tonnes) allows utilization of the entire length of the leader, and therefore ensures maximum performance and reliability even in the most difficult soil conditions and operating circumstances.

Despite its size, the LB 44 can easily be moved from place to place and, if necessary, dismantled so that the weight of the heaviest element does not exceed 90,000 lb (41 tonnes).

The first two LB 44 are currently employed in the construction of a particle accelerator in Darmstadt (Germany) to stabilize the subsurface with cast-in-place drilled piles. These operations form the basis for the construction of the international particle accelerator FAIR. In total, some 1,400 foundation piles with a length between 131 and 203 ft (40 and 62 m) are being set in the ground since March 2013. All drilled piles are installed down to the final depth completely cased. That means that during the drilling process, the excavated material is removed under the protection of an advancing casing. The efficiency of the rotary drilling rigs working in the rotary drilling method means that the boreholes can be excavated down to the final depth completely cased, without the need for a casing oscillator.



After its planned completion in 2018, the FAIR particle accelerator will be one of the largest research facilities in the world.

Hotels

„Löwen Hotel Montafon“ Re-opened

November 2013 saw the re-opening ceremony of the "Löwen Hotel Montafon" in the Austrian region of Montafon. With its new façade, the fully renovated building has changed even at a first glance. On the ground floor, the new bar forms the central point of attraction. The new layout features a new restaurant, a cigar room and a fireplace room. The bedrooms have also been completely refurbished.

Since 2012, the "Interalpen-Hotel Tyrol" has been listed among the "Leading Hotels of the World" and the "Leading Spas" – an umbrella organization of the most exclusive hotels and spas worldwide. The 5-star Superior Hotel on the Seefeld plateau in Tyrol, Austria, has recently had three new rooms added: the Salon Bellevue, the Café Wien and the Smokers' Lounge.

Three more Liebherr hotels are located in and around the town of Killarney (Ireland). The 5-star "The Europe Hotel & Resort" was named "Best Resort Hotel 2013" and "Best Overall Hotel Winner 2013" in the National Hospitality Awards. The restaurant has won numerous awards as well. Killarney is also the home of "The Dunloe", which has fantastic views over the Gap of Dunloe, and the "Ard na Sidhe Country House" on the shores of Caragh Lake. The "Hotel Falken" in Memmingen (Germany) is the sixth hotel owned and operated by the Liebherr Group.

LIEBHERR

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