2017 / 2018 **EN** I DE

LIEBHERR MAGAZINE

Gear Technology and Automation Systems

Gear Technology:
New design – proven quality // **p. 4**

Automation Systems:
Flexibility redefined // **p. 22**

In Practice:
XXL Pallet handling system // **p. 30**





The Executive Directors of Liebherr-Verzahntechnik GmbH (from left to right): Michael Schuster, Dr. Christian Lang, Dr. Hans Gronbach and Dr. Klaus Finkenwirth

Dear readers,

This issue speaks for itself. Never before have we been able to present our customers and partners such a great number of innovations. We start with this right on the title page: Our new machine design combines functionality and aesthetics. On the following pages, you will learn why this is also conceptually introducing a new era.

We are able to present new machines and new solutions in all technologies of gear manufacturing. Our innovative Skiving³ solution offers the customer everything from a single source: machine, tool and process. With the LC 280 α, a new gear hobbing machine for flexible suppliers and contract manufacturers, we offer maximum flexibility with the familiar Liebherr quality, coupled with fast delivery times. Further innovations: Chamfering with ChamferCut, now also for smaller gears in a stand-alone machine. Shaping with an electronical shaping head, grinding of internal gears and the LH Geartec software top off the package of our novelties in gear technology.

The automation division is expanding its product range with increased use of robot applications with machine tools and in the automotive sector. In addition, the sector of pallet handling systems is consistently expanding. With the PHS Allround we developed a compact class with flexibility and optimal space usage. Furthermore, we introduce you to the new software solution “Liebherr Manufacturing System 4.0”. By the way, our bin picking solution, which we presented to you in the previous issue, has recently been distinguished with the „Best of Industry“ award.

The economic surroundings are exciting, predictions grow more and more short-termed. Flexibility through technological innovation is the answer. We are convinced that you will find many impulses in our magazine. Explore this magazine and our new developments and start a dialog with us. We look forward to your feedback!



Michael Schuster, Dr. Christian Lang, Dr. Hans Gronbach and Dr. Klaus Finkenwirth
The Executive Directors of Liebherr-Verzahntechnik GmbH

Gear Technology

New design – proven quality
Aesthetic and functional: Liebherr's new look 4

Skiving³: Machine – Tool – Process
Everything from a single source 7

New generation of gear hobbing machines
Liebherr quality with maximum flexibility 10

Maximum flexibility for small workpieces
LS 180 E: Internal, external, spur and helical 12

ChamferCut solutions from Liebherr
LD 180 C: Stand-alone solution for existing productions 14

The paperless way to increase safety
Digital data import with LH Geartec 16

CBN ranks high for internal gears
High process stability, high rate of metal removal 17

Reman: As good as new
The second life cycle 18

Liebherr counts on standard interfaces
Different data profiles are available 19

Safe and convenient set-up of processes with LH Geartec
New visualization supports the operator 21

Automation Systems

Flexibility redefined
The new pallet handling system PHS Allround 22

Robots: Practical assistants increase possibilities
Multiple more functions through robots and rail systems 26

The safe way into automation
New certification concept for employees and all other installers 29

In Practice

XXL pallet handling system
Liebherr Machines Bulle fully automates machining of heavy workpieces 30

Passion for pumps
Rosenbauer constructs fire trucks with the RLS 800 34

Pioneers of skiving³ technology
The first LK 500 is in use at SIAP 37

Liebherr World

"Liebherr is part of me."
Arici Gürhan has been working almost everywhere for Liebherr since 1973 42

Liebherr trainees benefit from Erasmus+
International educational exchange 44

Guest in Trondheim
Erasmus+ exchange program with Norway 45

A powerful partner in China: STON
Mutually beneficial cooperation with STON 46

New sales representatives for automation systems
Increased local support for customers 47

Prestigious award for Liebherr "Bin Picking solution"-Application
„Best of Industry" thanks to new vision system 48

Liebherr receives John Deere's Achieving Excellence Award for the second time
Quality awareness pays off 48

Beautiful new automation world
The interactive application receives an award 49

The intelligent refrigerator of tomorrow
The Internet of Things has now also arrived in the modern kitchen 50

Imprint

Publisher / Responsible for content:
Liebherr-Verzahntechnik GmbH
Kaufbeurer Strasse 141
87437 Kempten / Allgäu, Germany

Editorial staff:
Stefan Bischof, Marie-Therese Engstler, Walter Ferstl, Dr. Hansjörg Geiser, Ralf Glatzeder, Dr. Hans Gronbach, Jürgen Groß, Stefan Jehle, Knut Jendrok, Manfred Kaut, Ottmar Kern, Lena Leidl, Thomas Mattern, Dr. Andreas Mehr, Dr. Peter Pruschek, Karl Sauterleute, Lukas Schult, Florian Schuon, Thomas Weber, Ronja Wildberger, Dr. Oliver Winkel, Martin Winterstein

Issue:
2017 / 2018

Layout / Design:
C&G: Strategische Kommunikation GmbH, Overath, Germany
www.wir-verstehen-technik.de

Photo credits:
Liebherr-Verzahntechnik GmbH,
Alexandra Loock: Page 2, 11, 17, 40 to 41,
Sebastian Grenzing: Page 34 to 36

© Liebherr-Verzahntechnik GmbH
No part of the contents of this magazine may be reproduced or published in any form or by any means without the consent of the publisher.





New machine design

New design – proven quality

The machine tools from Liebherr-Verzahntechnik GmbH are currently going through a visual redesign process. Clear and contemporary shapes combined with an uniform and easy-to-understand arrangement of the functional elements showcase tried-and-tested Liebherr quality and make the machines easier to operate.

A modern, clearly laid out design will help the operator to use the machines intuitively. Liebherr-Verzahntechnik GmbH is focusing on this approach to update the design of its machine tools. This involves scrutinizing fundamental aspects of dealing with products to find potential for improvement and to standardize the design. “We understand the redesign not just as a cosmetic reworking, but rather as a measure to better visually and functionally bring Liebherr’s reliable expertise to future design,” explains Dr. Hans Gronbach, Managing Director of Development and Design at Liebherr-Verzahntechnik GmbH.

The cross-departmental project team approached experienced offices for industrial design with this engineering task before deciding to collaborate with an agency. The goal of development was a distinct, recognizable design with a clear, quality design line. Dr. Gronbach summarizes, “Added value for the customer was our constant focus during the finding process.”

Clear, tidy layout

The source of inspiration during the development phase came from more than just state-of-the-art models from the industry, because Liebherr also kept an eye on the machine’s operator. “For example, if you think about the modern kitchen design, there you find clear geometrical elements, such as cuboids and straight lines. That demonstrates a look of orderliness and improves orientation,” Dr. Gronbach explains. The result is a reserved but quality design, which expresses the technical competence and customer orientation of the company group in a way that is fully in line with the basic values of Liebherr. The deliberate reduction to clear lines, modest surfaces and neat control panels and interior makes it easy to work with the machine. After all, the increase in efficiency and speed, with which customers can operate the machines, was a main argument for Liebherr to take this step.

The new body features large, light-gray surfaces. The usage of Liebherr yellow paint, which is new and reduced for Liebherr machine tools, is known from the Liebherr construction machinery divisions and sets a clear example for uniformity within the company group, and with its high recognition value it distinctly sets these machines apart from the competition. Furthermore, the redesign has been thought through rigorously at all machine levels. A lot of development work has gone into standardizing the body, labeling, signal lamps, hinges and handles. The peripherals were also taken into consideration. Ergonomically optimized access points and improved layout will make it easier to operate the machines from now on.

But operators must be able to get their bearings quickly and conclusively – not just for operating the machines, but also for performing maintenance and repair work. This is the only way that communication with Liebherr Service for fast, straight forward assistance can run as precise as possible. Training new colleagues is just as easy: “With Liebherr now having a consistent style, every employee is able to work with the machine quite intuitively in almost no time. This slims down processes and increases cost-efficiency for our customers,” states Dr. Gronbach.

“Added value for the customer was our constant focus during the finding process.“

Dr. Hans Gronbach, Managing Director of Development and Design



Uniform and effective

When structure and core elements were being developed, the flexibility for optional equipment features was always kept track of, despite the goal of standardization, so as not to stand in the way of further technological development and individual customer requests. This is because the design ought to provide support during all life cycle phases of the machines. In addition to the advantages for customers, clear design rules were being used as early as the development stage and in the design process for the Liebherr machine tools. The new guidelines and directives likewise have a positive effect on the efficiency here. The uniformity and standardization of materials, components and attachments are beneficial for purchasing, production, logistics and assembly. Increased precision, faster processes and more time for innovation are the result. That pays off for Liebherr customers, too.

Now that the first machines with the new design have made their premiere at the EMO, the rest of the product portfolio will be converted to the new design. This means that the newly developed design will also be transferred to the products from the area of Liebherr automation systems. A first step in this direction has already been taken with the new workpiece infeed conveyors for the EMO machines. ■



Everything from a single source

Skiving[3]: Machine – Tool – Process

Gear skiving according to the Liebherr concept has proved itself. The specialists from Kempten, Ettlingen, and Collegno offer competence from a single source in a full-service package.

"For successful gear skiving users need more than just a good machine", summarizes Dr.-Ing. Oliver Winkel, Head of Application Technology. "With skiving[3] we do not sell the LK 300 or 500, but a process. The customer presents a gear and we supply a machine, tools, and technology for its production."

The holistic approach from Liebherr has already been tried and tested in practice. For many customers the process of skiving is new, the operators of the machines need comprehensive training and assistance. On top of that, the tool design is a very complex issue. “We have organized our division of labor very well”, reports Oliver Winkel. “In Kempten we calculate the tools, which are then designed and manufactured in Ettlingen or in Collegno in Italy – we have the entire process under control, for both cylindrical and conical tools.”

Skiving machines have to endure a lot

The gear skiving machines LK 300 and 500 are based on the tried-and-tested components of the corresponding large hobbing machines. However, process-related modifications were essential. For instance, the entire machine had to be more rigid and equipped with extremely powerful spindles. A gear skiving machine requires a table with a direct drive owing to the high workpiece speeds required. This drive works with an automatic control, which constantly has the optimal parameters. The clamping fixture which links the workpiece and the machine is extremely complex and is designed by Liebherr.

As skiving is a highly dynamic process, the machine is practically supplied on a “turnkey” basis, with individual clamping fixtures for each workpiece, precise rigidity and contour accuracy. “This overall view is an important part for the success of production”, explains Siegfried Schmidt, Team Leader in Development and Design of Skiving. “A complex process such as skiving has many specific obstacles, which we overcome with very specific mathematical solutions.” The newly developed LH Geartec control system also contains the mathematical formulas for pressure angle corrections. This way quality improvements can be easily achieved via the kinematics of the machine.

Simple integration in production

The optional tool changer which can be used to change between roughing and finishing tools, for example, is new. Liebherr



Internal gearings are quickly and economically machined with Skiving.

LK 300 / 500

- Maximum module: 5
- Maximum gearing diameter: 300 / 500 mm
- Maximum workpiece outside diameter: 500 mm
- Maximum table speed: 3,000 / 1,500 rpm
- Maximum tool diameter: 250 mm
- Maximum tool speed: 2,700 rpm
- Maximum spindle output: 32 kW

offers a ringloader as a standard option for the workpiece changing device; other automation solutions, such as belts and robots, can also be realized upon request.

Skiving³ is popular especially for internal gearing with medium size and quantity, as it is much faster than shaping and more economical than broaching. In situations where gear skiving is not possible or appropriate owing to interfering contours or if quantities are too low, Liebherr still offers technological alternatives with gear shaping and gear hobbing. ■

Skiving³: machine, tool and process from a single source

Machine:
Highly rigid machine and components combined with automation, deburring and tool changer

Tool:
Design, production, reconditioning

Process:
Technology configuration, implementation, optimisation



Skiving³: Liebherr Skiving machines offer machine, tool and process from a single source.

New generation of gear hobbing machines

The LC 280 α provides Liebherr quality with maximum flexibility and short delivery times. In recent years the gear market has been experiencing a trend towards outsourcing. As a result of this shift, many suppliers are receiving orders for the soft machining of gears.

"With the LC 280 α, Liebherr has developed a new generation of gear hobbing machines for such short-term requests", reports Dr.-Ing. Hansjörg Geiser, Manager Development and Design, Gear Cutting Machines. "This gear cutting machine equipped with the well-known Liebherr quality offers maximum flexibility, maximum productivity, and is available to the customer at short notice."

Flexibility thanks to diverse range of workpieces

The criterias for an investment decision regarding a new gear cutting machine are primarily quality, maximum flexibility, and at the same time maximum productivity with low procurement costs. For the user it is vital which orders he can execute and how efficiently he can process these orders. The LC 280 α was developed precisely for these requirements. "It should offer the user the unique opportunity of being able to machine gears and shafts with a workpiece diameter up to 280 millimeters and a shaft length up to 500 millimeters. Most typical machining sizes required for a gear fall within this range", reports Hansjörg Geiser.

Wet and dry machining: New modular concept as successful basis

Some of the tried-and-tested components were adopted in the new development and many were improved. For example, the machine base was designed with a very steep bed which prevents a deposit of chips. In addition, an optional complete stainless steel housing was integrated which reduces the thermal influence of the hot dry chips on the machine bed to a minimum.

Increased performance

The hob head was also redesigned for increased flexibility and productivity. "It is now possible to machine workpieces up to a module of five millimeters", explains Hansjörg Geiser. "The spindle speed was increased by 50 percent to 2250 revolutions per minute compared



Liebherr is opening a new chapter in the evolution of gear hobbing with the LC 280 α.



100 percent Liebherr – Short delivery time

- Machining workpieces with max. 280 millimeters diameter and shafts with a short length of up to 500 millimeters
- Wet and dry machining possible
- Dry machining with stainless steel housing available
- Newly developed and optimized hob head for larger tools in diameter and length

with the previous model. At the same time, the shifting length increased to 200 millimeters and the maximum tool diameter increased to 150 millimeters."

As a result of these improvements, the tool life is increased considerably with the use of longer tools. Through the use of indexable carbide insert cutters, the process time for certain applications can be reduced by up to 30 percent and the tool costs per workpiece can also be lowered. As a result, the unit costs can be reduced significantly.

"The new gear cutting machine equipped with the well-known Liebherr quality offers maximum flexibility and maximum productivity."

Dr.-Ing. Hansjörg Geiser, Head of Product Development & Design Engineering, Gear Cutting Machines



Automation system with ringloader

The proven and fast ringloader system was further optimized. Now workpieces up to maximum 15 kilograms can be automatically loaded and unloaded very quickly. This internal automation concept is as fast as a double-table machine and is characterized by high flexibility and efficiency. Set-up and maintenance costs can be dramatically reduced.

Modern control system

With the new touch user interface LH Geartec, operators can control the machine quickly and easily. It can be individually configured and supports the user with simple user guidance, which detects and eliminates faults and offers suggested values. It guides the user through the program step by step for process and retooling cycles.

Short delivery times

"In the supplier business it is all about fast order decisions, relocations, or order extensions", states Karl Sauterleute, Sales Director for Gear Cutting Machines. "Liebherr can supply customers with the LC 280 α gear hobbing machine within three to four months." ■



Maximum flexibility for small workpieces

Internal, external, spur, helical – everything is possible with the new LS 180 E gear shaping machine. This machine masters all types of gearing, including electronic helical guide and asymmetrical geometries.



Helical gearing is the specialty of the LS 180 E.

The fully electronic shaping head

- The time-consuming replacement of the mechanical helical guides is omitted
- Lengthy procurement of new helical guides no longer required
- The set-up procedure for changing a workpiece is reduced to a minimum
- Gear shaping of several gears with different helix angles possible in one clamping

We've come full circle with this machine: Last year, Liebherr introduced the LS 180 F gear shaping machine, which can, as of this year, be equipped with a new shaping head. That head has a directly driven spindle, which can perform helical movements without any additional mechanical effort. "This machine is therefore ideal for all helical gearing", highlights Torsten Schwabe, Team Leader in Development and Design of Shaping Machines at Liebherr-Verzahntechnik GmbH. The LS 180 E closes the gap and complements the lower end of the range of shaping machines so that all models of the shaping machines now have an electronic shaping head.

A small machine for big jobs

"We can offer maximum flexibility on one machine", adds Dr.-Ing Andreas Mehr from Technology Development and Consulting for Grinding and Shaping at Liebherr-Verzahntechnik GmbH. "It can machine spur and helical gears in one setting and thus shape several gear teeth out of one workpiece." This is particularly interesting for automotive shafts, because, for example, the reverse gear must have straight teeth and the first gear must have helical teeth. "With the LS 180 E, developers can effortlessly try out different amounts of crowns – also asymmetrical – on the gear flanks for the prototype production." The lead modifications can be established with the simple input of the target data in the control. The machine control panel assumes all other calculations. There is the option of a precise µ correction following machining and gear checking. For this, the operator only needs to enter the corresponding measured values in the correction window.



With the LS 180 E, developers can effortlessly try out different amounts of crowns – also asymmetrical – on the gear flanks for the prototype production.

Many application possibilities

This machine is also well positioned in production. If a shaft was previously shaped on two machines, as described above, it can now be manufactured on one machine in one clamping. Gear development is ongoing and constantly being refined. Manufacturers therefore need machines that respond to and support these advances, and work efficiently in spite of reduced batch sizes with increasing variants. The LS 180 E is tailored to these requirements and is suitable for prototype development as well as for series production and flexible productions of suppliers.

With a max. stroke number of up to 1,500 double strokes per minute, the machine can efficiently achieve high quantity production rate. The LS 180 E can work in wet or dry mode; however, the tool is heavily loaded during dry machining which limits the performance. Furthermore, its small installation area makes integration in small factories possible. “Nowadays, gearboxes are often provided by suppliers to the automotive manufacturer. They in turn have to machine many different workpieces”, states Andreas Mehr knowingly. “A flexible machine is often a better option for such operations than two machines with fewer functions.” The new machine makes its debut in 2017 at EMO in Hanover. ■

Technical data

LS 180 E		
Max. normal module	mm	5
Max. workpiece size	mm	180
Max. stroke number infinitely variable	DH/min	1,500
Stroke length	mm	max. 70
Center distance cutter spindle/workpiece table	mm	-30 to 285
Shaft angle cutter spindle/workpiece table	°	+/- 0.5
Column swivel axis	°	-1 to +12
Stroke position traversing range cutter head slides	mm	275
Feed radial axis column slide	mm/min	5,000
Total weight kg	kg	13,000
Dimensions (L x W x H)	mm	5,000 x 3,480 x 2,950

Possible tooth trace modifications

- Symmetrical crowning
- Symmetrical taper
- Asymmetrical crowning and tooth alignment modifications

Advantages of electronic helical guide

- Modifications can be easily programmed
- Excellent tooth trace quality thanks to the precise µ correction option (DIN 1 to 3)
- Reasonable chip formation leads to very good profile quality (S stroke)

ChamferCut solutions from Liebherr

For years, ChamferCut has been the best and most efficient solution for deburring and chamfering. In addition to the LD 300 C, which was introduced last year, the new stand-alone solution LD 180 C offers new opportunities for introducing the method in existing production lines.



The new LD 180 C can easily be integrated into existing production lines due to its minimal size.

Clean-edge gear teeth prevent damage during workpiece transport, hardness cracks, and gear wear. They also facilitate the assembly process and improve the tool life. Chamfering using ChamferCut delivers high-quality edges with reproductive accuracy, and is more cost-effective than press deburring and chamfering with tapered end mills. It is thus no wonder that chamfering is so popular among car and commercial vehicle manufacturers as well as in gear and engine manufacturing.

Perfect chamfers for existing production

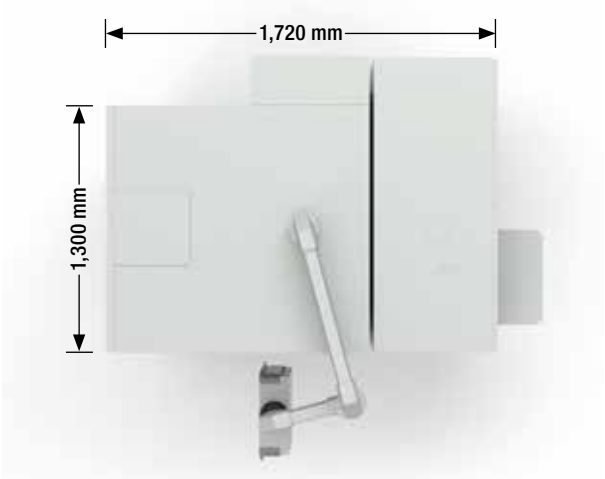
"When planning new production lines, our customers generally decide on an integrated solution of gear hobbing and ChamferCut to save installation space", reports Dr.-Ing. Oliver Winkel, Head of Application Technology. "However, many users also want to incorporate this efficient method in their existing production. We therefore developed the LD 180 C and LD 300 C for them." This way, every user can use this technology: The version with workpiece diameter up to 180 millimeters is designed for the automotive area. Machines with a diameter up to 300 millimeters are generally more suitable for contract gear manufacturers and the truck sector.

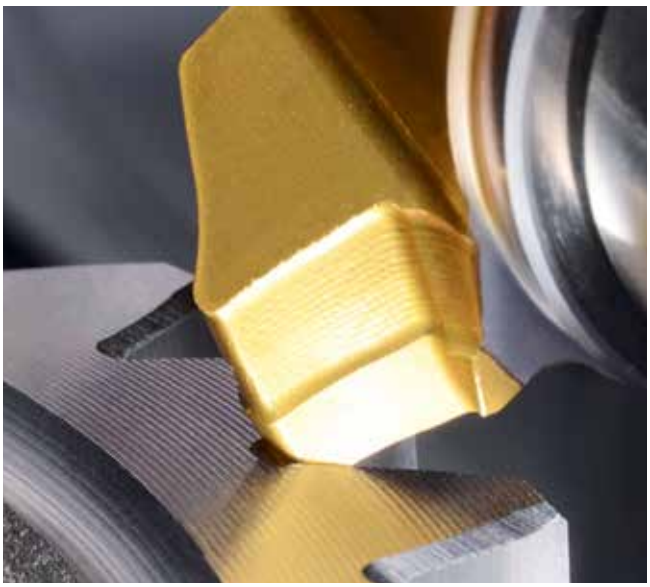
The developers paid special attention to minimal size and maximum flexibility of the new machines. As the installation area is restricted in existing lines, the machine and control cabinet can be positioned separately as an option. "This increases the setup possibilities in halls with limited space", highlights Dr.-Ing. Hansjörg Geiser, Manager of Development and Design of Gear Cutting Machines. The machine can also be operated from the right or left. "This mirror image version enables an even better integration option in existing production lines", is how the developer explains the background.

Automation according to customer specifications

The developers were also careful with the automation to ensure that the machine can be integrated in every environment. The loading can be effected by belts, robot cells or other automation solutions. "During the development stage, we listened to our customers and customized the machine to their requirements", is how Oliver Winkel summarizes the concept.

Space requirement of the LD 180 C





Advantages of the machine:

- User-friendly software
- Simple adjustment or corrections via CNC axes
- Simple adaptation at varying flank corrections
- Dry and wet machining possible
- Automatic loading with new lift / tilt loader (robot also optional)
- Flexible automation, e.g. via plastic chain conveyor, palletizing cell
- Right / Left operation: Control cabinet can be freely positioned

Advantages of this method:

- Very precise chamfer geometry
- Premium chamfer quality and reproducibility
- No bulging or material deformation
- Standard tooth-root chamfering
- Established process in gear production
- Very long tool life
- ChamferCut tools can be re-sharpened approx. 20 times easily and cost-effectively
- Lower tool costs compared to alternative processes
- Short amortization period due to low tool costs
- Application range module 0.8 to 3.5
- 2nd cut omitted when gear hobbing – thus higher tool life quantity with gear hobbing
- Short setup times

Similar to all Liebherr solutions for the ChamferCut method, the LD 180 C also works with maximum productivity in order to guarantee very short cycle times. It can machine small to medium workpieces with a diameter up to 180 millimeters and length of 200 millimeters. Although extremely precise chamfers are created with the ChamferCut method in comparison to other deburring methods, the lowest tool costs are still incurred, which shortens the amortization period considerably. The LD 180 C and LD 300 C handle both wet and dry machining, and have a high tool life with both machining types. They have simple and intuitive controls, which can be easily programmed with the user prompts. ■

Karl Sauterleute

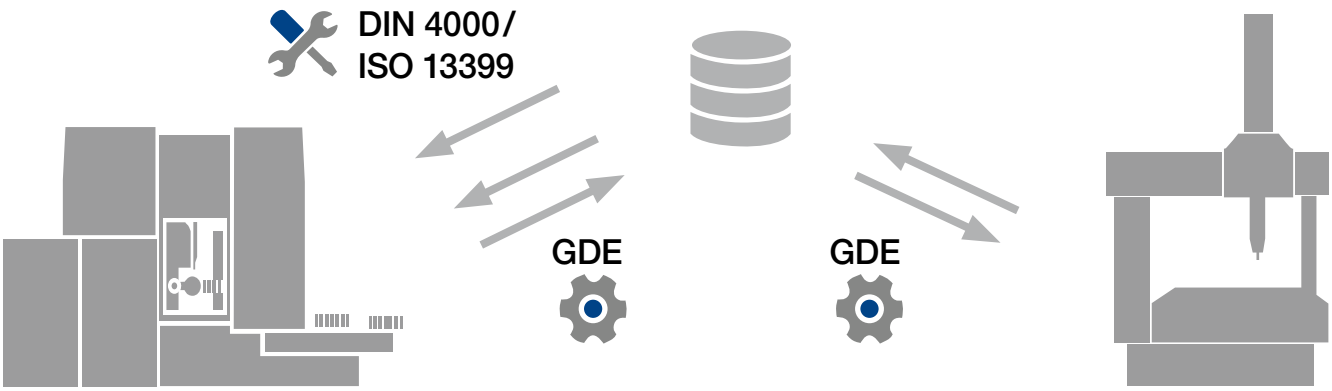
Sales Director Gear Cutting Machines

Kaufbeurer Strasse 141,
87437 Kempten, Germany
Phone: +49 831 786-1316
karl.sauterleute@liebherr.com



Do you have any questions?

Gear hobbing / Gear skiving		
Dr. Oliver Winkel	+49 831 786-1998	oliver.winkel@liebherr.com
Gear shaping / Generating grinding		
Dr. Andreas Mehr	+49 831 786-1988	andreas.mehr@liebherr.com
Gear cutting tools		
Ottmar Kern	+49 7243 708-670	ottmar.kern@liebherr.com



Geometry data can be im- and exported via GDE format.

The paperless way to increase safety

"Connecting systems for intelligent production" is the motto of this year's EMO – and could also be a slogan for the Liebherr software LH Geartec. New features such as the digital data import open up more routes to the Smart Factory for users.

What causes the most faults in production? The answer is obvious: people. The control system takes on a special role as a central operating system. Transposed digits are typed quickly, for example, which may cause defective workpieces or damage. This is why Liebherr-Verzahntechnik GmbH integrated a digital data import in the LH Geartec machine control panel. Florian Schuon explains how this works using the example of the tools: "The tool manufacturer must provide parameter lists for the tools, e.g. online, which are then imported as a digital datasheet to the machine. The user is only responsible for performing a visual check. As the user no longer has to input data himself, there are fewer incorrect inputs and at the same time, the ease of use increases."

"Parameterization in one minute which took ten minutes before."

Florian Schuon, Product Manager Control Systems Development



At AMB 2016, Fette presented the Liebherr system for ChamferCut tools, which is based on tabular layouts of product properties according to DIN 4000 and offers exceptional operating reliability. "We want to continuously expand the tool offer", explains Florian Schuon. "Up to this date, tools have been designed for ChamferCut and gear hobbing."

Digital data import

When an operator creates a tool at the machine, he has to enter roughly 30 parameters, which he must search himself on a datasheet. Sometimes these figures have up to four decimal places – input errors are possible, which can cause costly collisions. LH Geartec can import digital tool datasheets according to DIN 4000 (e.g. gear hob or ChamferCut according to DIN 4000-141). The operator can have his tool displayed on the screen. Thanks to the graphic support, the user sees at a glance whether he loaded the correct datasheet for the inserted tool.

Geometry data of the workpiece can be imported and exported via the GDE format (GearDataExchange) at the machine. The operator can comfortably create workpieces in the work preparation, e.g. using an offline version of LH Geartec. For instance, incorrect inputs to the machine are minimized and the highest possible comfort is created for the worker. Thereby digital work preparation is possible in the future. The Liebherr experts see a change of direction in production: "We are transferring this step from the machine to the PC. With this software, Liebherr is clearly taking on a pioneering role in Industry 4.0." ■

CBN ranks high for internal gears



For around two years now Liebherr has been using single-, double-, and triple-ribbed CBN profile grinding discs – with great success. "Our users are very satisfied with the results", reports Janus Siegfried, Head of Tool Production and Technology in the Ettlingen plant.

Together with diamond, CBN (Cubic Boron Nitride) is one of the superhard grinding materials. Both materials are superior to the conventional grinding materials corundum and silicon carbide in terms of hardness. There is no need for the time-consuming dressing when grinding with electro-plated CBN profile grinding discs; the discs also have a longer tool life. Very high process stability meets a high rate of metal removal – a combination which users appreciate. "There is also the fact that we provide individual grain sizes for various applications. Our customers can select the appropriate grinding material for each application", reports Janus Siegfried.



Single-ribbed CBN profile grinding disk from Liebherr

Liebherr-Verzahntechnik GmbH offers various discs which can be used with the new grinding head generations IG, OPAL 4.0 and 4.1 for internal grinding. CBN also has another advantage over corundum for internal grinding: "These tools can be manufactured with very small diameters. Corundum tools reach their geometric process limit quicker." With double- or triple-ribbed grinding discs the two machine steps roughing and finishing can be completed in one process as the individual ribs have different grain sizes. As a result, the grinding time can be significantly reduced, but the high surface quality required can still be achieved.

The first users of this technology came from the aerospace industry, where the quality requirements are very high. "We also see huge opportunities for this technology in the automotive sector and for some industrial gear unit applications", explains the Production Manager. "The market calls for the use of low-noise planetary gear trains particularly in combination with electric motors." High-quality internal gearing is also decisive for these planetary gear trains. Liebherr sees an interesting market here, which can benefit from the contribution of the current internal grinding technology. ■

Technical data

Internal grinding heads		IG OPAL 4.0	IG OPAL 4.1
Max. spindle speed	1/min	12,000	7,500
Max. module	mm	3	5
Min. tip circle	mm	80	115
Dimensions of grinding disc:			
Outer diameter	mm	100	125
Length	mm	8 (12)	12 (16)
Bole diameter	mm	36	50.8

Ottmar Kern

Sales Director Gear Cutting Tools

Hertzstrasse 9-15,
76275 Ettlingen, Germany
Phone: +49 7243 708-670
ottmar.kern@liebherr.com



REMAN: As good as new

High-quality machines with a second life cycle. What if a machine becomes outdated, but still performs well?



Before: Many years of production have left a mark.



After: Technically up to date.

Depending on technology, age or residual value, customers can choose between a reconditioned used machine, a general overhaul or a repair of their machine to original manufacturer quality, at attractive conditions. A machine from the REMAN program looks like new inside and out, complies with the state of the art and obtains a new warranty.

Used machine

With the used machine program, we offer the opportunity to replace the outdated machine for a "new" used machine, which is a reasonable alternative to new machines. This concept also enables a reduction of the downtime in the case of a general overhaul of an operator's own machine, as these machines can be rented for the duration of the general overhaul. A Liebherr used machine complies with the latest technical standards, and its design has the same manufacturing quality as a new machine.

General overhaul

For the reconditioning stage of the general overhaul, the machines are completely disassembled and cleaned. All wear parts and damaged parts are replaced. The machine is then restored to its original technical condition, freshly painted, checked according to the original manufacturer's standards and given a warranty. The costs of a general overhaul can be based on a fixed rate or time and effort.

Repair

In this conditioning stage, the damaged parts of the machine are initially identified and then properly repaired. Before returning the machine, the component is checked according to test criteria and then supplied including a warranty.



All of the wear parts like cables and pipes are replaced.



REMAN machines are as good as new, not only visually but also functionally.

Experience is decisive

"In 2011, Liebherr set up a specialist department for repairs which has now been expanded to cover used machines and general overhauls of machines", highlights Ralf Glatzeder, Product Manager for REMAN. "Qualified and experienced employees, who have many years of experience working on the assembly of the machines and are very familiar with older control systems, work in the REMAN area. The competence of the colleagues is absolutely decisive for a successful reconstruction", adds Glatzeder. "Only outstanding technicians are able to give these machines or components a 'second life' at top performance, and make the machine or component available to the customer as quick as possible."

The general overhaul for all technologies (grinding, hobbing and shaping) is offered from the year 1999 onwards. ■

Ralf Glatzeder
Product Manager REMAN

Kaufbeurer Strasse 141,
87437 Kempten, Germany
Phone: +49 831 786 1208
ralf.glatzeder@liebher.com



Liebherr counts on standard interfaces

While many competitors want to create their own communication paths between machines and cloud systems, Liebherr-Verzahntechnik GmbH decided to provide standard interfaces in different formats in the future.

In the course of Industry 4.0, more and more customers want to link their machines with systems for process monitoring, resource management, and order management. Due to the numerous requirements of customers and systems to be networked, many data come together in different formats which makes communication difficult.

Today, machine tool interfaces are often designed specifically for a control system type and a data profile defined by the customer. If the customer later decides to enter more data or change the type of connection, it is not possible without the intervention of the machine manufacturer. As the requirements for operation of the machine change over the years, ▸

the costs for such adaptations can often not be estimated in advance.

For these reasons, several standards for M2M data transmission are currently being discussed - with regard to the machine tool market, these are mainly “MTConnect” and “OPC Unified Architecture”. Liebherr offers solutions for both transmission paths. OPC Unified Architecture is a standard for manufacturer-independent communication in automation technology. This interface is freely configurable – only the manner in which two machines communicate with each other is controlled.

MTConnect is a license-free platform, which was already designed for the task ‘Communication with Machine Tools’. It is very popular in America and Asia, but also has users in Europe. Liebherr also offers data transfer with Profinet and Profibus coupler. Other methods (e.g. MQTT or AMQP) are also being planned in order to satisfy all customer requirements.

Innovative solution from Liebherr

The special feature of the Liebherr solution is that all possibilities are generally set up in advance. “So that we are internationally aligned and can respond flexibly to each market”, highlights Dr. Peter Pruschek, head of electrical engineering and control development for gear cutting machines at Liebherr.

Not only the software modules are standardized,but prepared data profiles are also offered for various applications, from simple monitoring of the machining progress to the detailed process analysis.

The following data profiles are available:

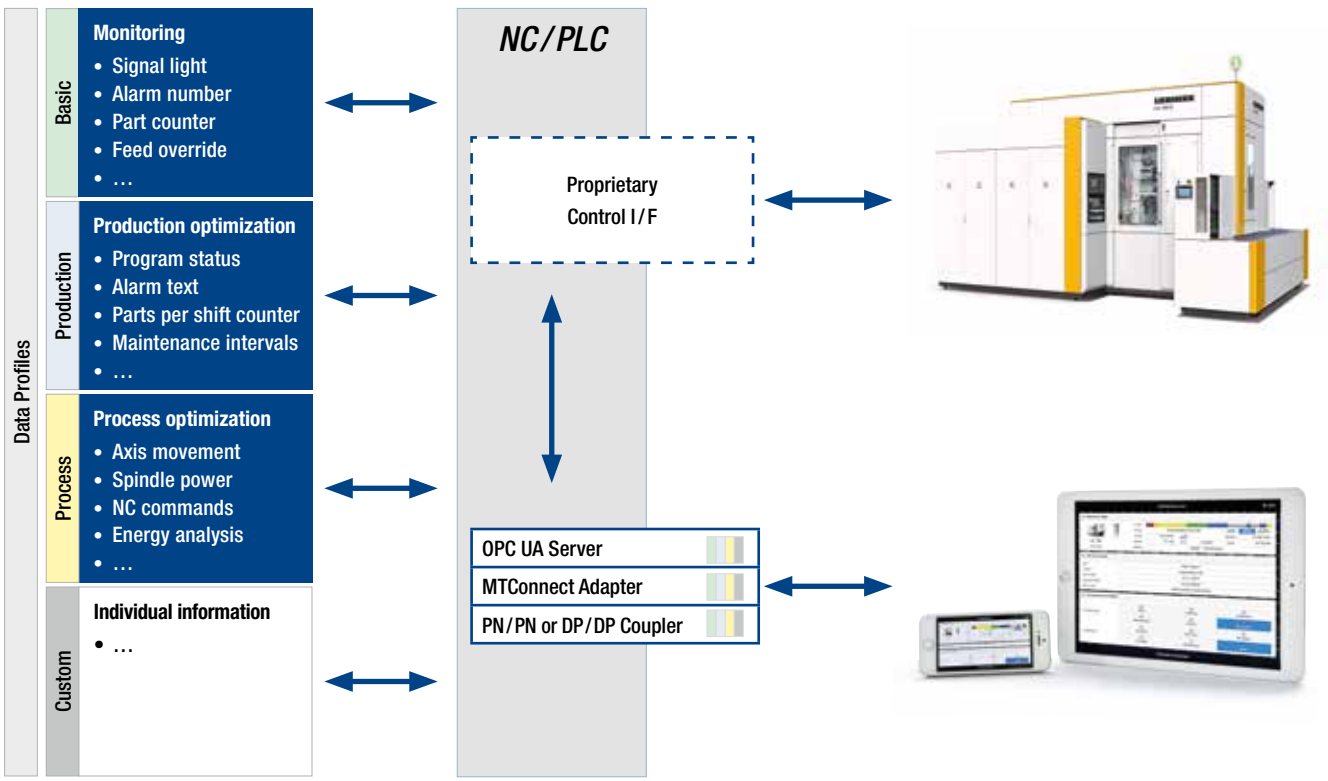
Basic: Standard signals such as the signal lamp, current NC program name, etc.

Production: Information for production optimization such as machine status, workpiece counter, production and operating hours, etc.

Process: Information for process optimization such as axis positions, feed rates, operational performances, energy status, etc.

Custom: Customer-specific configurations, which can be individually configured.

A significant aspect of the solution is the possibility of configurable pre-processing of signals in the machine. With a logic gate, the user can put together the information from the standard signals and make available the information he requires on the machine interface. For example, the data “Machine is in production” can be composed from the signals “Signal lamp is green“, “Control system is in automatic”, and “Feed override is above 90 percent”. The Liebherr interfaces combine the benefit of standardization with a high level of flexibility and simple configuration. ■



Industry 4.0 brings together process monitoring, resource management and order management.

Safe and convenient set-up of processes with LH Geartec

The Liebherr user interface "LH Geartec" has intuitive touch-based operator guidance. With the new visualization, the software thinks ahead.



The operator receives more visual support in the future for the input of all machining parameters. If the operator creates a new workpiece, he can track its progress using a 3D model. Different colors show him where he already specified the necessary data, where he is currently working, and what is still missing. "These references to missing or incorrect parameters make it easy for the user. The 3D live graphic considers all geometrical parameters (such as number of teeth, helix angle, part width, bore hole diameter, etc.) The operator sees immediately whether he has set the parameters for the workpiece that he wants to produce. This way, incorrect inputs are minimized considerably", explains Florian Schuon, Product Manager Control Systems Development at Liebherr-Verzahntechnik GmbH. "If the data is complete and valid, the 3D live graphic changes to a golden-colored workpiece."

Customized displays

Another new highlight of LH Geartec is the customizable process display. "It is an overview, where each operator can personally configure his display according to his own requirements", explains Florian Schuon. These settings are saved under the user currently logged in and are retained. Up to nine monitoring widgets can be displayed simultaneously on a monitor. The individual widgets can be selected from a catalog using the familiar swipe gestures, as well as by Drag&Drop. Various views are available: axes, documentation, current values, torques, and the momentum monitor can be shown as requested.

Defining set-up procedures

"From EMO 2017, our customers can also define set-up procedures", announces Schuon. "We give our customers a combination of set-up procedures and set-up matrices as a template, which they can adapt, supplement, or reconfigure to their requirements." Images, videos, or datasheets can be stored in any number of steps individually and as required. "We offer the convenient input in a single window which contains all information." This is particularly interesting for companies with small batch sizes who have to retool quite frequently and which prevents every operator choosing his own path – and possibly wastes times or makes mistakes.

"The focus is on the intuitive operating comfort."

Florian Schuon, Product Manager Control Systems Development



Pinpointing defective hob areas

In addition to process monitoring and support during the set-up procedure, the modern user interface LH Geartec also offers other opportunities to optimize the use of machines and tools. One example is the new function with which different defective hob areas can be defined for partly worn tools. The user interface provides support during the input by graphically highlighting these areas. LH Geartec considers the areas marked as defective in the calculation of the shift strategy, whereby they are no longer automatically used in the machining. The intact areas can continue to be used, meaning that the service life of the tool is exhausted to the maximum. ■


LIEBHERR
PHS 1500 Allround
LIEBHERR
LIEBHERR

Flexibility redefined

Liebherr Automation Systems is systematically expanding its range of pallet handling systems.



Increases in efficiency and simple operation are the goals of an intelligent automation concept. These are independent of the size and weight of the part. “Small parts or large workpieces: the task remains the same”, stresses Knut Jendrok, Sales Automation Systems: “How do we increase machine capacity utilization and at the same time reduce workforce levels – with the goal of reducing unit costs? That question can be asked for both large-scale and small-scale series production.”

Cost per part reductions of more than 20 percent possible

A combination of machining centers with pallet handling systems has proven to be a good solution for an automation system for small-scale series down to batch sizes of one. Such systems shift the set-up of the workpieces from the machine to a separate set-up station and store the pre-fitted workpieces in an intermediate storage area. The setting up and the machining of the machine are thus decoupled. The pre-fitted workpieces stored in the system compensate for short and long machine running times and allow shifts with very little or even no manpower at all, which in turn allows unit prices to be optimized by up to 20 percent.

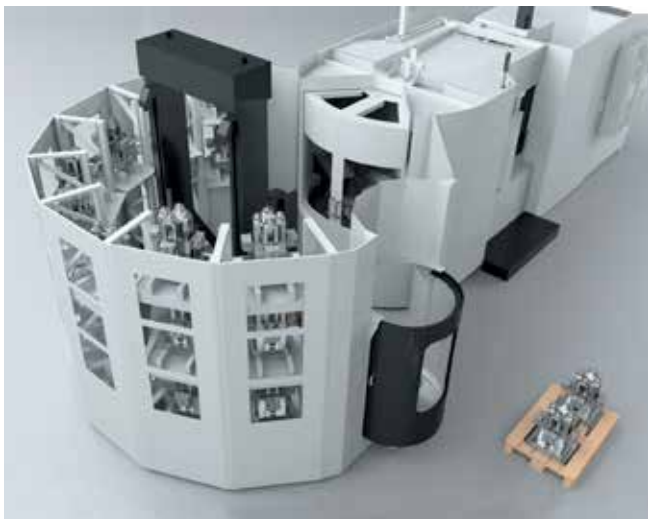
Advantages:

- Increase in machine capacity utilization to over 90 percent
- Modular design, customizable and expandable
- Reduction of costs per part by optimization of cycle and lead time
- Continuous machine loading even during breaks or unmanned shifts
- Full monitoring of production schedule, resources, machine utilization and manufacturing process
- Relief of employees and improvement of working conditions by decoupling of work assignment and machine cycle time

New technology for RLS

A rotary loading system for one or two machine tools is the entry-level model. This RLS has an optimized fork for better accessibility to the working area in the machining center. The longer telescopic lift allows machines to be incorporated in the automation system which have not been possible to date because of the characteristics of the working area and of the cab. For example, the operator's area has been expanded to include direct-loading vertical five-axle machining centers. In the current project, the modular design of the RLS series allows a combination of different interference diameters in the shelves and additionally increased storage space with a turret in a single system. For the customer, it is important for the system to have two set-up stations – despite the tight space available.

For all Liebherr pallet handling systems (RLS, PHS Pro and PHS Allround), there will be a new cell control on the market in 2017. Simple operation will be the main priority. The new graphically guided interface concentrates functions on the main computer in a user-friendly manner and if required also allows full production control. This includes resource planning, cutting tools and NC data management. Furthermore there are also interfaces to the ERP systems. The development engineers at Kempten have implemented a new concept for the PHS Pro set-up stations. Further standardization of the important set-up stations and the introduction of the modu-





lar concept have meant that functions such as motor-driven rotation, moving, turning or tilting can be realized. The milling/turning precision set-up station is becoming ever more important and remains in the range.

Front access during ongoing process

The special characteristics of the PHS Pro include the "front access" option. This is essential in machining centers in which the design only allows operator intervention at the front side. Front access is designed such that a cordoned off safety area allows the operator access to the system during ongoing operation. The other machines connected to the pallet handling system can still be used in parallel automatic mode.

The weight class PHS 10000 Pro (designed for transport loads up to 16 tons) was only introduced in 2015 and boasts its first installations in the fields of machine construction large engine production. Two different large-scale machining centers (a five-axis milling center and a milling/turning center) have been combined to form a single system at our own site in Kempten. All machine beds and other machine subassemblies of Liebherr-Verzahntechnik GmbH are now manufactured on this in three-shift operations. Another system has been in operation at Liebherr Machines Bulle SA (Switzerland) since 2016. This is used to machine large diesel engine cylinder blocks (up to V20).

New class: PHS Allround

Liebherr has specially developed the compact class PHS Allround for universal users. Knut Jendrok: "The PHS Allround closes the gap between our entry-level solution with the RLS rotary loading system and the individually configurable PHS Pro pallet handling system."

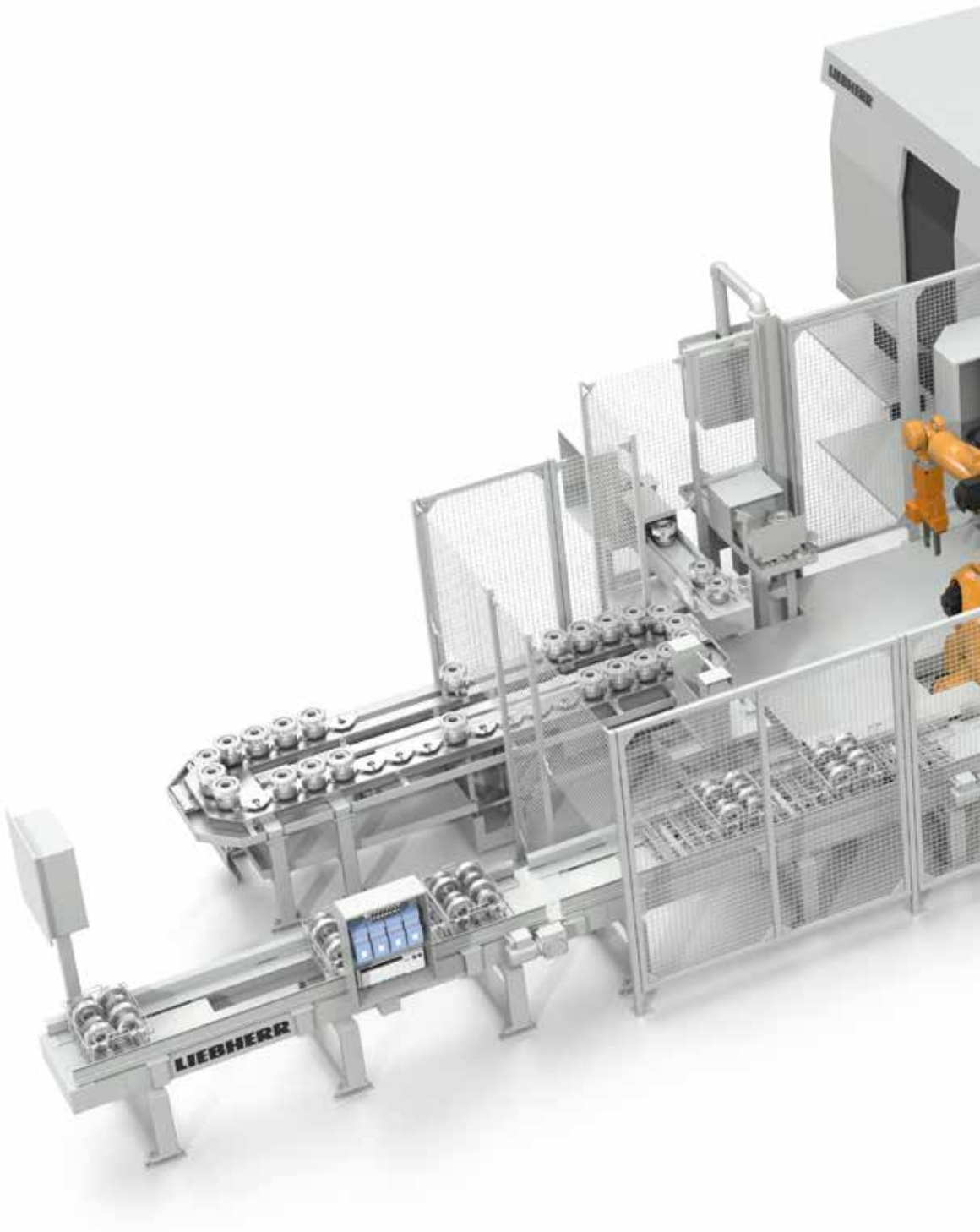
The Liebherr PHS Allround pallet handling system will celebrate its world premiere at the EMO 2017. It will allow a large group of users to enter the world of flexible production in combination with 4- and 5-axis machining centers. The new, modular concept for loads up to 1.5 tons is extremely flexible and can be individually configured and expanded. This corresponds to pallet sizes of 500 x 500 to 800 x 800 millimeters. Users can thus introduce flexible production systems with manageable investment and expand them when necessary.

Development of the PHS Allround strictly followed the modular concept. In other words, the customer is able to combine preconfigured modules as needed to meet his requirements: The storage locations can be arranged in a circular pattern at the ends with one or more machines and front access. "Our extremely space-efficient system fits in almost every production hall," stresses Knut Jendrok. He also considers it to be extremely important that flexibility is continued. "We can remove and fit this system without complications. For example, investments can be spread over different expansion stages. Our PHS Allround grows as demand increases." It is no problem for example to start with one or two machines and increase this number to four. ■

Knut Jendrok
Sales Automation Systems

Kaufbeurer Strasse 141,
87437 Kempten, Germany
Phone: +49 831 786-1482
knut.jendrok@liebherr.com





Robots: Practical assistants increase possibilities

Liebherr focuses more on the combination of robots and gantry solutions or rail systems, so these tried-and-tested systems can handle multiple more functions.



Robots were one of the big trends at the Hannover Messe 2017, which impressively highlighted the importance and current relevance of the topic. Liebherr also focused even more on robots, and was able to supplement the tried-and-tested solutions with interesting features. “This year we increased the number of employees in the automation area considerably”, reports Jürgen Groß, who as Sales Director for Cells and Flexible Manufacturing Systems also joined the automation team in 2017. Many of the “new” team members, around 30, will strengthen the areas of robotics, simulation, application engineering, design, development, and commissioning.

“The combination of robots and gantry solutions enables these tried-and-tested systems to handle multiple more functions.”

Jürgen Groß, Sales Director Cells and Flexible Manufacturing Systems



According to the current study “Robots in German Mechanical Engineering” by PwC, the number of industrial robots are growing worldwide each year by at least seven percent. Germany is one of the leading nations in robotics. The German Engineering Federation (VDMA) also confirms the increase in robot systems.



Vision system and "Flying Robot"

"Our main topics are component handling, Bin Picking solution, palletizing, flying robot technologies, and robot-on-rail systems", explains Groß. The 3D vision system presented last year for Bin Picking solution is now in use at the first group of customers. The focus is now on positioning robots at or on the gantry beam or on a rail. "We have various fastening solutions in the offer", explains Groß. He sees exceptionally high potential for solutions where the robot sits on the gantry or is suspended. "Then the robot has maximum freedom of movement around the gantry with its seven levels of movements and can easily perform additional tasks. This increases the flexibility and reduces consumption of valuable hall space."

"The gantry itself can only work in a linear direction, however in combination with the robot it becomes an efficient area gantry", states the long-standing automation expert. In doing so the role of the robot is not only limited to workpiece transport. Flexible production facilities are increasingly requiring the automatic set-up of the machines with clamping fixtures and tools.

For this so-called "Flying Robot" strategy, Liebherr uses robot arms from Kuka and Fanuc, which are embedded in the Liebherr automation system. "Thanks to our gantry modular system, we can offer many different combinations." The design of the control system is also flexible. It can be designed as a master cell control or integrated as a slave in a complete system. Special focus is put on user friendliness. For instance, many tasks and functions can be adapted by simple parameter setting without additional programming like with the palletizing cell LPC.

Already in operation

A current example for Liebherr robot applications are modular gear cells, which are already in use by different customers. In this case, a robot loads the gear hobbing machines and completes additional functions such as cleaning, testing, and labeling. "Particularly in combination with gear cutting technology, we also provide complete production lines as a turnkey supplier, we can cover all steps from blank to finished part with partners from a single source", explains Groß.

At another customer, Liebherr is currently implementing a production line for gear housing with a combination of gantry robots for machine tool loading, conveyors, depalletizer stations with the new "Vision System for Blanks", as well as a rail-mounted robot for additional tasks such as leak testing, storage, and swapping out finished parts. For all installations, Liebherr can rely on the deep standardization of the automation systems. "It is imperative for integration. Our system with standardized modules and functions also offers the ideal conditions for extending existing systems with robots", highlights Groß. ■

Jürgen Groß
Sales Director Cells and Flexible Manufacturing Systems

Kaufbeurer Strasse 141,
87437 Kempten, Germany
Phone: +49 831 786-3072
juergen.gross@liebherr.com



The safe way into automation

When automation systems are assembled and modified internationally, there are many rules that need to be followed. The topic of safety and danger prevention is heavily formalized. The automation experts take this into account with a new concept that enables its own employees and others to work safely worldwide.

"Health and Safety" is an important topic – especially in Great Britain and the United States. That is why last year the automation division of Liebherr adjusted its processes and organizational structures. "The impetus came from Great Britain," explains Stefan Bischof, who provides support for the large customer Ford. "These customers expect a strong risk awareness and understanding of safety which is also accompanied by corresponding documentation and audits."

For automation, that meant expanding the product line. "Now we train not only our own employees, but also all other installers. This training also takes place through the year because that is the only way we can guarantee that there will always be certified personnel on site." Stefan Bischof and his colleagues have created new training materials for this. After the successful completion of the course, a training certificate shows the areas in which the participant can now be deployed. For example, that can include working with a scissor lift during gantry installation, with a forklift or with electrics.

So called RAMS (Risk Assessments and Method Statements) help with new installations. Each work step is assessed in terms of risks and appropriate safety measures are defined. In the case of modifications, these plans are created individually, as external circumstances differ. The client approves these plans, and only after the installing companies have been trained, the actual construction project can begin. "In Great Britain this is prescribed by law and a standard procedure. Large customers such as Ford and Jaguar Land Rover require these documents from us, and it makes sense to train all the parties involved," emphasizes Stefan Bischof. If a safety-related incident happens, the entire construction process temporarily comes to a stop, which is a great risk in terms of planning.

In Germany the requirements are similar: Thanks to the excellent level of training and the courses included, the knowledge of German technicians on the topic is quite high. Within the context of international standards, however, the requirements from German manufacturers for formal safety guidelines also increase. For that, Liebherr has done all its homework. "We have reorganized ourselves internally," reports Stefan Bischof. "Our safety officers from Production and Manufacturing are now working together with the Design team and the newly established safety officers for on-site installation. In doing so, we have created a consistent culture and structure that enables more intensive support for customers and subcontractors. We are now much more pro-active in regards to this topic." ■



Stefan Bischof
Customer Service Automation Systems / Health & Safety Coordinator



XXL Pallet handling system

Liebherr Machines Bulle SA has set itself the big task to fully automate the manufacturing of crank cases of large diesel engines. With the new automation concept of Liebherr-Verzahntechnik GmbH, a unique production line that sets new standards for heavy workpieces is developed.

Liebherr Machines Bulle (LMB) introduces a new class with the D96 and D98 diesel engines. The Swiss-based company planned versions with 12, 16 and 20 cylinders for the two new series. The V20 version of the D98 boasts impressive dimensions: with a length of 2,720 millimetres and a weight of 2,700 kilograms, the workpieces could not be machined with the existing machine portfolio.

“We knew from our own experience how big engine components have to be machined,” is how Klaus Bosch, Production Manager for combustion engines at Liebherr Machines Bulle SA, describes the initial situation. “A machine concept was quickly put in place, but how should we deal with the pallets and the clamping fixtures? That was the problem for which we sought a solution.”

Group-internal solution

The solution was found within the cooperation, where the idea of the fully automated machining of heavy workpieces also met with huge interest in gear engineering in Kempten – and in two respects. The automation division in Kempten already offers pallet handling systems (PHS) on a smaller scale, and at the same time the gearing division was looking for a solution for in-house production. “Never before had we realized such a system on this scale”, explains Stefan Jehle, Sales Director Automation Systems. “However, we had two pilot projects – and we developed the PHS 10 000 Pro.”

Together with the machine supplier and turnkey provider BURKHARDT+WEBER (BW), a new production system for crank cases of large engines was developed. Following two years of intensive planning and development, a forward-looking production system with test bench, logistics, assembly, and control system could start production.




LIEBHERR



The new Pallet handling system PHS 10000 Pro for maximum transport weights up to 13,000 kilograms.

Orders are now transferred from the ERP system of the process software Soflex, which coordinates the machining sequence in the machining centres; manages raw parts, workpieces and tools; transfers the NC codes to the machines; and provides the staff at the set-up stations with the right information, instructions, and material.

Everything integrated in one PHS

All workstations and machines are supplied by the PHS, which also manages both components and unmachined parts. “Set-up times are omitted and production becomes very flexible. At the set-up station, the operator receives component and material assigned by the PHS, the logistics is made considerably easier”, is how Stefan Jehle highlights the benefits of this working method. “The work stations are at ground level and protected by sensors so that barrier-free and safe work is guaranteed. Large screens show the operator what needs to be done to the respective workpiece and guide him through the steps.”

While the basic design of the PHS is oriented towards the tried-and-tested small series design, the high weights with regard to the shuttle meant certain changes were necessary. “Some rethinking was needed for the lifting movement technology”, explains Jehle. “A chain for these dimensions would be too heavy and unmanageable. We drew on in-house know-how in crane construction and used rope technology, which provided a solution to our problem.” Thanks to the favourable gear ratio of the rope drums and the pulley technology, a relatively small standard motor is now sufficient to move the heavier loads.

Seven different clamping fixtures

In the current configuration level, the pallet handling system manages 26 storage locations for machine pallets with clamping fixtures (maximum 13,000 kilograms), 69 storage locations for transport pallets (maximum 4,000 kilograms), and ten storage locations for washing pallets (maximum 4,000 kilograms). A process on the largest workpiece of the D98 series requires six different workpiece clamping fixtures in seven different clamping fixtures. As many tasks have to be performed horizontally and vertically, storage locations that can store objects up to 3.6 meters in length are required for both versions.

Two large machining centres from BW, as well as a washing machine from Sturm, are available for machining. A MCX 1200 and a MCX 1400 of the Reutlingen-based machine manufacturer are working in the current first configura-

Overview: Complete system

PHS 10 000 Pro Pallet handling system

- with BURKHARDT+WEBER MCX 1400 machining center
- with BURKHARDT+WEBER MCX 1200 machining center
- with Sturm SDV-3000-CD cleaning system
- with Soflex control system



Large screens guide the operator through the steps.

tion level of the Bulle-based plant. Both are identical, except for the dimensions, and can use the same tools. Their operation is also the same. "We can integrate a total of seven machines in the system", states Sebastien Bussard from LMB, pointing out the future prospects. "The foundation and set-up station are already being prepared for another MCX 1200."

Integrated boring bar insertion

A special feature is the integrated boring bar insertion for machining crankshaft and camshaft bore holes up to 3,100 millimetres in length, for which a special machine is usually installed. BW integrates this process. "So that we can machine to these lengths with µ precision, we need support bearings in the clamping fixtures for the NC-controlled line boring bars", is how Michael Wiedmaier, head of sales at BW, explains the biggest challenge for his firm. "We developed a special system for this purpose. Firstly, the crankcase is positioned in the two-piece clamping fixture with support bearings in the area of the oil pan, the lower part of the clamping fixture has fixed columns with a type of zero-point clamping system, which centres and holds the lid, then we place the lid, which weighs 1.3 tons, on top. The crankshaft and camshaft boring bars are then automatically inserted."

In order to integrate the handling of the lid in the PHS, the automation experts at Liebherr-Verzahntechnik GmbH came up with something very special: If the lid is required for the machining process, the PHS picks it up from a storage location in the system. It is not supported like the clamping fixture pallets, but suspended at the fork of the shuttle and then positioned exactly at the set-up station on the prepared clamping fixture. Stefan Jehle explains: "The fact that our system works so precisely makes this step possible in the first place and dispenses with the need for another handling device in the system." The tool is also stored separately in the PHS on a pallet and transferred to the machine if needed. "These long drill bits do not fit in the normal tool magazine, but can be integrated in the system."

For the team from Liebherr Machines Bulle SA this project marked the entry into a new production era. "Our system controls long and short machining operations and ensures optimal machine utilization and operator workload", summarizes Sebastien Bussard. "We are fully satisfied with the quality of our products and can respond flexibly to customer orders. We have achieved all objectives we set for this project." ■

Technical data

PHS 10000 Pro		
Stacker crane for max. 13,000 kg loading		
Travel distance (X) 80,000 mm	m/min	90
Stroke (Z) 5,600 mm	m/min	13
Telescopic lift (Y) 2,300 mm	m/min	12
Infeed conveyor (raw parts)	Piece	1
Material conveyors (supply of set-up stations	Piece	2
Set-up stations (mobile) with media coupling	Piece	2
Outgoing conveyor (finished parts, washed)	Piece	1
Storage locations for transport pallets (maximal 4,000 kg)	Piece	69
Storage locations for washing pallets (maximal 4,000 kg)	Piece	10
Storage locations for machine pallets with clamping fixtures (maximal 13,000 kg)	Piece	26

Liebherr Machines Bulle SA

LIEBHERR

Industries:	Components
Company size:	1,060 employees
Founded:	1978
Headquarters:	Bulle (Switzerland)
Locations:	Sales Nussbaumen (Switzerland)
CEO:	Rudolf Ellensohn, Claude Ambrosini
Website:	www.liebherr.com



Passion for pumps

“The fire pump is the heart of every fire truck”, explains Michael Schöftner, Head of Mechanical Production at Rosenbauer International AG, the global leader for fire service equipment. The equipment has to withstand enormous loads in cases of operation. Rosenbauer relies on an automation solution for pump manufacturing from Liebherr. The rotary loading system RLS 800 from the Kempten-based automation experts has been deployed in Leonding near Linz for around two years now.



The “Panther” is trained for its service and is therefore put through its paces at Rosenbauer.

Bright light floods through the large windows of the hall roof. The large rotary loading system from Liebherr can already be recognized from afar. It is installed upstream from a machining center, where up to 63 different components can be milled for various water pumps. Michael Wizany now clamps a new raw part at the set-up station of the RLS 800. It is then precisely moved to one of the 21 storage locations in the rotary loading system by means of a rotation shuttle or directly placed at the machine for machining.

In the mechanical pump manufacturing at Rosenbauer, water pumps are developed for various applications. In addition to fire pumps, which are installed in fire trucks, submersible pumps or stationary motor pumps that are used for the protection of industrial companies or in flood protection are also part of the product portfolio of the Leonding-based company. Pump parts, which are manufactured with help of Liebherr automation, are later used in vehicles of the AT line. AT stands for Aluminum Technology, as the frame, which is also developed by Rosenbauer and later combined with the chassis, is made from aluminum. The water tank of those vehicles can hold up to 4,000 liters of extinguishing water. They are used as conventional fire trucks for countless dams and account for around 55 percent of the annual turnover.

Enormous increase in productivity thanks to Liebherr system

One machining center follows the other in the production plant



The machine operator clamps a new part at the set-up station.

and there is not much storage space. The automation solution from Liebherr is designed precisely for restricted spaces. “We can store up to 21 pallets in the RLS in a confined space. The entire system also takes into account the individual delivery dates and can be adapted dynamically – depending on prioritization”, is how the machine operator Michael Wizany explains the benefits of the Liebherr system. If a new part is coded in the system, the automation solution automatically recognizes recurring components. “With the use of the rotary loading system we achieve time savings of up to 50 percent”, states the 28-year-old about the enormous increase in production efficiency. Thanks to the rotary loading system the machining center can also be supplied with parts without any manual intervention, which is beneficial particularly after the end of a shift. “We work in a two-shift operation, but can continue to produce up to four hours after the end of a shift thanks to this automation. The next morning, the employee unclamps the parts machined overnight and can perform new clamping processes”, explains Production Manager Michael Schöftner. Schöftner and his team appreciate the stable, robust, and yet high-precision functionality of the Liebherr automation, as well as the fault-free and very reliable operational readiness of the RLS right from the start. “When choosing such a machine, we pay great attention to the manufacturing company. We obtained a fully developed concept with the solution from Liebherr”, adds Schöftner.

However, at Rosenbauer the individual employee is always the decisive factor – despite automation. “Our employees are experts in the area of mechanical production. The machine and the RLS must be programmed and monitored. This is a very responsible job”, states the 39-year-old. And his employee Michael Wizany adds: “Automation needs professionals”. Many employees are also active firefighters and contribute their experience to day-to-day work. Lifeblood for firefighting can almost be felt here.

Nonetheless, before a vehicle leaves the factory premises in Leonding, the pump has to pass several stations of production. After the pump parts have been deburred, the density of the pump is verified by a pressure test. A job which also requires lots of expertise and sensitivity. Pump housings must withstand an operating pressure of up to 18 bar. Nevertheless, they are deliberately tested at 24 bar – this ensures that the parts withstand the high pressure during use.

Now, the finished pump has to be anodized. A protective layer is formed from the oxidation of the surface made from aluminum, which makes the pump housing extremely robust. When the pump is completed it is combined with the frame in plant II, which is only a few kilometers away from the main factory. “The frame made from aluminum is the framework for the structure, which is later positioned on the truck chassis”, explains Michael Schöftner, who has been managing mechanical production for two years. This structure can be individually designed and equipped – depending on the customer’s requirements. “Most of our vehicles are unique, we only manufacture our AT line in series production”, adds Schöftner.

A highlight product from Rosenbauer is the Panther. The vehicle was designed especially for use at the airport and can transport up to 19,000 liters of water in the tank. The main components, such as structure, cab, or chassis, are produced directly on site and have been for many years. The company’s history dates back to 1866. At that time, ▸



Up to 21 pallets can be stored in the Liebherr rotary loading system.

Johann Rosenbauer founded the company as a trading company for firefighting supplies. The company has been manufacturing fire trucks since 1906. Today around 3,400 employees work at 16 production sites worldwide for the listed family-owned company, which achieved a turnover of 871 million Euro in 2016.



Michael Schöftner (left), Head of Mechanical Production, and his employee Michael Wizany are the guardians of the RLS 800 in the mechanical pump production.

Tests under real conditions

In addition to tests under real conditions, the Panther is also put through its paces on the factory premises and deliberately pushed to its performance limit, because the vehicle must perform its duty even under extreme conditions in the event of an emergency. Around 750 vehicles leave the Leonding-based plant every year and are used all around the world. Whether it is in the USA, Saudi Arabia, or South America – the Upper Austrian company manufactures its vehicles for diverse requirement profiles and standards. In addition, firefighting equipment, such as helmets or gloves, are also sold, meaning Rosenbauer has positioned itself as a Full-Liner for firefighting on the market.

When the chassis is coupled to the structure, the vehicle is individually laminated and fitted with the desired technical equipment. After all of this is completed, the big moment arrives– leaving the hall and the handover to the customer. Rosenbauer created a special customer center for this purpose, where the vehicles are handed over and the firefighters receive training on their new vehicle. In an Emergency Driving Response Simulator (ERDS), emergency drives can be simulated realistically on public roads.

But how will fire service develop in the future? Since the start of 2017, specialists from Rosenbauer have already been addressing the fire service of the future in a think-tank. In vehicle construction trend is clearly heading towards even more ergonomics and safety. “The vehicle is more and more approaching people. This means various equipment and tools can be extended automatically, which, in turn, considerably facilitates work for the firefighters”, explains Michael Schöftner. And even though automation arrived a long time ago in fire service, people remain the decisive factor during operation as well as in the production of fire trucks, as Michael Wizany concludes. “Human beings are indispensable.” ■



Up to 63 different parts can be machined with the help of the RLS 800.

Rosenbauer International AG

Industries:	World’s leading manufacturer of systems for firefighting and disaster protection
Company size:	3.375 employees
Founded:	1866
Headquarters:	Leonding, Austria
Production plants:	Europe, North-America, Asia
Produktionswerke:	Austria, Germany, Slowenia, Italy, Spain, Russia, USA, Saudi Arabia and Singapore
CEO:	Dieter Siegel
Website:	www.rosenbauer.com



Pioneers of skiving³ technology

The first LK 500 skiving machine is in use at the Italian gear specialists SIAP. An innovative investment that will increase both productivity and quality.



SIAP's machine park comprises more than 200 machines – about 30 are from Liebherr.

The town of Maniago, Italy, is principally known for two things: Knives and cutting tools. The whetstones of cutlers at the Còlvera stream, at the foot of the Carnic Alps, have been operated with hydropower since the 15th century – the start of a big handcraft tradition from which an industrial center developed. Since 1960 SIAP has been manufacturing gears, and since 1988 as part of the international Carraro Group. Gear boxes, axles, and contract manufacturing are the businesses conducted by the Italians.

"We are always growing", explains COO Paolo De Col. In recent years, the premises underwent constant expansion. "We have to add a new hall practically every year." This of course also means a continuous expansion of the fleet, which now includes over 200 machines – around 30 of which are from Liebherr. The most recent acquisitions were a LCS 500 generating grinding machine, a LC 300 gear hobbing machine, and the LK 500 gear skiving machine - the first of its kind in a production environment.



The first LK 500 in serial operation at SIAP – another one is already on the wish list.

Partnership with a long history

"We have a long history with Liebherr. Firstly, two Liebherr companies are our customers, the connection to the group has therefore existed for a very long time. Secondly, we opened a plant in India in 2004, which we equipped with around 25 Liebherr machines" states Paolo De Col. "The parts were manufactured in Germany and assembled in India. Liebherr Machine Tools India was set up in Bangalore at the same time as our subsidiary. We believe in Liebherr India and Carraro, who was confident of the excellent quality of the machines in our production, released an order of 25 machines, thereby opening up the Indian market."

In addition, when it comes to gear skiving, SIAP demonstrated its huge confidence in the Kempten-based technologies. The company's first manufacturing gear skiving machine is in Maniago. "For us, skiving is a new and very interesting topic. Together with Liebherr, we have the opportunity to jointly develop a new machine with a new process. Liebherr is familiar with all challenges of mass production – we have access to the developers and can bring about improvements, both to the machine, and to the process and tools." The Liebherr skiving^3 (machine, tool, and technology) approach is also very effective in the collaboration with SIAP.

Focus on costs and quality

Luca Cadelli, sales manager of SIAP, responds to the question about why SIAP is mainly introducing the new technology: "The market requires this machining method. Gear skiving promises better quality while reducing costs. This combination is irresistible for our customers, because everyone pays attention to costs and quality." Cadelli and De Col expect that a successful introduction of the skiving^3 process will be critical for gaining a competitive edge in the medium term.

At SIAP the LK 500 produces, e.g. various internal gearings – a classic application for gear skiving, as here only the considerably slower gear shaping technology can be used. "We are extremely satisfied with the production speed", reports the COO. "The machine works roughly five times faster than our shaping machines. If we want to expand our production, we compare the procurement of a skiving machine to the pur-

chase of three shaping machines in the latest generation." Other costs are included in this comparison: number of operators, installation space, tool costs and set-up times. "A single machine has clear benefits of course." Even without the gear skiving machine, SIAP currently has a daily production capacity of 3,000 internal gears.

Skiving will partly replace the broaching process

SIAP uses five broaching machines for large quantities. As the broaches are very expensive for low volumes due to the high tool and sharpening costs, SIAP uses broaching for straight gears. The company expects a partial replacement of the process in the future with skiving. "In the future broaching will only be worthwhile for mass productions of part numbers with high volume. Especially for large toothed gears, the tool costs will decide whether we broach or skive", predicts Paolo De Col. From a certain size the broaching tools become so expensive that the process is no longer worthwhile.

Another decisive benefit of skiving: The quality remains consistently excellent across the entire tool life. "The process is completely stable. Skiving thus satisfies four requirements: quality, cost benefit, consistency and reliability of the process."



As SIAP not only produces toothed gears, but also complete gearboxes – for example for forklifts – the company has extensive process and quality competence. The latter is also reflected in the production equipment: Test engineers examine the products in labs for metallurgy, measurements, and purity. One project is "clean production", the contamination-free production for preferably pure components.

"We are always open to innovative approaches and technologies", highlights Paolo De Col. "We are therefore also happy to pursue the skiving³ path with Liebherr." A display of trust which Liebherr appreciates and led to a fruitful partnership. The machine should be fully integrated in production by the end of the year and manufactures the entire range of parts. Then SIAP will decide about more procurements – another LK 500 is also on the wish list. ■



Paolo De Col explains the production schedule at SIAP.

SIAP

Industries:	Automotive, Trucks, Agricultural Equipment, Construction Equipment, Renewable Energies, Rail, Industrial, Material Handling
Company size:	About 350 employees
Founded:	1960
Headquarters:	Maniago, Italy
Parent company:	Carraro Group
CEO:	Paolo De Col
Website:	www.siapgears.com
Liebherr machines at work:	30





Machine tools and automation systems from Kempten

Since 1952 Liebherr has been manufacturing gear cutting machines – at the beginning still in Kirchdorf an der Iller (Germany). In 1962 production was relocated from Kirchdorf to Kempten in the Allgäu. Since 1969 the company has been operating under the name Liebherr-Verzahntechnik GmbH. At the Kempten site, Liebherr has more than 1,100 employees and more than 1,300 employees worldwide.

“Liebherr is part of me.”

Arici Gürhan came to Liebherr in Kempten from Turkey in 1973. His career took him to many places – most recently to Korea.



Arici Gürhan

1973 was not an easy year. In Vietnam, a ceasefire had been agreed to, in USA, President Nixon found himself caught up in the Watergate scandal, in Chile, General Pinochet came to power, and the world struggled with the oil crisis. In Istanbul, the President of Turkey, Fahri Korutürk, opened the bridge over the Bosporus, a symbol of renewal and connection – but unemployment rates in the country were huge at that time. As such, Arici Gürhan was unable to find work in his homeland. Fortunately, the qualified electrician received an offer from Germany: Liebherr-Verzahntechnik GmbH in Kempten desperately seeks employees for a large project. “This was our opportunity. We were 20 skilled workers who came from Turkey to Germany to work with the German colleagues in producing 300 gear-cutting machines for a Russian customer. My job was to handle the “control cabinets”, Arici Gürhan remembers, 44 years later.

“We integrated quickly and worked a lot, after all we came to Germany to make money.” As there was a lack of skilled workers locally, an international team was built which lasted until 1976. Then Arici Gürhan’s contract at Liebherr-Verzahntechnik GmbH was not renewed. He moved to Liebherr in Lindenberg. “There I built conveyor belts and later a packaging factory. Then afterwards I had the opportunity to return to Liebherr-Verzahntechnik GmbH and work on assemblies.”

Five years in Algeria

Initially, he was only meant to spend one year in Algeria to help build a plant there. Ultimately he stayed, five years and those proved to be personally decisive years for Arici Gürhan. “I met my wife there and got married. Algeria was a very special time. The Liebherr family came once a month and visited and supported us. We watched videos together in the evening, which Willi and Hubert Liebherr brought from Germany. At the time we felt very appreciated and developed a strong bond with the company.”

Arici Gürhan’s employment became permanent by Liebherr-Verzahntechnik GmbH and he spent the next 14 years traveling throughout Europe doing assembly and commissioning work: “Thanks to Liebherr I have seen a lot of the world.” He cannot understand young employees, who find traveling for assembly work too exhausting. For him it was always a very intensive experience, which furthered both his career and personal life. At 65 years of age, he still did not want to stop and hence his last business trip became his furthest journey: four months assembly work in South Korea.

안녕하세요 – Annyeonghaseyo

“Older gear grinding machines were to be repaired there. I am of course familiar with all components of recent decades, even if those machines are no longer being produced. So I took advantage of my experience and flew to Korea”, states Arici Gürhan. A real adventure, because he does not speak any English. “I know many languages. Turkish and German of course, French and Arabic through my wife and the long time I spent working in Algeria. However, English and Korean? I quickly had to learn a few words!” Greeting his Korean boss correctly in Korean every morning with “Annyeonghaseyo”, was appreciated just as much as his meticulous work. The machines ran again in the estimated time and his boss would have loved to keep him – but his time in Korea also meant his time at Liebherr was ending.

While other employees look forward to their retirement, Arici Gürhan does not. “I feel fit and would have loved to have continued working for another few years”, the Kempten-based man, who is always on the go, regrets. But he does not run the risk of getting bored. Arici Gürhan is involved in the Integration Advisory Council in Kempten, his wife even became an honorary citizen of the town thanks to her commitment. Intercultural exchange and understanding are very important to the couple. Arici Gürhan is very interested in culture and history – which is why he enjoyed traveling for assembly work so much. However, despite his many hobbies and interests, he is finding it hard to leave: “Liebherr is part of me. I will definitely miss it”, states Arici Gürhan with conviction. ■



1



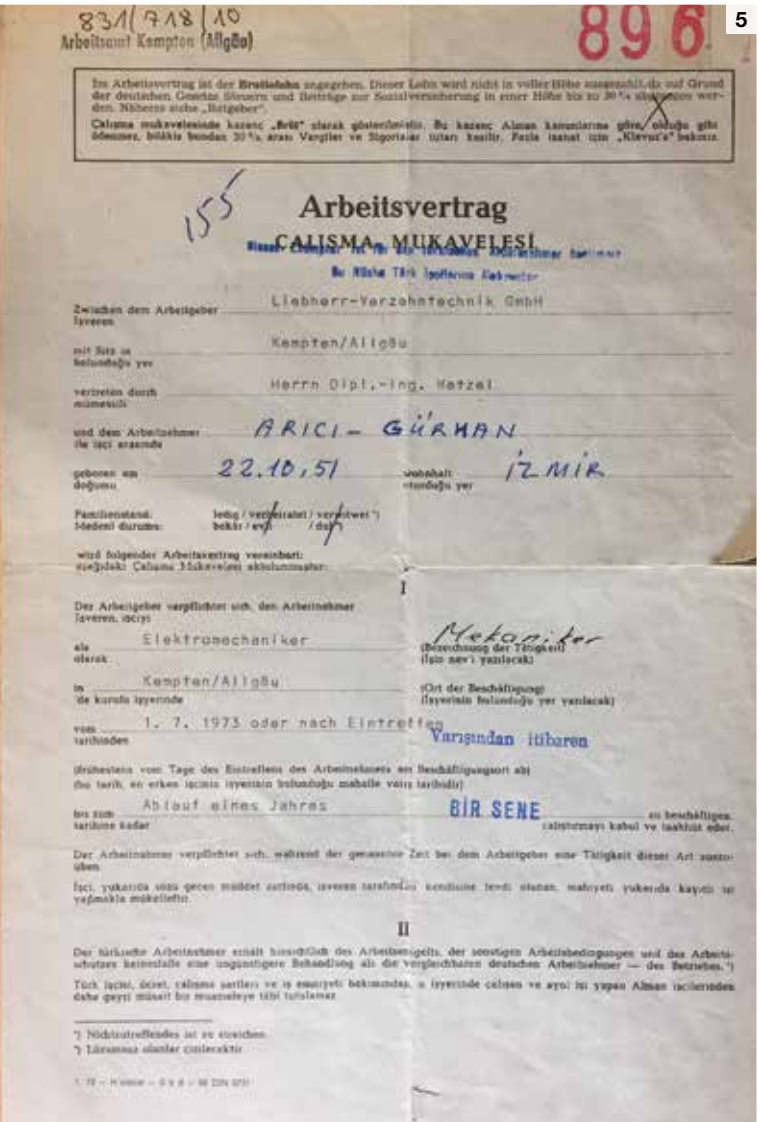
2



3



4



5

831/718/10
Arbeitsamt Kempten (Allgäu)

896

Im Arbeitsvertrag ist der **Bruttolohn** angegeben. Dieser Lohn wird nicht in voller Höhe ausgezahlt, da auf Grund der deutschen Gesetze Steuern und Beiträge zur Sozialversicherung in einer Höhe bis zu 30 % abgezogen werden. Näheres siehe „Ratgeber".

Çalışma mukavelesinde kazanç „Brüt" olarak gösterilmiştir. Bu kazanç Alman kanunlarına göre, olduğu gibi ödenmez, bölükle beraber 30 % arası Vergiler ve Sigortalar tutarı kesilir. Fazla izahat için „Klevuz'a" bakınız.

155

Arbeitsvertrag

ÇALIŞMA MUKAVELESİ

Zwischen dem Arbeitgeber — İşveren: Liebherr-Verzahntechnik GmbH

mit Sitz in — bulunduğu yer: Kempten/Allgäu

vertreten durch — mümessili: Herrn Dipl.-Ing. Metzel

und dem Arbeitnehmer — ile işçi arasında: ARICI - GÜRHAN

geboren am — doğumu: 22.10.51 wohnhaft — oturduğu yer: IZMIR

Familienstand — Medeni durumu: ledig / verheiratet / verwitwet *) bekâr / evli / dul *)

wird folgender Arbeitsvertrag vereinbart: — aşağıdaki Çalışma Mukavelesi akdolunmuştur:

I

Der Arbeitgeber verpflichtet sich, den Arbeitnehmer — İşveren, işçiyi

als — olarak: Elektromechaniker — (Bezeichnung der Tätigkeit) (İşin nev'i yazılacak): Mekanisyer

in — de kurulu işyerinde: Kempten/Allgäu — (Ort der Beschäftigung) (İşyerinin bulunduğu yer yazılacak)

vom — tarihinden: 1. 7. 1973 oder nach Eintreffen — Varışından itibaren

(frühestens vom Tage des Eintreffens des Arbeitnehmers am Beschäftigungsort ab) (bu tarih, en erken işçinin işyerinin bulunduğu mahalle varış tarihidir)

bis zum — tarihine kadar: Ablauf eines Jahres — BİR SENE — zu beschäftigen. — çalıştırmayı kabul ve taahhüt eder.

Der Arbeitnehmer verpflichtet sich, während der genannten Zeit bei dem Arbeitgeber eine Tätigkeit dieser Art auszuüben.

İşçi, yukarıda yazılı geçen müddet zarfında, işveren tarafından kendisine tevdi olunan, mahiyeti yukarıda kayıtlı işi yapmakla mükelleftir.

II

Der türkische Arbeitnehmer erhält hinsichtlich des Arbeitsentgelts, der sonstigen Arbeitsbedingungen und des Arbeitsschutzes keinesfalls eine ungünstigere Behandlung als die vergleichbaren deutschen Arbeitnehmer — des Betriebes. *)

Türk işçisi, ücret, çalışma şartları ve iş emniyeti bakımından, o işyerinde çalışan ve aynı işi yapan Alman işçilerinden daha gayri müsait bir muameleye tâbi tutulamaz.

*) Nichtzutreffendes ist zu streichen.
*) Lâzımsızı silinecektir.



6

1. Arici Gürhan at Liebherr in Algeria, 2. Contract signings in Algeria, 3. Arici Gürhan with his wife, 4. Adventurous getaways, 5. Arici Gürhan's contract from 1973, 6. The electrical mechanic at his daily work

Liebherr trainees benefit from Erasmus+

In cooperation with the Erasmus+ program, Liebherr offers trainees the opportunity to take part in an international educational exchange.

On January 24, 2017 the official event "30 Years of European Cooperation in the Field of Education" took place at the Berlin Congress Center. In addition to the Federal Chancellor Angela Merkel and various representatives from the Federal Ministry and the European Union, Liebherr-Verzahntechnik GmbH also extended its congratulations on the occasion of the anniversary. The company was delighted to be invited to Berlin for the official event as one of the five best training companies taking part in the Erasmus+ exchange program in Germany.

The Kempten-based plant offers its trainees the opportunity to work for four weeks in Norway within the framework of the European exchange program. With its Norwegian partner schools and host companies, Liebherr-Verzahntechnik GmbH found the perfect partners for the exchange program. The exchange with Norway has now been offered for 13 years, and has been partly financed through Erasmus+ since 2011.

A win-win situation

The majority of young employees gain experiences in other countries eventually. According to Hubert Hemmerle, Personnel Officer at Liebherr-Verzahntechnik GmbH, not only the trainees benefit from this exchange, but the company and customers as well. "We are an internationally aligned company and therefore employees with good language skills and intercultural experiences are the basis for successful work."

Liebherr-Verzahntechnik GmbH has exceeded the German government's aim to give ten percent of all trainees in a company the opportunity to work abroad by 2020, as 90 percent of all its trainees already spent four weeks abroad during their training.

The Erasmus+ program of the European Union was set up in 1987 to promote and support the exchange of students in Europe. The current exchange program not only supports students, but also people of different age groups and education levels, and helps them acquire occupational and intercultural skills in the areas of youth, sport, and vocational training.



From left: Lena Leidl (electronics technician at Liebherr-Verzahntechnik GmbH in her 3rd year of training) and Walter Ferstl (Training Manager at Liebherr-Verzahntechnik GmbH) with the Federal Minister of Family Affairs, Senior Citizens, Women, and Youth Manuela Schwesig.

Guest in Trondheim

Lena Leidl is currently training to become an electronics technician in production engineering at Liebherr-Verzahntechnik GmbH. During her two-year training course, she also spent four weeks in Trondheim, Norway. Not only she obtained insights into the Norwegian training system and way of working, but also learned a great deal about the culture of the Scandinavian country.

How is the training in Norway different from the training in Germany?
Lena Leidl: In Norway, the students attend a secondary school for two to three years, which is comparable to the German vocational school. Then they can start a training program in the respective companies, which is significantly shorter than in Germany.

How is this reflected in the exchange program?
Lena Leidl: At the beginning of the first working week, we visited the vocational school in Trondheim and became familiar with the different training programs. We received a detailed insight into the automation area. In small groups, we had the opportunity to exchange our knowledge and solve programming tasks together, such as “chocolate transportation”. In the following days, I worked in the Nidar chocolate factory.

What do electronics technicians do in a chocolate factory?
Lena Leidl: They eliminate problems in the event of a standstill in production or replace old electronic components. I was extremely impressed by the old machines because at Liebherr, work is mostly only carried out using the latest products. The oldest machine there dates back to 1930 and is still in use.

What impression did you gain of the Norwegian working world?
Lena Leidl: The motivation of the employees who solved the various problems and the personal working atmosphere were very noticeable. My colleagues took the time to explain things to me and always answered my questions in a friendly manner.

How was the accommodation in Norway?
Lena Leidl: We lived in a shared apartment where the Norwegians often visited us. Collective cooking or card games in the evening were great fun, and our group grew closer. The location was very central which means we could walk a short distance to the city center and didn’t have to endure long bus journeys to our work place.

Would you go abroad again?
Lena Leidl: Definitely! This year, I am going to spend three weeks working at our plant in Bangalore, India. This is a work placement without an exchange program, and I’m really looking forward to it. ■



Erasmus+ makes it possible
In 2016, Lena from Liebherr-Verzahntechnik GmbH and Stian from Strinda vgs worked together in the Nidar chocolate manufacturer in Trondheim as part of the Erasmus+ trainee exchange program. They played a role in ensuring that production ran smoothly at Nidar.

Exactly one year later, they are back working together again, but this time at Liebherr in Kempten. To ensure Stian does not get bored in his spare time, Lena took him on an evening ski trip with some Liebherr employees.

Stian’s feedback: It was hard for me to reach the top of the mountain, but I had a great day with Lena.

Walter Ferstl
Training Manager

Kaufbeurer Straße 141,
87437 Kempten, Germany
Phone: +49 831 786-1229
walter.ferstl@liebherr.com



A powerful partner in China: STON

China is the biggest market for machine tools. But economic viability suffers if large and heavy parts have to be imported. For this reason, the Liebherr automation division officially agreed a mutually beneficial cooperation with the Chinese manufacturer STON at the AMTS Shanghai in 2016.



"Contacts between the companies had long been ongoing", reports Martin Winterstein, Head of Global Business Development & Market Sales, Automation Systems. "We have now completed the first successful projects together, for example a transmission production facility with four production lines."

STON manufactures high-quality automation systems such as gantry portals, robot cells and conveyor systems. The company was founded in 2010 and has realized projects for numerous gantry portals and, for example, production lines for crankshafts and pistons. The customers are primarily Chinese OEMs and their suppliers.

"The companies support each other mutually in different roles: When Liebherr acquires a project, we procure subassemblies, components, belts, oil pans and supports (low tech) from STON. Here we speak of Liebherr and Liebherr quality. Purchased items are examined for quality – shipping costs are reduced and time is saved. When STON acquires a project, we provide engineering and software support. That is then the STON brand, and not Liebherr", explains Martin Winterstein.

Increasing production costs in China have caused a trend toward automation here which has been accelerating for years. Especially high in demand are gantry systems such as the LP 100 from Liebherr, which provides particularly high flexibility and is available especially for high-speed applications and heavy loads. Together, Liebherr and STON have excellent chances of success. ■

New sales representatives for automation systems



The automation systems division of Liebherr added new partners in order to increase local support for customers. The experts from OCH are available as official sales partners in Bavaria, Saxony, and Thuringia. In Austria, Franz Stadler Werkzeugmaschinen (FSWM) has been a partner of Liebherr-Verzahntechnik GmbH for a long time. In 2017, the company also took over the sales and marketing of automation systems. Dipl.-HTL-Ing. Reinhard Simon is delighted with the stronger collaboration. “With the broad product range of linear gantries, pallet handling systems, robot systems, etc. we can realize projects in all areas of manufacturing and assembly.”

There are also two new representatives on the American continent. Dynamic Machine of Detroit is responsible for the US state of Michigan and the Canadian province of Ontario. DMOD is a partner for both gear technology and automation systems. The same applies to Simsa. The experts for automotive and aerospace technology are the new partners in Mexico. ■

Martin Winterstein
Head of Global Business Development & Market Sales
Automation Systems

Kaufbeurer Straße 141,
87437 Kempten, Germany
Phone: +49 831 786-3331
martin.winterstein@liebherr.com



Contact

Germany

OCH GmbH
Fischbacher Hauptstraße 156
90475 Nürnberg
Phone: +49 911 83307 - 0
info@och.de
www.och.de

Austria

FSWM GmbH I Franz Stadler Werkzeugmaschinen
Schlag bei Thalberg 120
8241 Dechantskirchen
Phone: +43 3339 25125
office@franz-stadler.at
www.franz-stadler.at

Mexico

Simsa
Ocotillos 3650 Jardines de San Francisco Chihuahua
Chihuahua 31125
Phone: +52 (614) 427 2568
www.simsainc.com

USA

Dynamic Machine of Detroit
1653 E. Maple Road,
Troy, MI 48083
Phone: +1 (248) 404-6190
info@dynamicdetroit.com
www.dynamicdetroit.com

Canada

Dynamic Machine of Detroit / Canadian Division
3350 Fairview St., Suite 3–116
Burlington, Ontario L7N 3L5
Phone: +1 (905) 681-0387
info@dynamicdetroit.com
www.dynamicdetroit.com

Prestigious award for Liebherr “Bin Picking solution”-Application



Martin Winterstein (left) and Thomas Mattern are happy to receive the “Best of Industry” award.

The trade journal MM MaschinenMarkt honors the best the industry has to offer with their “Best of Industry” award every year in eight categories. Liebherr Automations systems participated for the first time, entering with their Bin Picking application and winning the prestigious award. The honoring speech highlighted the design combination of the vision system and the robot arm. These new designs make it possible to remove components arranged chaotically from a box, which is up to one meter deep, and to either sort or transfer them into their correct locations.

The winner is chosen by a panel of experts, the MaschinenMarkt editorial team, and by a readers’ poll. “We would like to extend sincere thanks to all participants of the online readers’ poll on maschinenmarkt.de“, stated Martin Winterstein and Thomas Mattern during the awards ceremony. “The award motivates us to look for innovative customer solutions in this very exciting field.” ■

Liebherr receives John Deere’s Achieving Excellence Award for the second time

“We are proud that our long-standing customer John Deere honored us with this award for the second year in a row”, explains Karl Sauterleute, Sales Director Gear Cutting Machines at the Liebherr plant in Kempten. This confirms the strong alignment of the company towards customer focus, quality, and technological advances. This award is ultimately for partners who distinguish themselves in terms of product quality, technical support, delivery reliability, customer understanding, and cost management.

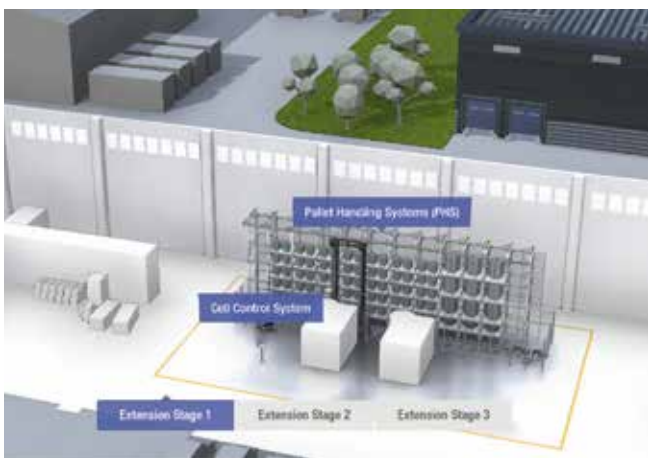
With the excellence initiative, John Deere promotes continuous improvement of the supply chain, from which both the company and the suppliers should benefit. Samuel R. Allen, Chairman and Chief Executive Officer of Deere & Company: “We aim to build strong relationships with suppliers, who can contribute distinctive values to our products and services, whereby we obtain significant competitive advantages.” The quality awareness of Liebherr fits this motto. ■

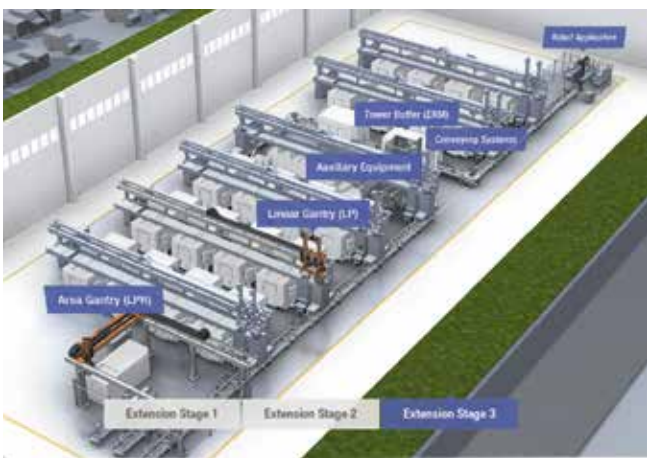


Beautiful new automation world

The interactive application "World of Liebherr Automation Systems" was developed especially for trade shows and exhibitions and enables visitors to visit a fictitious factory environment at the booth of Liebherr Automation. In various virtual production halls, one is able to become familiar with the product portfolio- starting from the gantry robot or the pallet handling system all the way through to Bin Picking solution. The interactive application can thus convey the broad range of the Liebherr automation world in 3D, made available to the visitor by just one finger touch. This tool, developed by the agency Stoll von Gáti, received the "Annual Multimedia Award 2017", awarded by the "Yearbook for Digital Marketing". The committee provides an overview of the digital advertising year, documents the status quo, and identifies upcoming technology trends. The premiere of the beautiful new automation world was at AMB 2016 and since then it has become an integral element of the trade show concept. Sales employees can now also access a tablet version in customer meetings. ■







The intelligent refrigerator of tomorrow

The Internet of Things is all around us and has now also arrived in the modern kitchen environment. Liebherr is taking a logical step forward in the direction of digitalisation: refrigeration and freezer appliances being able to network with mobile devices via the new generation of the SmartDeviceBox, enabling innovative household grocery management at home and on the move. In the process, open standards and modular units create the prerequisite that Liebherr's long-life appliances are also expandable and adaptable well into the future.

Pioneering food and groceries storage employing innovative refrigeration and freezing technologies has long been part of the core competences of Liebherr. Now Liebherr is going one step further, setting course for domestic groceries management with the help of digital offerings and mobile services.

Digitalisation for daily routines

Digitalisation and the networking of domestic appliances alter consumers' expectations. It's no longer simply about buying an individual refrigerator or freezer appliance; it's now about the intelligent interplay of networked solutions that simplify household routines. In this sphere Liebherr places the convenience of the customer at the forefront with digital products and services which offer real added value.

"Technological progress is not an aim in itself. Not every technical possibility has to have an application in daily life," asserts Steffen Nagel, CEO of Liebherr Hausgeräte GmbH. "When it comes to digital offerings, we are very close to the consumer and we constantly ask ourselves: What do new living con-



Stored groceries can be recorded and monitored by using cameras with object recognition and a voice module.



The new generation of the SmartDeviceBox allows the customer to digitally interact with their Liebherr refrigerator and opens up new dimensions in food and groceries management.

cepts and circumstances, such as mobility, urbanism and the desire for healthy nutrition mean to the consumer and how can technology specifically support them?"

Liebherr refrigerators will in future help in shopping and meal planning. Stored groceries can be recorded and monitored by using cameras with object recognition and a voice module MIA. In this process cameras not only show images, they also recognise the individual foods inside the refrigerator. This information then flows automatically into an inventory list. This lets the customer see quickly and clearly what is in the refrigerator. Using the voice module they can then add additional groceries, thus creating their shopping list. Using an app for iOS, Android or Windows they can also access their shopping lists while they are on the move.

Microsoft as a strong partner in the digitalisation offensive

The cooperation with Microsoft is a component of the Liebherr household appliances division's digital offensive. Microsoft is a strong partner to complement Liebherr's competence in the field of refrigeration and freezing technology and it brings the latest technologies into the digital offerings. The new generation SmartDeviceBox is one result of this cooperation. The high-performance hardware and the Windows 10 IoT Core operating system augment the appliances and equip the consumer for future digital scenarios. The system is designed to have a long life: Modular units can be integrated and upgraded at any time in existing SmartDevice-capable appliances. The open standards enable adaptation for future offers and services. With this Liebherr offers the widest range of intelligent refrigeration appliances on the market. ■

Your Solution Providers

Liebherr-Verzahntechnik GmbH
Gear Technology and Automation Systems
Kaufbeurer Strasse 141
87437 Kempten
Germany
Phone: +49 831 786-0
Fax: +49 831 786-1279
info.lvt@liebherr.com

Liebherr-Verzahntechnik GmbH
Ettlingen Plant
Hertzstrasse 9–15
76275 Ettlingen
Germany
Phone: +49 7243 708-0
Fax: +49 7243 708-685
tools.lvt@liebherr.com

Liebherr Machine Tools India Private Limited
353/354, 4th Main, 9th Cross, 4th Phase
Peenya Industrial Area
Bangalore – 560 058
India
Phone: +91 80 41 1785-91
Fax: +91 80 41 272625
info.mti@liebherr.com

Liebherr-Gear Technology, Inc.
Liebherr Automation Systems Co.
1465 Woodland Drive
Saline, MI 48176–1259
USA
Phone: +1 (734) 429-7225
Fax: +1 (734) 429-2294
info.lgt@liebherr.com

Liebherr-Utensili S.r.l.
Via Nazioni Unite 18
10093 Collegno TO
Italy
Phone: +39 114 248711
Fax: +39 114 559964
info.lut@liebherr.com

OOO Liebherr-Russia
Bolshoy Palashevskiy pereulok 13/2
123104 Moscow
Russia
Phone: +7 495 280 18 91
Fax: +7 495 280 18 92
info.lru@liebherr.com

Liebherr Brasil Guindastes
e Máquinas Operatrizes Ltda.
Rua do Rocio, 288 Salas 81/82
Vila Olímpia
04552-000 São Paulo - SP
Brasilia
Phone: +55 11 2221 3519
Phone: +55 11 3538 1509
info.lbr@liebherr.com

Liebherr Machinery Service
(Shanghai) Co. Ltd.
Building 1, 88 Maji Road
Waigaoqiao FTZ
200131 Shanghai
P.R. China
Phone: +86 21 2893 8088
info.lms@liebherr.com

Liebherr Japan Co. Ltd
3-7-8, Kudan-Minami
Chiyoda-Ku, Tokyo
102-0074
Japan
Phone: +81 3 6272-8645
info.lvt.ljc@liebherr.com

Liebherr Machine Tools and
Automation Korea Ltd.
174-30, Saneop-ro, Gwonseon-gu
Suwon-si, Gyeonggi-do
Korea
Phone: +82 31 294 9888
info.mak@liebherr.com

Liebherr-Verzahntechnik GmbH
6 Place Du Village
92230 Gennevilliers
France
Phone: +33 1 412110-35
info-machineoutil@liebherr.com

www.liebherr.com

LIEBHERR