





New assembly hall

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New assembly hall

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THINKING BEYOND

Finding tomorrow's solutions today.

"Thinking beyond" – to think outside the box is the guiding principle of our company. Together with my dedicated employees we develop tomorrow's innovations as early as today. We optimize existing technology and automate complex processes.

At Makkon GmbH, we use all our knowledge, experience and common sense to come up with solutions that guarantee real added value for our customers. The systems we manufactured operate all over the world – in the USA, China, Russia, and of course in Europe our customers appreciate our commitment to automation and forward-thinking.



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Ing. Markus Koell
CEO

ONE STOP SHOP FOR AUTOMATED SYSTEMS

Makkon GmbH has been developing and manufacturing its own systems since 2013. Additional to the modern CAD/CAM department, a new 540 m² assembly hall now houses state-of-the-art machines such as a CNC lathe and milling machine to facilitate production. With two indoor cranes, up to 10 tons of weight can be lifted. The development and construction takes place in our company, as well as the production of systems including the control technology and final assembly with training at the customer. Makkon GmbH now employs more than 25 highly qualified workers.



The Makkon Team

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AUTOMATED HARDNESS TESTING SYSTEMS FOR STEEL PRODUCTION



For our solutions in the field of hardness testing, we have been working together with QATM Salzburg, one of the market leaders in the manufacture of probes, since 2014.

QATM hardness testers cover the entire test load range and all standard test methods such as Vickers, Brinell, Knoop & Rockwell. The hardness testers are characterized by technical innovations, extreme precision and maximum ease of use and have modern digital interfaces with higher-level systems.

Hardness testing of workpieces represents the essential quality assurance in steel production. Ideally, it is carried out immediately after heat treatment in order to identify defective products immediately. In order for the testing process to be carried out, the surface must be prepared accordingly. This preparation (usually grinding up to 7 mm deep)

often takes a lot of time and is cumbersome. In order to facilitate the production and testing process and to save valuable time, we at Makkon manufacture production-related, fully automated systems for the entire process.

The preparation of the parts to be tested for a standard-compliant hardness test, i.e. the positioning of the workpiece, the processing of the surface with grinding or milling units, and also the subsequent testing process is carried out fully automatically in one system.

Each component can be labeled directly with the respective results or marked with an unmistakable QR code. At the same time, the data is transmitted digitally to PLS or ERP systems.

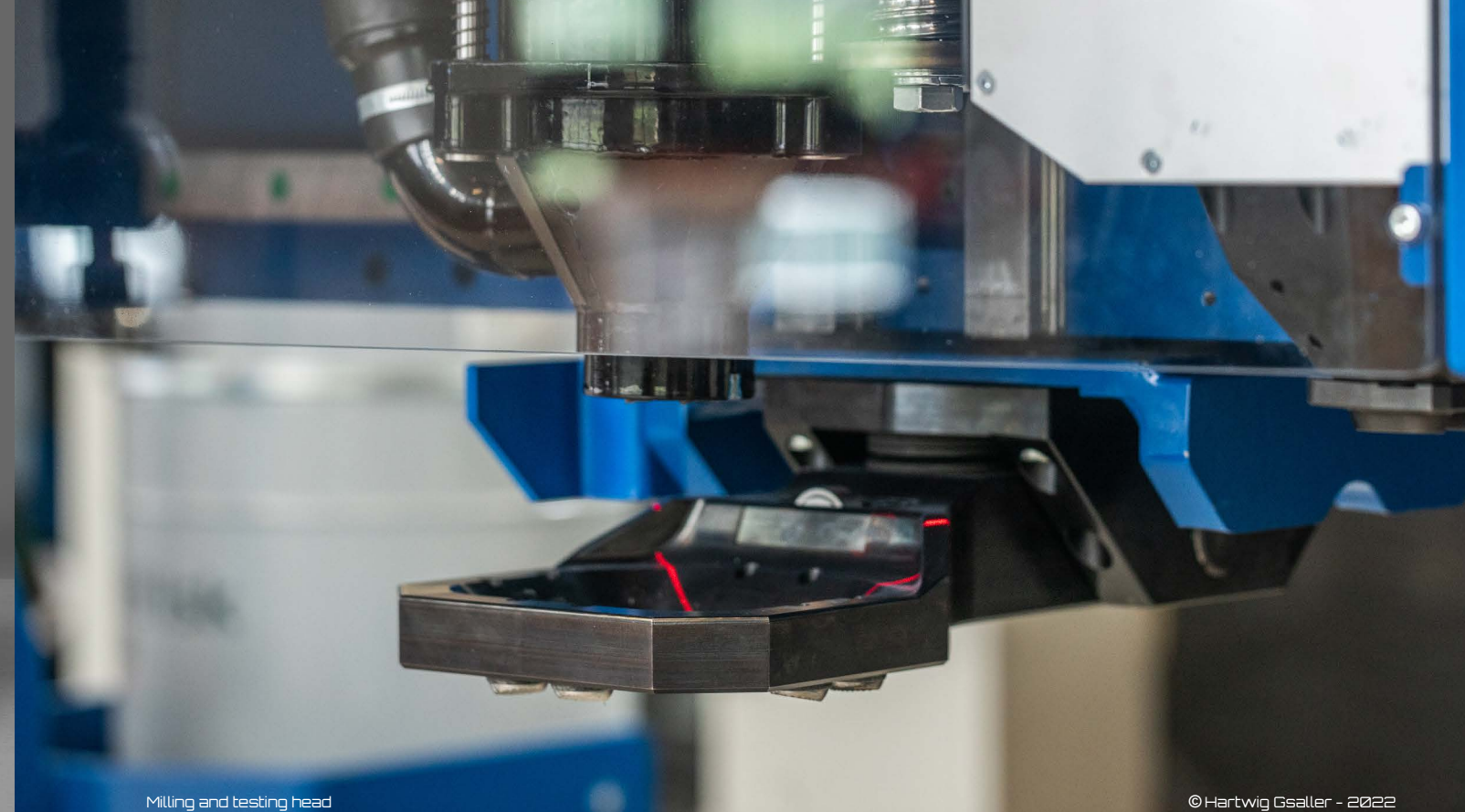
When designing hardness testing systems, our design team focuses specifically on problem solving and production optimization in order to guarantee a simple, unmanned, safe and production-oriented and -optimized process and high-quality hardness testing. All hardness testing systems are individually adapted, planned and manufactured for the respective type of production.





Hardness testing portal

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Milling and testing head

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BRINELL HARDNESS TESTING PORTAL HBW 10/3000

The fully automatic Brinell testing portal was developed for hardness testing of open-die forged shafts (round and rectangular in cross section), forged bars (round and rectangular in cross section) and seamless rolled rings. With a test area of 7100 mm x 2700 mm, both large and small parts can be tested.

The system carries out the testing of the components fully automatically. The process includes positioning the machine on the respective component, milling the surface layer (material-specific, but no more than 7 mm), moving the axis, hardness testing and subsequent data transmission. The milling/testing coordinates are taught manually by the system operator using a coordinate measuring arm (teach arm).

The portal then moves to the specified coordinates in the order specified by the operator and carries out the respective hardness test there.

At the end of the test series, the portal moves to a safe position. When the system has reached the defined position, the test area can be accessed again by the operator – without causing any disruption to the system.

The test cycle consisting of milling, testing and data transmission to the PLS-WB is completed in a maximum of 75 seconds at a milling depth of 3 mm.



HARDNESS TESTING

TECHNICAL DATA

| | |
|-----------------------------|-----------------------------------|
| Dimensions: | 4300 x 1900 x 4000 mm (L x W x H) |
| Weight: | approx. 3500 kg |
| Testing area: | 7100 x 2700 mm (L x W) |
| Max. Testing height: | 1200 mm |
| Traversing speed of Portal: | X axis: 500 mm/s |
| | Y axis: 300 mm/s |
| | Z axis: 300 mm/s |



Milling and testing system

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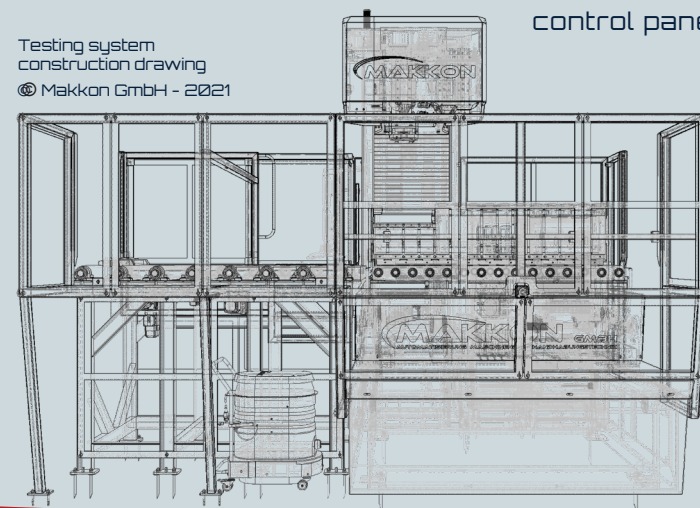
Testing system wit swiveling table

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MILLING AND TESTING SYSTEM USA

Makkon GmbH has been cooperating with QATM (Salzburg) since 2014. This collaboration also resulted in the project for a big producer in the steel industry in the USA. This customer with thousands of employees worldwide was looking for an automated solution for the extremely personnel-intensive and difficult inspection and testing work on their products weighing up to eight tons.

This was solved using a milling and hardness testing system with vertical drive and a 90° swivel table for workpiece manipulation, which brings the products into the respective test position. Two integrated, servo-controlled roller conveyors are attached to the existing roller conveyors which transport the workpieces to and from the system. After the process, the milling pattern, test pattern and measurement results are displayed on the control panel.



Testing system
construction drawing
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HARDNESS TESTING

TECHNICAL DATA

| | |
|---------------------------|----------------------------------|
| Dimensions: | 5000 x 3700 x 4000mm (L x w x h) |
| Swivel angle: | 90° |
| Traversing speed: | max. 50mm/sec |
| Max. weight of workpiece: | 8 tons |
| Controlled servo axes: | 13 |



Hardness testing system for crankshafts

© QATM - 2019

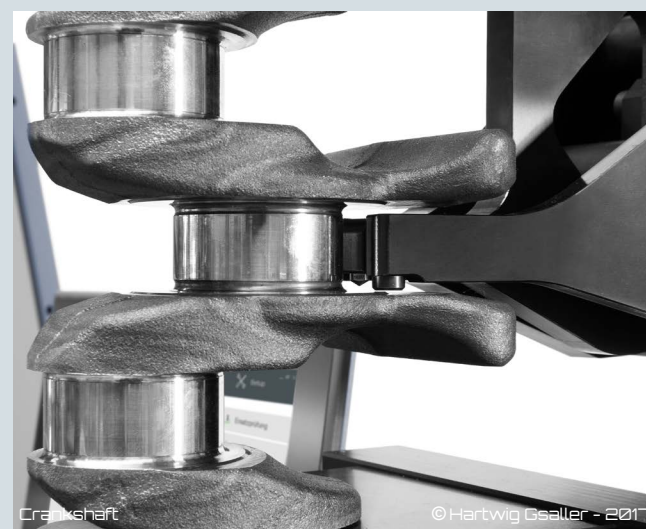
HARDNESS TESTING STATION FOR CRANKSHAFTS

This hardness testing station was developed together with QATM, which makes the testing of crankshafts more ergonomic for a well-known Upper Austrian engine manufacturer. The areas to be tested are often very inaccessible.

The heart of the system is a floating eccentric testing device developed by Makkon, with which an HRC 150 (Rockwell) hardness test can be carried out in the main and secondary bearing points on all four quadrants.

The various crankshaft types from the manufacturer are clamped between centers, like on a lathe. The test system can be positioned manually, easily and quickly to the test point. The testing process in the floating clamp is fully automatic.

Near-series standard machines from QATM were positioned to the left and right of the hardness testing unit, with which sidewall and sprocket tests can be carried out.



Crankshaft

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Special solution hardness testing system

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QECO 150 HRC SPECIAL HARDNESS TESTING SYSTEM

This system was developed to test the hardness of tools and dies with deep recesses (Rockwell hardness test method).

The maximum depth at which the test can be carried out depends on the length of the test mandrel, which in this case can be exchanged. The swinging of the machine stand and the extension (Y-axis) is carried out easily and manually by the operator.

A force of only 2-3 kg is required. Only the Z-axis is powered. An innovation was developed for this purpose: a sensitive handle that converts the operator's movement up and down into an average traversing speed. The traversing speed of the Z-axis reaches 50 mm/s in rapid traverse.



Sensitive handle control

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Cylinder head test stand

© Hartwig Gsaller - 2019

HIGH SPEED CYLINDER HEAD HRC 150 TEST STAND

During the production of cylinder heads, these must be subjected to random or 100% hardness testing after heat treatment.

Makkon GmbH developed an extremely fast HRC 150 (Rockwell) testing system for a customer in China, with which a freely programmable hardness test can be carried out at up to six different points.

The hardness testing system is an integral part of a fully automatic heat treatment line and is loaded and unloaded by a robot.

The measurement results of the test points are reported directly to the higher-level process control system and are being saved.

The machine is equipped with an industrial Siemens S7 controller, and servo-controlled synchronous motors are installed in all axes. This allows a test cycle with six test points to be completed in less than one minute.



Testing of Cylinder head

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Hardness testing bench

© QATM - 2020

TEST BENCH WITH INTEGRATED SURFACE PREPARATION

This Brinell HBW 3000 test stand enables sample preparation and hardness testing in one setup.

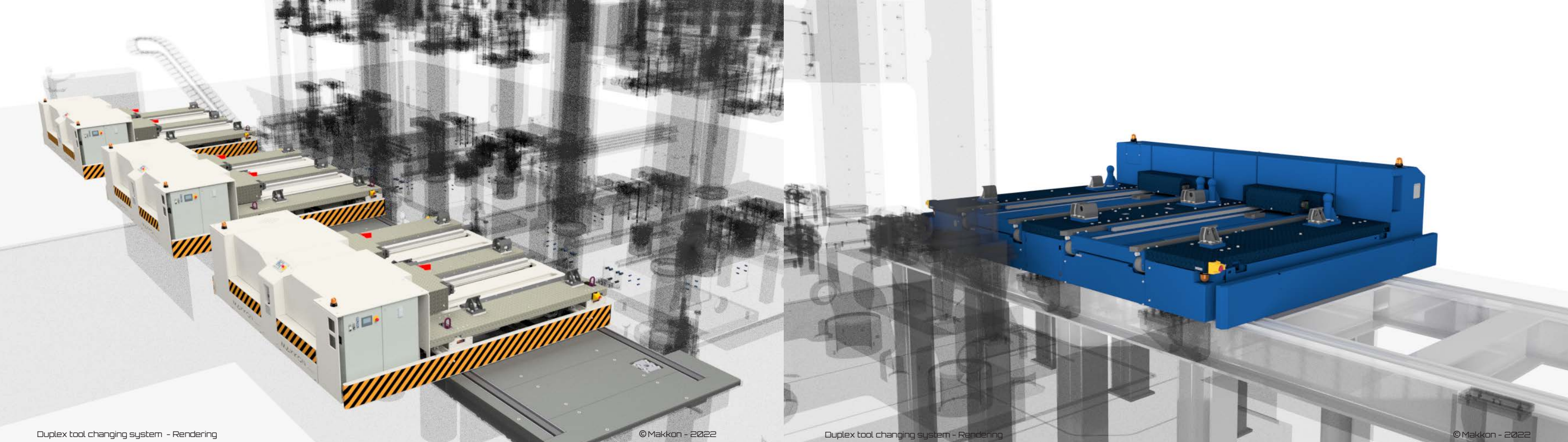
The samples are clamped to the manually moveable table using T-slot clamps and are positioned under the built-in grinding wheel. The operator can precisely set the desired test position using a cross line laser. Now the operator uses the manual crank to move the grinding wheel with integrated suction downwards and thus grinds the sample at the point where the subsequent test is to take place.

The operator then manually slides the clamping table under the testing machine using a snap-in system and the automatic hardness test can be started.



Preparing the surface

© QATM - 2020



AUTOMATED TOOL CHANGING SYSTEMS FOR STEEL PRODUCTION

Ever since Makkon GmbH was founded, we have been developing and manufacturing tool changing systems for closed-die forging presses. International producers in China, Russia, Hungary, Germany and Austria rely on the expertise of our team.

These systems enable easy, fully automatic and highly efficient changing of tools weighing up to 200 tons for large forging die presses. With our systems, the set-up times for these presses are reduced tremendously.

The process takes place at an unbeatable time of less than five minutes for a complete press changeover. The die changing carrier (or several) transports the dies automatically on track systems or plain ground. Inductive energy supply, energy chains or underfloor sliding contact can be used for energy and

data connection. Set-up platforms for preparing the forging dies can be offered individually. The changing process takes place using fully servo-electric systems with or without hydraulics.

At Makkon, we attach great importance to a high level of safety throughout the entire process, with protective grids, laser scanners or light grids to protect employees and prevent damage. In our systems, data is constantly transmitted via WLAN or data cable.

Simplex tool changing systems (bottom right) represent a more cost-effective version for the tool changing process alongside the duplex systems (top), whereby only one tool is transported instead of two. Although this increases the set-up time, the investment costs are kept low.

Operation can be fully automatic or manual using an enabling button, either independently or with communication to the press control system.

One of Makkon GmbH's customers, for example, is specialized in the manufacture of aluminum truck rims. For this process, the rims have to go through a total of three different, consecutive press stations. The individual stations are equipped independently and fully automatically with three tool changing systems, which move independently on a track next to each other (top left).

In order to be able to complete the tool change in a cycle time of less than five minutes on all three presses, the so-called "Duplex" system is used here.

Each press station has a changing carriage with two changing platforms. While the tool is pulled out of the press with the first platform, the next tool is ready on the second changing carriage so that it can be pushed directly into the press.



Simplex tool changing system

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Duplex tool changing system - Rendering

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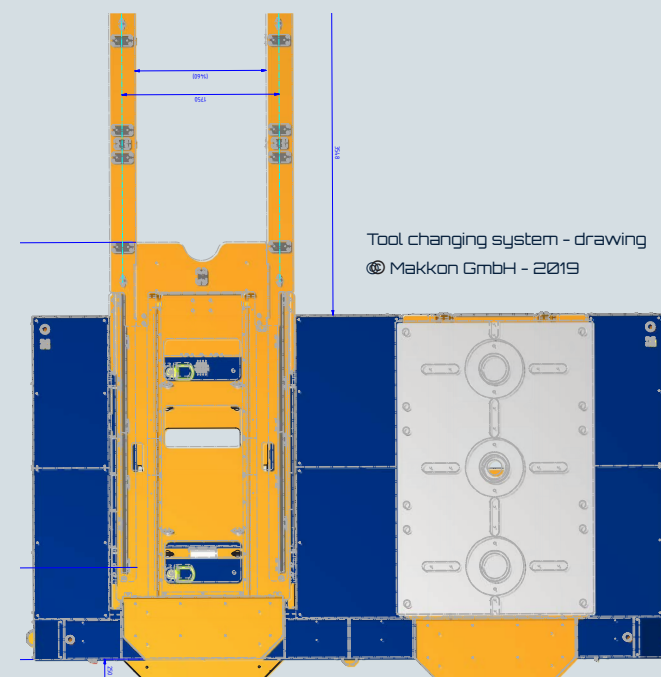
Platforms / Tracks

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DUPLEX TOOL CHANGING SYSTEM 2 X 85 TONS

A manufacturer of aircraft components has been a customer of Makkon GmbH for many years. A fully automatic, free-moving duplex changing carriage system was developed for the automatic forging die change and the transport of the heavy dies to the set-up platforms.

With this, the tool change can take place in the most effective way directly in front of the press. On the freely accessible area in front of the press, the area scanners attached to the tool carrier ensure maximum safety and reliably monitor the dangerous areas. In order to be able to set up the respective tool in an ergonomic position, the two set-up platforms were equipped with a lifting platform that can be raised and lowered. In order to be able to comply with all necessary safety precautions, a self-contained shelter was also designed here.



Tool changing system - drawing
© Makkon GmbH - 2019



TOOL CHANGING

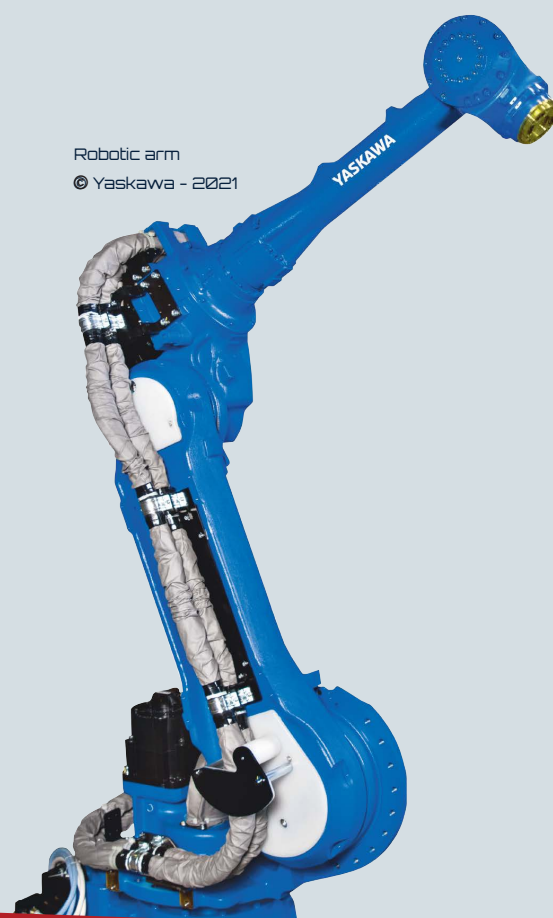
TECHNICAL DATA

| | |
|-------------------|----------------------------------|
| Dimensions: | 6750 x 4000 x 865 mm (l x w x h) |
| Weight: | approx.. 28 000 kg |
| Payload: | 2 x 85 t |
| Travel length: | ca. 35 m |
| Traversing speed: | 0,5 m/s |
| Changing time: | < 10 min |

Components produced: Aircraft components



GENERAL AUTOMATION IN THE STEEL INDUSTRY



In addition to the areas already described, on which Makkon has particularly concentrated in recent years, tailor-made solutions for all other processes in steel production are also being designed and built on an ongoing basis.

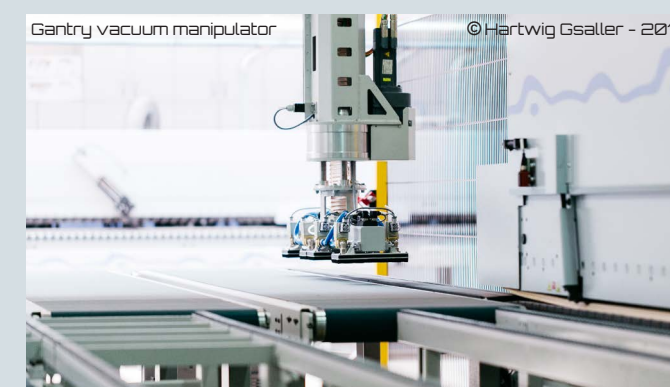
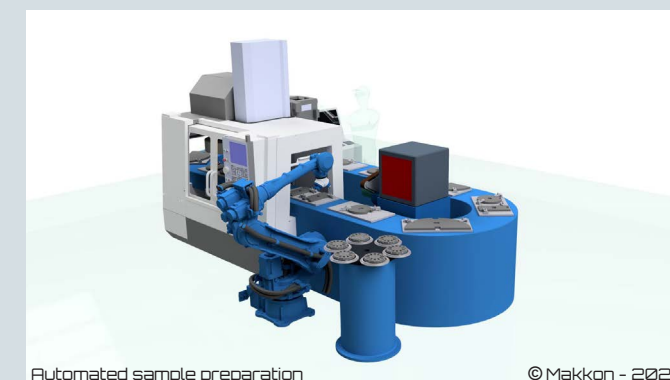
Automated systems are created in all areas within production chains (conveyor technology, handling technology, etc.) in order to optimize production.

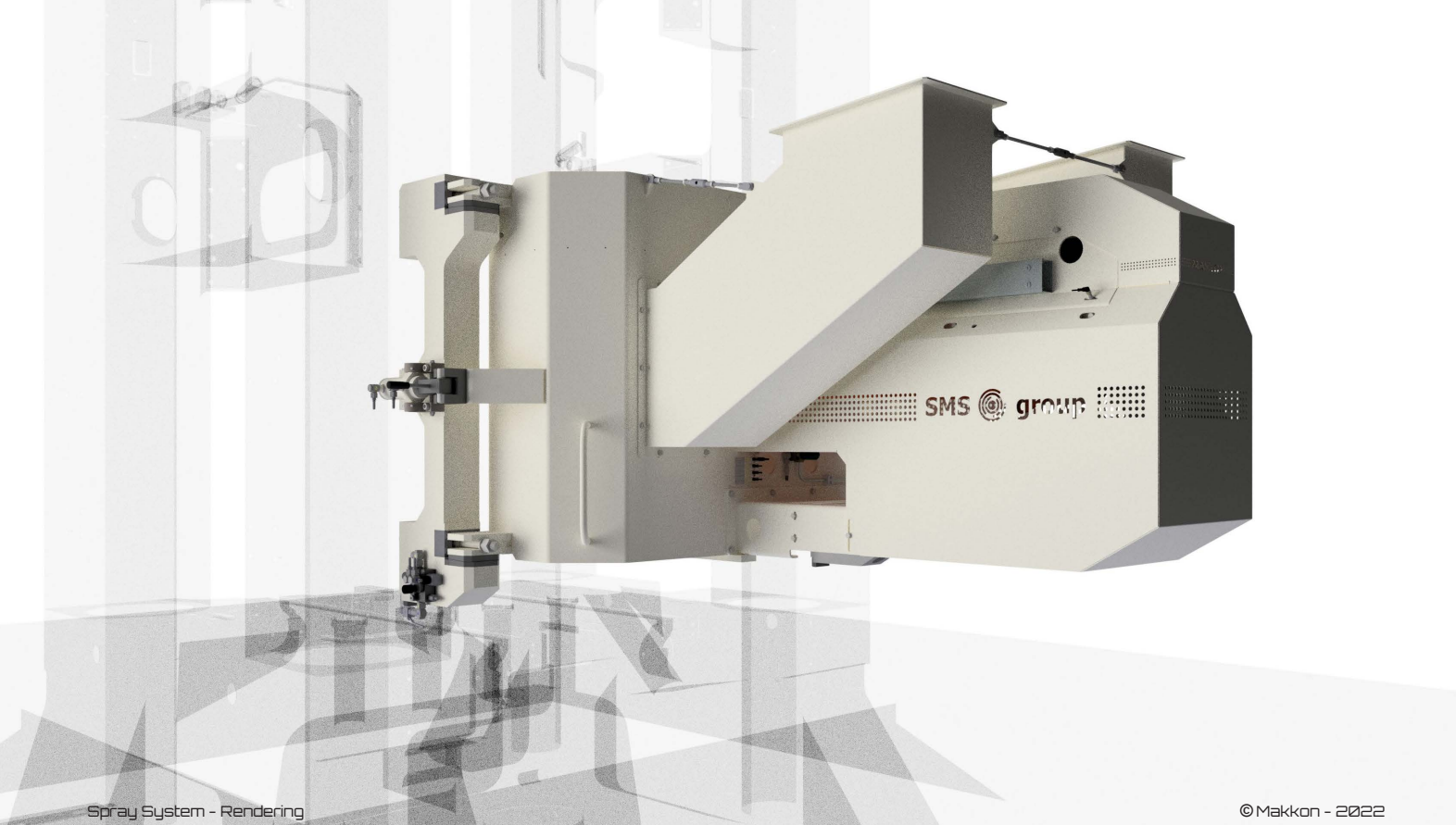
More and more companies are opting for partially or fully automated production in their companies to compensate for the lack of skilled employees and to relieve employees from difficult work steps. At the same time, efficiency and output increase with the same amount of employees.

Another advantage that speaks for automation is the assurance of quality standards and the reduction of errors with end-to-end part-tracking and identifiers of each product stored in the database.

An ergonomic system design creates a pleasant workplace, which ensures less fluctuation among employees. A high system availability (98 - 99%) ensures consistent and plannable capacities.

Makkon systems are individually adapted to each customer in order to achieve an optimal solution with the highest efficiency. To create a high added value, we try to integrate the highest possible level of automation with the latest technology and continuous digitalization in every work step.





Spray System - Rendering

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HIGH-SPEED SPRAY SYSTEM FOR FORGING PRESSES

In their daily use, forging dies are exposed to enormous forces, friction and, above all, dirt. In order to ensure optimal functioning and the longest possible service life, both die halves must be kept clean and lubricated.

Makkon GmbH developed a high-speed spray bar for a long-standing cooperation partner, which moves the spray nozzles in between the die halves in the specified cycle time of 4 seconds and retracts them again after spray rinsing.

A robotic solution could not meet the required speeds and cycle times given the high weight of the spray nozzles. Our significantly faster solution was implemented using a linear axis and ball screw. Another advantage of

the entire construction is the free access to the press for maintenance purposes. While the maintenance area is often built into other systems, with this solution the assembly can be folded to the side using a swivel mechanism, freeing up the interior of the press for maintenance.



Scrap shear with robotic arm - Rendering

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SCRAP SHEAR

During the production of forgings in forging dies, large, bulky burrs can form which later have to be disposed of as waste.

The larger the forged component, the larger the burr that is cut off by the trimming press. This is where the problem arises that this waste cannot be conveyed in automatic conveyor systems and the capacity of the scrap container cannot be used ideally.

To solve this problem, Makkon GmbH has developed fast hydraulic burrs. This allows steel burrs with high tensile strength and a length of up to 2.5 m to be quickly and easily cut into pieces approx. 0.5 m long. And that with a width of approx. 750 mm and a considerable thickness of up to 25 mm.

After deburring, the burr, which is often warmer than 1000°C, is placed in the shears by a robot, crushed there and then dropped into a vibrating conveyor underneath.



Scrap shear - Rendering

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Control system

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CONTROL ENGINEERING

The control system is the brain of every machine. A key feature of today's industrial production is the automation of production processes using complex, but very compact control and regulation systems.

In the control engineering department at Makkon GmbH, we attach great importance to the ease of use of our systems, individualized to each of our customers. The user interface (HMI) will be adjusted as needed. Highest system availability can be ensured at any time with our support and service (in person or remote maintenance).



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Nico Koell -
Head of Department
Control Engineering

The control technology department at Makkon GmbH consists of four employees who are responsible for planning, programming, interface design, control cabinet construction, commissioning and customer support.



REFERENCE CUSTOMERS

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QATM
QUALITY ASSURED

MAGNA STEYR

AVI

SPRINGER
THE WOOD-MECHANISING COMPANY

LINDNER
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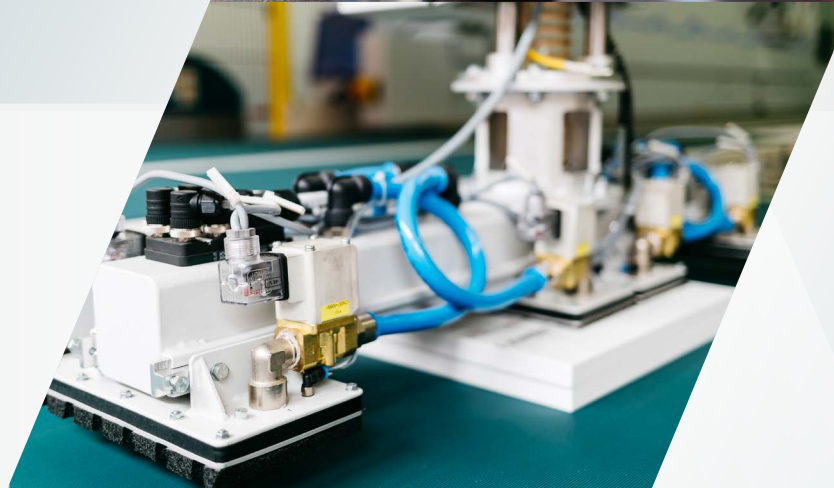
Due to a high demand for Makkon's automated systems in the USA in recent years, we decided to collaborate with a distributor in Ohio. Dibolt LLC is now distributing our systems exclusively all over the USA and in Canada. For references and more informations visit www.dibolt.com.



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