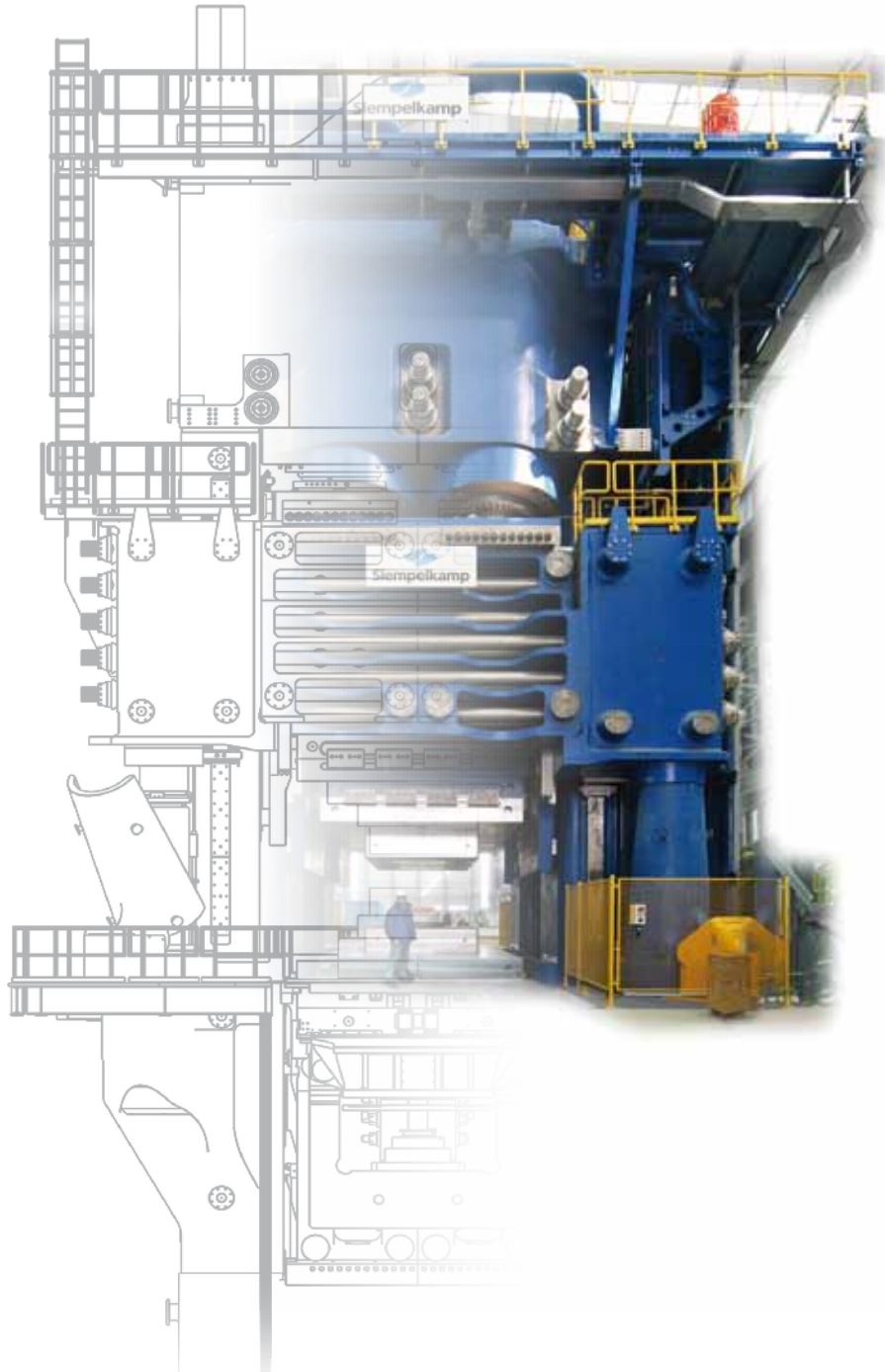




Siempelkamp



Hydraulic Presses

for Hot and Cold Forming of Metal

Structural parts

Landing gear parts

Aircraft engine components

Manufactured through

Siempelkamp Technology

Tanks and standard dished ends

Heavy plates for steel engineering

Blanked parts for body structure

Side members for trucks and axle housing rear parts

Forged aluminum rims

Rail wheels and wheel set axles





Rings

Flanges

We engineer complete system solutions ...

From day to day our customers show performance in manufacturing excellence recognized worldwide. They process heavily-to-form materials, bend extremely heavy plates or make components that meet the requirement of utmost precision and safety.

For the league our customers are in off-the-shelf solutions are simply cannot do. For this reason we design each press individually to match the customer's requirements. That includes also looking beyond the press: We map entire processes, plan and deliver complete plants including any peripheral equipment such as manipulators, furnaces and saws.

In doing so we can rely on our deep understanding of forming high-tensile materials that we have been developing for more than 130 years and modern methods of simulation, control technique and hydraulics.

Yes indeed, we do build the largest and most powerful presses in the world. But size and power are not the only things that count – we control the massive forces applied during the forming process of extraordinary component parts.

To give an example: Due to modern control systems we are able to position the nearly 500 MN of a moving crossbeam at a pressing force of 50,000 metric tons in all axes accurately within the tolerance of a tenth of a millimeter.

Through such machines structural components can be produced efficiently which used to be inconceivable opening new markets to our customers.

That is why we state: We build not only presses. We are suppliers of complete system solutions and know the rules of metal forming. We are committed to strengthen our customer's position in the market.

Dr.-Ing. Hans W. Fechner

Spokesman of the Management,
G. Siempelkamp GmbH & Co. KG



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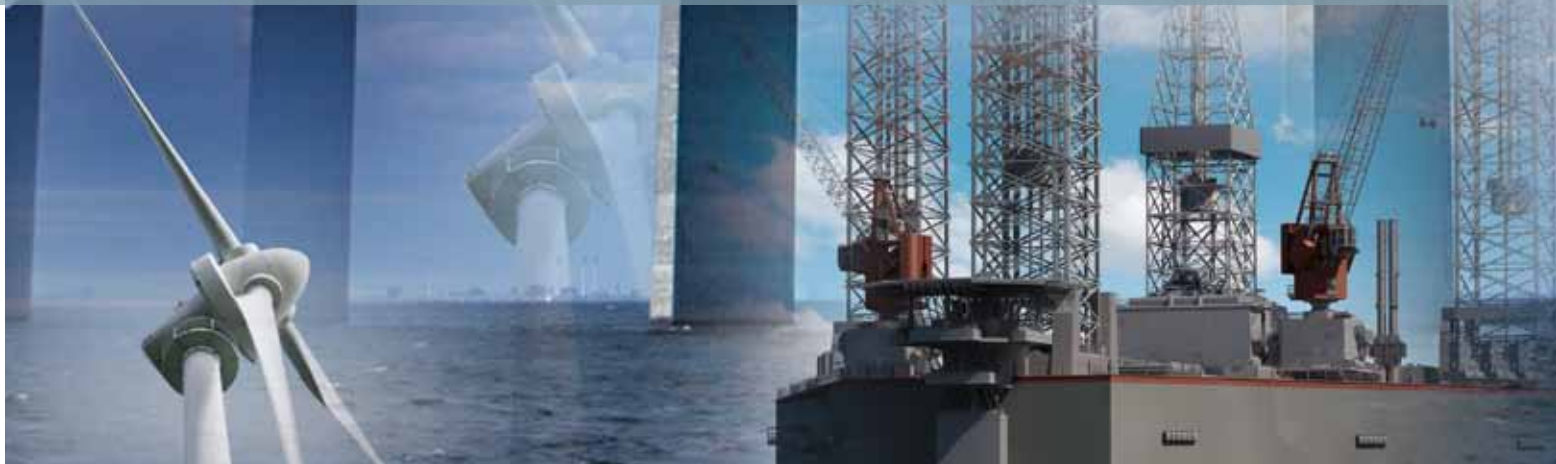
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Solutions for very precise challenges

Extremes

"Our approach to provide system solutions offers a high level of safety to our customers starting from design and layout of the machine to commissioning and far beyond: Our customers become aware of efficient technical capabilities with utmost precision and reproducible results at a very early stage during the process."

Dipl.-Ing. Götz Sondermann, Head of Engineering Metal Forming





Hydraulic presses made by Siempelkamp are applied for hot and cold forming of metal workpieces requiring specific quality features.

We focus on the extraordinarily complex parts, materials that are difficult to form requiring utmost precision.

On our presses fuselage frames for aircrafts of several meters of length, heavy plates or turbine blades with a thickness of up to 400 mm are shaped within a tolerance of a few hundredths of millimeters.

In doing so the point is always to accurately control huge forces and to make sure that products can be manufactured efficiently at a high process safety level. In each project we always start with the properties of the components to be manufactured. On this basis we design the press and provide the layout of the entire plant including all auxiliary equipment.



Technology for

Extraordinary Missions





Our customers benefit from:

Schedule adherence from project start until completion, focusing on high quality of the finished parts.

We understand the processes.

When it comes to the forming of tough materials into particularly precise components complying with extreme requirements, off-the-shelf solutions simply cannot do. So we make press systems that are individually matched to our customers' requirements.

Managing the forming process is not enough. Based on the experience of hundreds of projects, our experts have a deep understanding not only of the materials' behavior, but also of the process steps to be taken in the plants starting from the blank to the finished part.

In this way we develop the specific products of the customers in close cooperation, define the ideal process technology on the basis of these insights and design the plant from one source.

We make precise repeatable equipment.

Siempelkamp started the own proven track record in the design and construction of large presses 130 years ago: During this long period we have built some of the most powerful presses worldwide. They form workpieces at forces of up to 720 MN and operate at pressures of up to 420 bar.

But there's more to it than forces! You have to rule them anyhow. Equipped with hydro-electric control systems our presses make component parts that are dimensionally reproduceable within very close tolerances as to final dimensions so that subsequent machining is minimized.

We provide safety.

From the start of any project we focus on perfect coordination: Right from the designing stage we blend mechanics, hydraulics, automation and casting technology into the projects.

Based on a perfect match of all simulated processes we make sure that the press will comply with the required specifications – long before the first part will be manufactured.

The essentials of the plants - presses, rolling mills and hydraulic units – are developed and manufactured in our own factory. Peripheral equipment such as furnaces, feeders, manipulators or saws will be integrated. Resulting in fully integrated plants where all plant elements fit together effectively.



In the beginning we start with

the Finished Part

“Due to our extensive simulations our customers become aware very early that the new press will achieve the specified performance and will reliably operate for decades to come.”

Dipl.-Ing. Andre Boßmann, Computer-Aided Designer



The Outcome:

A system solution integrating the complete workflow in the plant of the customer – from blank to finished forging.

We always start with the finished product of our customer for the development of a new press line.

That means for us: LISTENING.

- What product shall be manufactured?
- What material shall be processed?
- What forming tolerances are required?
- What throughput shall be achieved?

On the basis of this information we enter into a brainstorming discussion with the customer for a first approach how to manufacture this product. We design the forming process and define the processing route. In a further step we calculate for instance the pressing forces and number of heats required for the finished forging.

On an equal footing

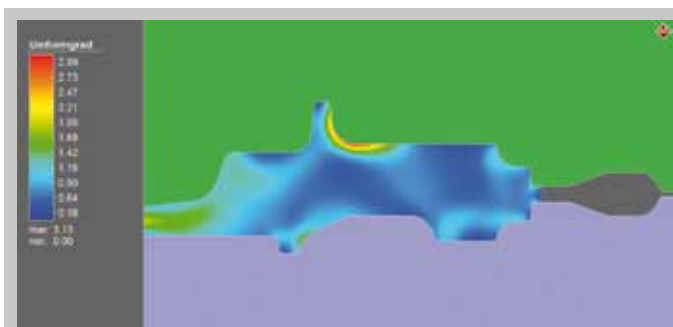
At that stage the customer's product know-how and Siempelkamp's expertise are merged: With the background knowledge from a great number of projects in hot forming and the ability to understand processes our engineers are on an equal footing with the customer's specialists.

To give an example: The customer specifies the requirements that the products have to comply with, our specialists contribute their know-how of the forming process. Thereby comprehensive databases related to forming behavior of the different materials are useful.

Beyond the forming process

Around the press we design the complete plant and coordinate the interaction of all peripheral equipment.

Siempelkamp handles any project through interdisciplinary teams. Metallurgists know the material, mechanical engineers, casting and hydraulic specialists collectively provide for the design, experts for automation technology work together with IT specialists.




The Recipe for success:

Complete System Solutions

“Short distances within our factory – for instance between engineering departments, foundry and production – as well as proven cooperation with suppliers for many years assure a smooth project development ... and last but not least economic solutions for our customers when it comes to the realization of the project.”

Dipl.-Ing. Klaus Schürmann, Head of Computer-Aided Design



Customer requirements

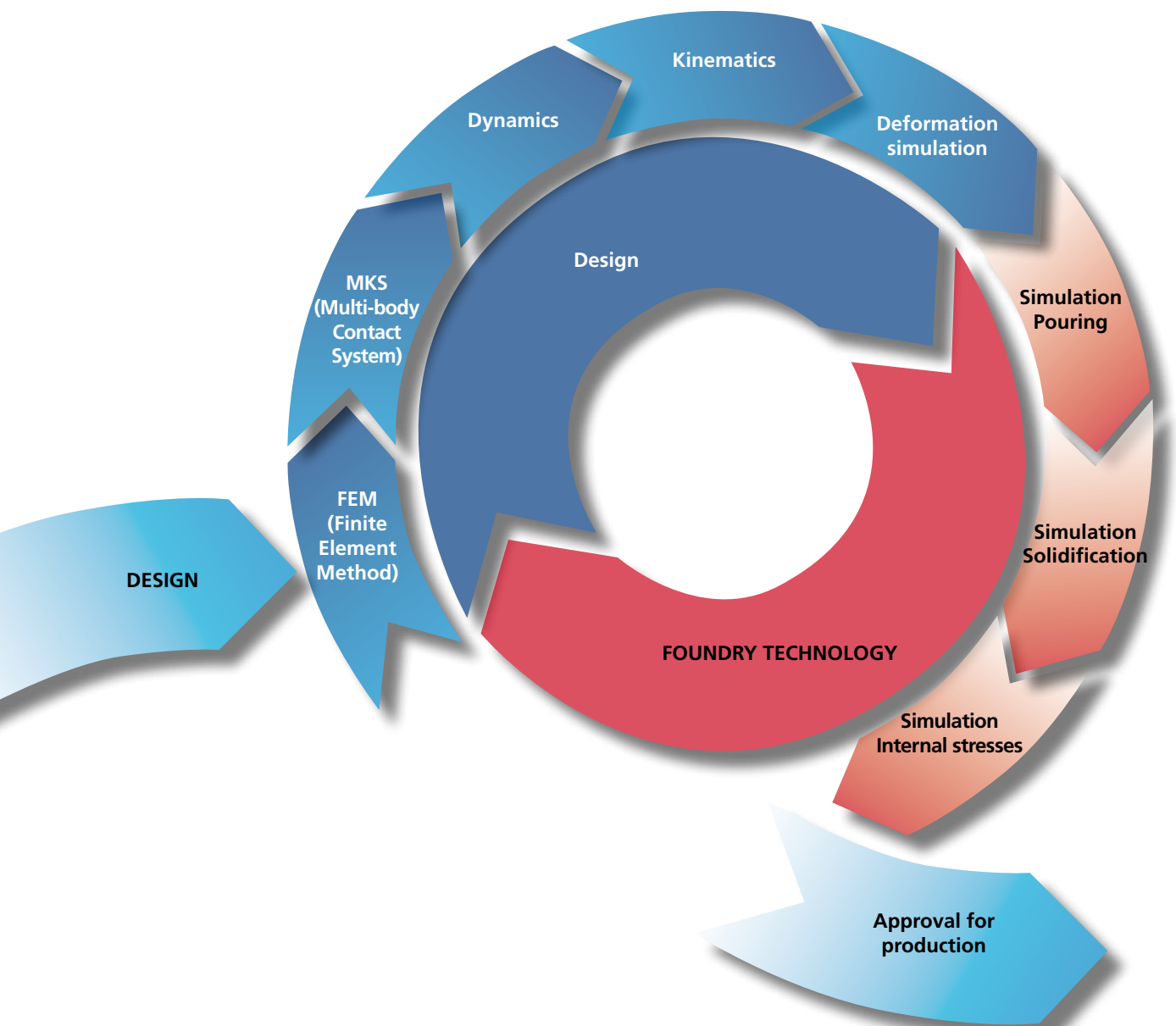
From the first idea to efficient production

To combine mechanics, control technology and hydraulics efficiently is one of the core competencies of Siempelkamp. We are not limited to the press only, but offer complete system solutions for metal forming provided with components that perfectly gear into each other.

During design and construction we coordinate the work of all suppliers. That means for our customers: Only one person in charge for any issue and clear assignment of responsibilities in the project.

This procedure is automatically related to continuous quality management across all process stages, all elements of the plant being interlinked and communicating.

Our customers benefit from the cost-effective manufacturing of high-quality products that comply exactly with the specifications of their related customers.

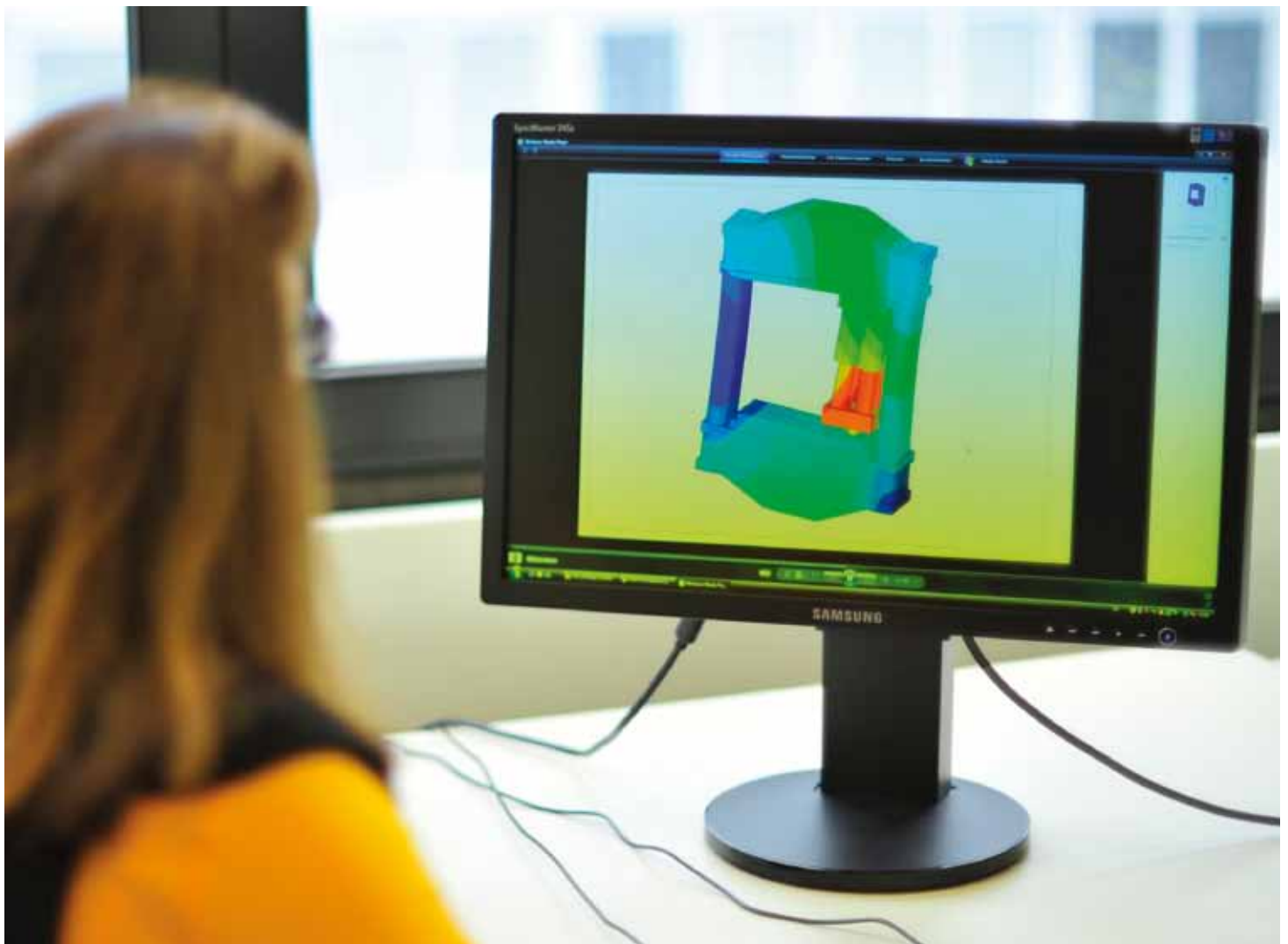


Everything gears into each other:

Mechanics

“Through dynamic simulation we represent the products of our customer, including the mechanics and complete hydraulics, as well as the automation technology. In this way we demonstrate early in the project that the press will perform with the required precision.”

Dipl.-Ing. Klaus Schürmann, Head of Computer-Aided Design



Certainty from the very beginning

We start the development with the behavior of the workpieces in the press. At first, it is analyzed under forming simulation – based on hot flow curves determined by material databases comprising hundreds of material types. The massive forming process is calculated through "SIMUFACT". For sheet metal forming processes we use "Marc/Mentat" which has proved itself particularly for the simulation of highly plastic processes. For open-die forging we utilize the application "Forgemaster".

Based on the outcome of the simulation the rough engineering concept of the new plant is defined. By extensive FEM analysis we then calculate, optimize and validate the structural components of the press. In doing so, we take the complete press system into account as well as the interaction of the different components including reciprocal effects of forming process and structural mechanics. Thus we achieve a high degree of realism.

Safe sequences

Subsequently, we simulate the casting process of press components starting from filling of the mold via solidification to calculation of the residual stress in the finished part. For this purpose we use software packages such as "MAGMA" and "Procast". The residual stresses of components resulting from the casting process are transferred into the FEM calculation and taken into account via "Autofena" software for the calculation of the structure according to FKM directive (German guideline for fatigue analysis of machine components).

Since we consider the fatigue strength of components very early under design, we make sure that the press will operate reliably over many years and the investment will be safe.

Subsequently, we calculate the sequential kinematics of the complete plant to determine the dynamics and the interaction of different elements including manipulators and feeders. For this purpose we use multibody contact systems such as "Adams".

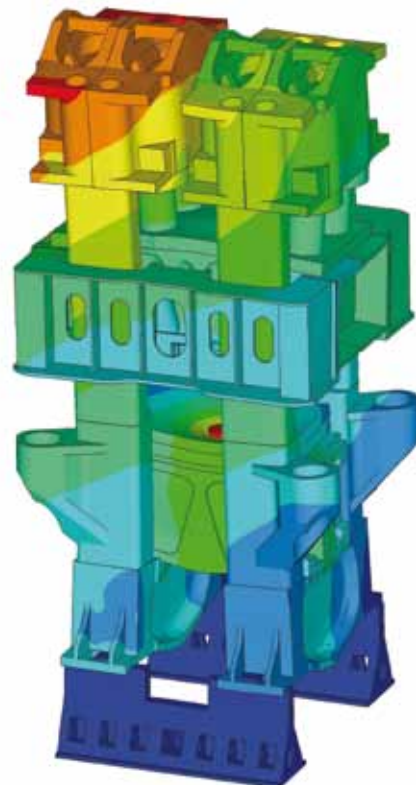
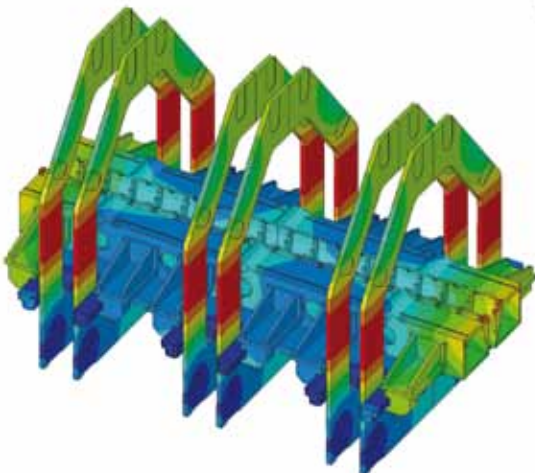
Exact results

Under "DSH+" we simulate the interaction between hydraulic drives and components such as valves, motors and pumps and both the mechanics and electric control and automation technology as well. This logical interconnection is the basis for "virtual commissioning" significantly reducing commissioning time on site.

At the end of this process the press structure is defined – characteristics as to forces, dimensions of the components as well as power requirements are identified. In addition to that we know what precision will be achieved through the press.

The outcome:

High benefit through fast and goal-oriented commissioning, as well as safe plant operation for many years to come.



Precisely controlled:

Hydraulic Drives

“We produce all hydraulic components in our own manufacturing facilities. Prior to shipping all components are subject to extensive functional testing, including control technology, at our in-house testing station.”

Dipl.-Ing. Gregor Endberg, Head of Hydraulics



We manage extremes

The hydraulic units of large closed-die forging presses produce more than 42,000 l of oil per minute to the press cylinders at pressures up to 450 bar.

However we safely handle also small flow rates such as 36 l per minute for an isothermal forging press.

Through highly precise control systems we realize the extremely low strain rates required by modern high-duty materials.

Since pressures and flow rates are extremely challenging, hydraulic units are designed and manufactured in the Krefeld plant by our staff of 80 members of the hydraulic department.

We use energy efficiently

Efficiency of the drive technology is a very important point, hydraulics being crucial for power requirement. The servo-electric drives of the pumps thus help to reduce costs for power supply: They only take the amount of current from the electrical grid that is required at that time while in scheduled down-times power requirement and noise emission drop to nearly zero.

By means of the factory-owned test stand we put new, energy-efficient drives through their paces.



The benefit for our customer:

Through the extremely precise hydraulics it is possible to meet the specific requirements of challenging products.



Any process under control:

Automation and Control Technology

“Through to our automation technology the plant operator benefits from optimized processes, productivity as well as outstanding quality – no matter if they make their decision in favor of standard executions or customized solutions. The outcome: Integral process control and high-quality finished products.”

Dipl.-Ing. Werner Schischkowski, Head of Automation Technology

Slowness is one of our strengths

To position a 2,500-metric tons running beam against a force of 500 MN down to the last tenth of a millimeter is already challenging. Modern materials are even more sophisticated: Extremely low strain rates in a range of a few hundredths of millimeters per second have to be adhered to precisely.

A head start for automation and control technology made by Siempelkamp: Combining industrial and control processes, operation, additionally visualization and overlapping process control tasks in an integral design. Thus we bridge between a degree of standardization as high as possible with the perfect customized design.

Plant operators are provided with standardized software and hardware components and a consistent operating system design via operator panel in the area of the entire plant. Operating system design and automation technology are thus available as integrated systems for the plant operator. The advantage for our customers is one design for all plant elements – clearly to operate and observe – high information content.

For forging of titanium and super alloys under isothermal forging require extremely low pressing speeds according to the respective technology of the customer. Hence the most important elements of our process control are our self-developed control algorithms allowing for specific conversion of our metal-forming know-how into motion. To give an example: In closed-die forging presses we control the pressing speed in a range of 0.05 to 50 mm/s within a tolerance of +/- 5 percent. In doing so, we belong to the worldwide leading suppliers.

We optimize the control programs at a very early stage of any project by interlinking them to the virtual plant model.

Pressing curves optimized under product development can directly be transferred from the forming simulation to the machine control. Thus we avoid entries of data that take too much time or are subject to error. Owing to the profound integration of modern design and process planning tools in the process control technology of the press R&D cost are reduced resulting to just-in-time availability of new forged products.

One of our highlights especially designed for ring rolling: The SicoRoll 3.0-control system combines the planning of the ring rolling process with control technology including utmost precision in the process.

The benefit:

Integrated measuring, automation and control technology for ideal product quality – owing to a sophisticated design.





Casting and Machining

“For the lower press beam of a closed-die forging press for the customer Nanshan Group 320 metric tons of molten iron were poured into the mold within 90 seconds. Number-one requirement for this performance was the unique combination of engineering know-how and hand-molding perfection that no other global iron foundry can offer.”

Dirk Howe, Managing Director, Siempelkamp Giesserei GmbH



That means for our customers:

Owing to the unique combination of foundry and machining at the same location we have the entire manufacturing process under control. Short distances provide for an optimum project safety.

Our Global USP: The foundry is located on our premises.

For thick-walled elements of large presses spheroidal graphite often is the best solution both technically and economically speaking – Siempelkamp is prepared for it. We operate the only foundry worldwide that is able to realize castings made of spheroidal graphite with a finished weight of more than 270 metric tons.

The foundry has the specific metallurgical know-how allowing for optimal conditions in the crystallization process also for thick-walled component parts – this professional expertise is shared by only very few companies worldwide.

One of the giants in Europe: The machining center Schiess

Huge castings require machining centers of the same caliber. For metal-cutting machining of castings Siempelkamp is equipped with capacious machinery comprising of CNC-machining centers. The „Schiess Vertimaster VMG 6“ – one of the largest portal milling machines in Europe – can machine workpieces at a clamping surface of 22 m of length. The passage width of 6.3 m and the daylight of 6 m enable the machining of large component parts of a maximum weight of 400 t.

Production Management

“A good example for successful long-range cooperation: By remote diagnosis a customer and Siempelkamp reduced the cycle time of a process from 130 to 122 seconds – a decrease by 8 % simply through data exchange.”

Dipl.-Ing. Werner Schischkowski, Head of Automation Technology



Efficient production through Prod-IQ®

The production management system Prod-IQ® collects current production data and makes them available for production planners, operators, process technologists or plant management.

Prod-IQ® was especially developed for presses and press lines. In case of open-die forging presses the data for each individual pass are collected and logged.

The system captures hundredths of parameters about the interlinked plant elements. As a result thereof shift, production and down-time logs are written.

Through a great number of analyses the system forms the basis for high productivity and low piece cost.

Via interface with ERP systems it is integrated in the IT infrastructure of the entire plant.

Analyzing your data instantly: DAHMOS

Complex processes as under metal forming provide thousands of data every minute – pressures, temperatures, tensions, valve stands and much more. Some products as for instance safety-critical forgings for aircraft applications require an uninterrupted tracking of process data comprising the entire forging process history.

Through the data collection via DAHMOS members of the maintenance team can stay on top of things: They can precisely reproduce and analyze data of any plant element.

They quickly identify trends and can respond proactively. To give an example: Should nominal and actual values of a valve differ from each other, it could be replaced as a precaution. The easy-to-control data exchange between users and our Krefeld office makes it possible that customers can optimize their processes together with our specialists.



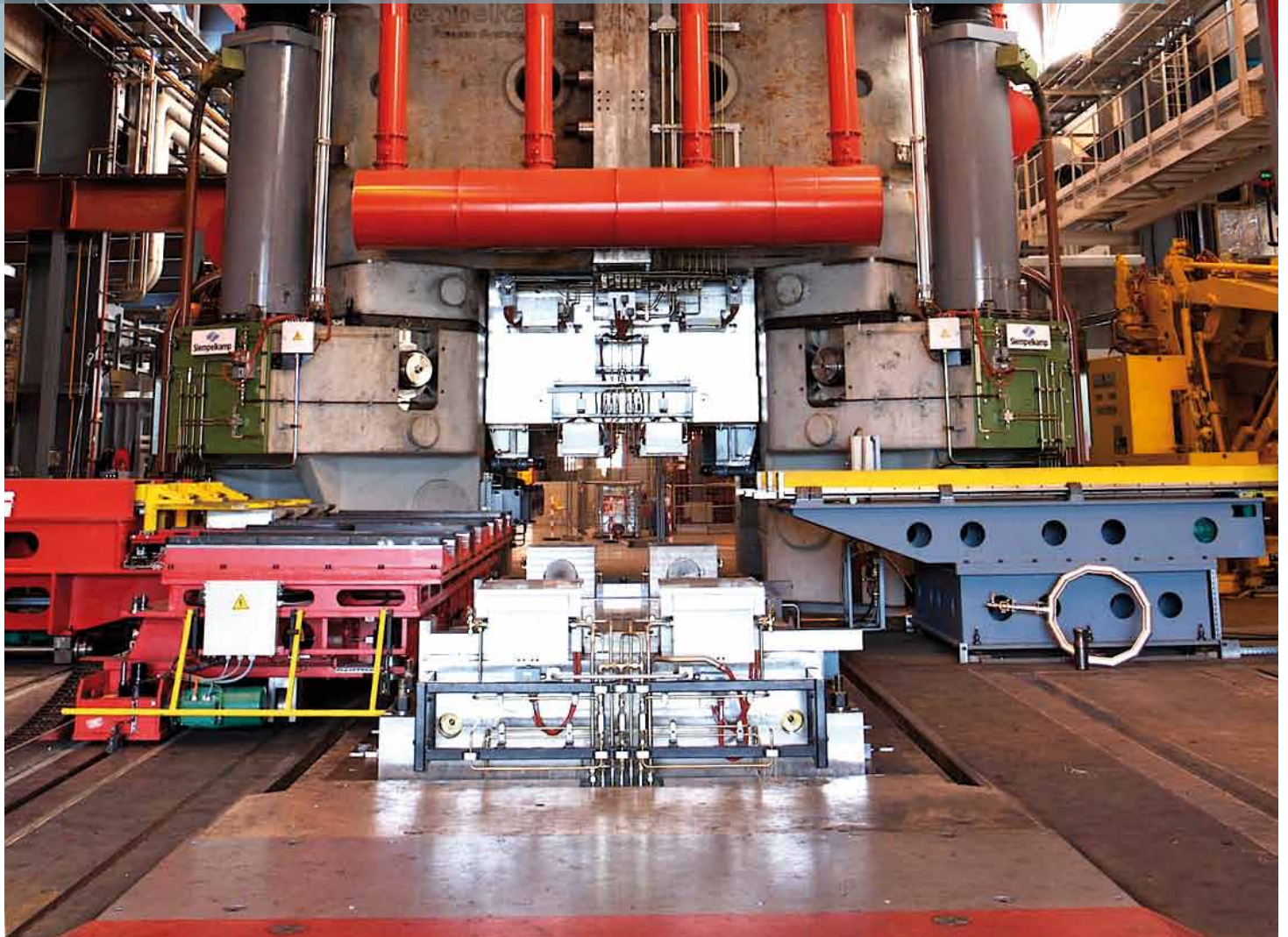
The benefit:

**High transparency
under manufacturing,
optimum utilization
of resources and high
availability of the
entire equipment.**

Forging Presses

"We precisely position a moving crossbeam of 300 metric tons of weight within a tolerance of ± 1 mm. That means for our customers: Forgings that exactly comply with the desired contour."

Dipl.-Ing. Rüdiger Bartz, Sales Manager Metal Forming





In every field of forging Siempelkamp has always been setting new benchmarks.

The 500-MN closed-die forging press for the Chinese Nanshan group is the largest forging press that was ever built in Germany. The open-die forging press at UKAD in France is one of the fastest open-die forging presses of this size worldwide.

However, the point is not only the individual press: Siempelkamp is offering the complete process technology for the forging technique. For the process chain starting from the blank to the finished part we provide the full range of equipment.

Open-Die Forging Presses

The open-die forging presses excel in high stroke rates that reduce the time of passes allowing for many cases to finish-forge in one heat, thus saving time and energy.

Closed-Die Forging Presses

Siempelkamp realizes closed-die forging presses up to 500 MN and more. The presses can be equipped – in addition to the mechanical guides that are available anyway – with hydraulic synchronous-run control cylinders. Consequently, products with asymmetric mass distribution can be forged under maximum pressing force and with utmost precision.

Isothermal Forging Presses

Our isothermal forging presses are suited for the manufacturing of highly stressed components for high-end products. These include turbine disks of powder-metallurgical materials or turbine blades of gamma-titanium aluminide which were considered as to be not formable for a long time.

**Type:****Open Die Forging Press**

Type of press	Pushdown
Forging force / upsetting	40 / 45 MN
Daylight	4,400 mm
Working stroke	2,200 mm
Table dimension	2,350 x 4,500 mm
Max. eccentric diameter	700 mm (at 40 MN)
Normal pressure	350 bar
Max. pressure / upsetting	420 bar
Stroke rate at forging force	max. 100 spm
Total installed power	4,500 KW
Press height above floor level	12,000 mm
Depth of foundation pit	3,500 mm

Open-Die Forging Presses

“On an open-die forming press in France workpieces of titanium and nickel-based alloys are machined through planishing with up to 105 strokes per minute. That means that we move the crossbeam of approx. 200 metric tons of weight at a frequency of nearly 2 Hz – unique for this power capabilities.”

Dipl.-Ing. Amir Tanbakouchi, Sales Manager Metal forming



Product Diversity from one Press

Our hydraulic open-die forging presses produce forgings for very different fields of application at pressing forces of up to 100 MN. Customers have the choice between constructions mounted above or below floor level, 2- or 4-columns-execution or oil- or water-hydraulic drive. In addition to rod material such as crankshafts or stepped shafts with several different diameters it is also possible to forge disks, punched disks, rings and sleeves.

Precise control: Minimum rework

The robust crossbeam guides – depending on the size – executed as guillotine guides or eightfold guiding system respectively make sure that the presses provide for repeatability of the finished dimensions within a tolerance of +/- 1mm, even in case of eccentric load. Thus, evenly forged workpieces with structural integrity are produced requiring a minimum of re-machining only.

By "computer-aided forging" through the FORGE-MASTER software the presses automatically form the forging. In doing so, also workpieces with complex geometry are forged efficiently and economically.



Perfectly coordinated: Press and manipulator

Siempelkamp provides complete open-die forging lines with integrated manipulators. The control makes sure that the movements of the manipulators are exactly synchronized. Through the perfect coordination of all movements the forging process can be exactly reproduced piece-to-piece, lot-to-lot.

Complete Lines

Equipped with a great number of auxiliary devices the press can be exactly customized depending on the individual application, such as rotary tables and saddles, lifting or skid rotary tables as well as centering and lifting devices.

The outcome:

Fast near-net-shape forging and reduced machining rework

Closed-Die Forging Presses

"In case of pressing with strain rate control we rule the extremely low speeds that are required for the forming of sophisticated parts for the aerospace industry. Our customers can thus produce components that always comply with the extremely challenging requirements specified by the aerospace industries."

Dipl.-Ing. Götz Sondermann, Head of Engineering Metal Forming



High precision also for high-tensile materials

The high pressing forces achieved by our closed-die forging presses and the precise control allow for the forging of complex workpieces of high-tensile materials in few steps. In this way, highly stressed components such as structural parts or jet engine parts for aircrafts can be manufactured efficiently.

Whenever particularly high pressing forces are required we provide our presses with hydraulic position control systems. The mobile part of the press is then equipped with capable guide systems enabling us to safely manage horizontal pressing forces. This combination results in a very high fitting accuracy of die halves perfectly aligned to each other. In addition to that the die halves stay parallel within a tolerance to a tenth of a millimeter, also for high eccentric pressing forces. The press is laid out such that the nominal pressing force is available to 100 percent, even under maximum eccentricity.

Type:	Closed Die Forging Press
Daylight (Table to Bolster)	4,000 mm
Press opening, side to side	5,250 mm
Press opening, front to back	3,040 mm
Stroke of moving crosshead	2,000 mm
Max. eccentr. at 500 MN	R = 300 mm
Working table	7,000 x 4,000 mm
Working table stroke	10,000 mm
Installed power	26,700 KW
Quantity of main hydr. pumps	60
Working pressure	420 bar
Forging speed range	0.05 – 50 mm/s

The parallelism of upper and lower die creates the prerequisites for the stick-slip-free movement of the moving crossbeam: Instead of chevron-type packing we use special low-friction sealing and slipping systems that suppress slip-sticks at very low pressing speeds.

Time for the material

Through algorithms especially developed for closed-die forging we control the extremely low forging speeds that have to be met for the forming of challenging materials within a very close tolerance range. Thus, the presses produce components with the requested material structure in a reproducible way – an important aspect, particularly for the manufacturing of parts for the aircraft industry.

In addition to extremely precise execution of mechanics we apply multi-cascade control valve systems for hydraulics enabling us to safely manage the complete speed range required.

Optimized sequences

Through integrated complete system solutions comprising also the handling of the forgings, we realize extremely short cycle times.



The outcome:

Precisely formed workpieces, minimum rework, high-quality surfaces and high productivity.



Isothermal Forging Presses

“Intermetallic compounds such as titanium aluminide had been considered to be not formable for a long time. Thanks to our isothermal forging presses our customer succeeded in implementing a commercially effective forging process in the market. ”

Dipl.-Ing Carsten Daub, Sales Manager Metal forming



Materials difficult to form

Components made of modern particularly heat-resistant materials have to be forged within a very narrow range of temperature. Examples are disks or turbine blades for aircraft jet engines. Hence, we control the temperature of our forging tooling in our isothermal forging presses within a tolerance of few degrees.

The isothermal process generally requires less pressing forces than closed-die forging at die temperatures that are technically considered to be common practice, however the forming speed has to be lower. It lies within a range of down to 0.01 mm/s. These extremely low pressing speeds need a very precise and smooth control of the hydraulic drive: Volume flows descending to less than 2 l/min have to be precisely dosed. Special guiding and sealing systems developed for isothermal forging make sure that forgings are evenly compressed in a stick-slip-free manner.

Forging instead of casting

Additionally, some materials such as intermetallics like titanium aluminide had been considered as to be not formable for a long time. Compared to casting a fine-grained structure results from forging. Thus, components can better withstand higher stress. With the aid of precise control of pressing force and speed we actively influence the crystalline structure.

Turbine blades that are manufactured on our presses are a good example for parts that withstand maximum centrifugal forces meeting the extreme quality requirements of the aircraft industry.

The symmetrical design of the presses comprising a guillotine guide that is arranged far away from any heat source makes it possible that during the forming process the die can be positioned with utmost precision, even under extreme conditions in the tooling space.

Complete plants

The molybdenum alloys applied for the dies – at present being the only materials that withstand the high stresses and strains under die temperatures above 1,000 °C – have to be protected in hot condition from aerial oxygen, otherwise they would be destroyed as result of sublimation. For this reason, the entire forging process – from placing the blank to taking the forged components – is run fully automatically in inert gas atmosphere or vacuum environments.

For isothermal forging Siempelkamp also provides complete plants. Including furnace, charging manipulator, forging press, die heating, hydraulic drive system and the complete automation technology. The plant control ensures monitoring and documentation of the process parameters in accordance with the certification standards of the aircraft industry.

The competitive edge

Components of materials that are extremely difficult to form can be manufactured efficiently and with utmost process safety.

Ring Preforming Presses

Complete System Solution

Upsetting and piercing presses produce ring preforms for seamless rolled rings. Siempelkamp provides these presses as complete system solution with all auxiliaries required for the preforming of rings.

The presses can be equipped with two swivel arms, pre-piercing and piercing mandrel can be realized with active wipers. Thus, you can dispense with lubricants normally applied for the removal of the pre-piercing mandrel. There is no unwanted carbonization of the pressed parts any longer, additionally dust emissions do rarely occur at the press yet. The swivel arm moves the pre-piercing mandrel into the central press area so that high pre-piercing forces are realized depending on the pierced hole diameter up to maximum pressing force.

Lifting and Centering Device

A hydraulic lifting and centering device provides for fast and exact blank positioning in the press.

High Degree of Automation

Through the integration of automatic cooling and lubrication systems for the pre-piercing mandrel, a service-duty crane for mandrel change, a rail-bound manipulator for material handling as well as automatic scale and pierced-out slug discharging unit a high degree of automation is achieved for the plant.

Generally classic closed-die or open-die forging presses can be upgraded by the function "manufacture of ring blanks". Additional equipment that is customized depending on the specific requirement such as lifting and centering devices, swivel arms and special tooling for the forging process are the guarantors for industrial applications in rugged environments.

The outcome:

An efficient production and reduced dust emission.





Type:

Ring Preforming Press

Press force	125 MN
Balancing force	32 MN
Nominal hydraulic pressure	420 bar
Max. hydr. working pressure	450 bar
Forging speed range	0.1 – 50 mm/s
Speed fast advance / idle stroke	190 mm/s
Sliding table shifting force	0.9 MN
Sliding table shifting speed	200 mm/s
Central ejector	3 MN
Daylight	4,000 mm
Upper sliding table	4,250 x 2,410 mm
Sliding working table	4,000 x 2,230 mm
Press height above floor level	15,000 mm
Depth of foundation pit	12,000 mm

Plate Forming

“We are experts for the forming of particularly thick plates. Individual solutions, product-specific handling systems and special equipment creating flexible manufacturing options including high product quality for our customers.”

Dipl.-Ing. Rüdiger Bartz, Sales Manager Metal Forming





Long experience

The Siempelkamp forming presses stand for our long experience in process technology and processing stages. Whether it is medium plate for large pipe construction or shipbuilding or 400-mm heavy plate for pressure vessel construction: Depending on the requirements of our customers we customize our presses accordingly.

Straightening presses

Our straightening presses with integrated material handling systems are applied in mill plants or in the processing industry where they are used for straightening of semi-manufactured products for the subsequent machining. As a result of the high straightening quality the enhancement of value in the factory is significantly increased. The plates can be straightened in cold or hot operation. We provide these presses, if necessary, with several straightening rams to be operated together or individually.

Head forming presses

Our special presses with a pressing force of up to 100 MN allow for the manufacture of segments for pressure vessel construction complying with utmost quality standards. The combination of forming in a progressive-die process for the vessel segments and drawing of the heads in the same press significantly reduces investment and operating costs.



Pipe forming presses

We provide complete production lines for the entire process chain starting from the plate to the finished large longitudinally welded pipe. Due to our long process experience we support plant operators in their investment decisions by simulating the entire forming process to the point of plant extension. We develop tooling together with our customers.

Side member drawing presses

Side member drawing presses are suited for the manufacture of side and cross members as well as axle housings. Through their material handling system they achieve short cycle times thus increasing the output of the plant.



Straightening Presses

“Since we operate our own straightening department we do know the requirements very well that the machines have to meet in daily practice. The straightening presses developed on the basis of this wealth of experience correct straightening defects that were considered before to be non remediable.”

Dipl.-Ing. Klaus Schürmann, Head of Computer-Aided Design



Concentrated force

Siempelkamp provides straightening presses for heavy plates of a thickness of up to 400 mm. For the execution with two transversely displaceable rams both can be coupled operating through one common straightening die. Consequently, straightening defects can be corrected that were considered before as to be non remediable.

Better than the Standard

A press for heavy plates straightens plates of a width of 1,000 to 5,200 mm and a length between 1,500 and 19,000 mm weighing up to 60 metric tons. With a stroke accuracy of ± 0.2 mm it allows for precise straightening. Therefore, our customer can supply straightened plates provided with an evenness that excels the toler-

ance class S of the German / European Standard DIN EN 10029.

Fast processes

Siempelkamp provides the presses including auxiliary devices. Thus, the equipment for handling, lifting, lowering and displacing of the plates are synchronized allowing short cycle times. The automatic die changing systems have the effect of short set-up times.

Head Forming Presses

“We are the only maker of large hydraulic presses offering plants for 400-mm plates of thickness as complete service package.”

Dipl.-Ing. Rüdiger Bartz, Sales Manager Metal Forming

Two presses in one

The head forming presses combine two basically different functions in one plant. They form of heavy plate both spherical caps and half spheres of pressure vessels. We already realized plants for thick plates of up to 400 mm.

Through these presses Siempelkamp offers significant cost benefits to the customers: While for hot forming of plates to half spheres and flanging (head forming) usually several presses were required, the plants made by Siempelkamp manage both processes.

In addition to that they can realize hot forming and cold calibrating of plates. A separate calibrating press is not necessary either.

Optimum utilization of the material

By only one press stroke a new 80-MN press forms complete heads for pressure vessels.

For the manufacture of the half spheres the software especially developed for plate forming compensates the bending of the die. The outcome: After calibration the presses achieve a deviation of the nominal diameter of the half sphere of only 0.5 percent related to the inner diameter and a profile departure of only +/- 4 mm.

Through the height adjustment within the lower die we ensure that long or thick plates do not run the risk of becoming barrel- or banana-shaped.



Dillinger Hütte

The process developed by Siempelkamp for plate forming allows for an optimum utilization of every single plate: The formed area directly reaches the chamfer of the subsequent weld.

Short cycle times

Manipulator rollers that are integrated in the upper and lower die provide for precise positioning of the plate during forming. In doing so, this saves time and money: Forming of a half sphere can be finished within 45 minutes only.



Type: Head forming press

Plate thickness:	220 mm
Pressing force:	80 MN
Material temperatures:	870 to 1,010 °C
Length of forming die:	11,500 mm

From Plate to Pipe

Siempelkamp

"Our presses allow for modern pipe manufacture for lots of optimum pipe geometry. The press design is modular and scalable and can be optimally customized for high numbers of lots."

Dipl.-Ing. Rüdiger Bartz, Sales Manager Metal Forming





As leading manufacturer of individual presses for the production of large longitudinally welded pipes we offer the "A-U-O"-process in three forming stages. Due to the high production output of up to 30 pipes per hour this process stands out in comparison to other processes that are commercially available. For each of the three forming stages our customers get the optimum press including its auxiliary devices in the forming line.

Crimping presses

The patented concept of our crimping press with closed-frame design allows for high specific forming pressure during crimping. The outcome: Also for high-tensile plates the presses achieve significantly better and reproducible forming results than presses of open design.

The tool adjustment only consists of one forming tool crimping the plate to the edges except few millimeters. Thus, the material is optimally utilized.

The tool can be moved under load. The benefit: Fast and precise adjustment to different plate sizes, shorter downtime intervals.

U-Forming presses

Modular design equipped with three to four main cylinders, innovative press control and drive systems that are directly arranged at the press: This is the concept of our U-forming presses manufacturing thick-walled pipes of higher steel grades. The controlled movement of all axes allows for the realization of the optimum U-canning for the subsequent forming stage into O. In connection with our patented multiple-stage system also pipes with smaller wall thickness can be crimped.

Another benefit: Through the optimized tool geometry several pipe diameters can be processed thus reducing nonproductive times.

O-Forming presses

The giant of the line with a pressing force of 4,000 metric tons/meter also forms the present materials beyond X100 to the desired roundness based on optimum reduction ratio of up to 0.4 %.

Varying pipe length is automatically detected and the press is controlled accordingly. Our patented highly precise control for parallelism of moving crossbeam ensures a parallel pipe gap across the entire pipe length. Pipes manufactured in the O-process excel through homogenous compressive stress distribution around the diameter and across the pipe length thus complying with utmost "deep water" requirements.

Our try-out presses systematically manage each of the three process stages in one machine.

The benefit of all three forming stages at a glance

- Optimum forming parameters through A-U-O-application software
 - Minimum cost owing to modular tool systems with half shells
 - Short downtime intervals through automated tool change systems
-



Side Member Presses

“Customers from the utility vehicle industry appreciate the side member presses due to their precision and short cycle times. The tool change and plate charging system allow for flexible production of different side members.”

Dipl.-Ing. Amir Tanbakouchi, Sales Manager Metal Forming



All functions in one machine

These presses are suited for blanking and drawing of side members and cross members, bumpers, cabin parts and chassis components of trucks, pick-ups and buses.

The machines combine all blanking, piercing and forming functions in one plant. Through the automatic device for unstacking of plates, charging of the press as well as turning and unstacking of blanked plates and finished side members they achieve a high cycle time. The press at a truck maker produces one side member on average every 50 seconds.

Precision for dimensions and contour

Through the patented electronic control of ram parallelism and the direct-hydraulically controlled active shock-absorption during blanking they accomplish a high precision as to dimensions of the plates, position of the holes and the shape of the cross-section of the side members – even in case of high eccentric load and a tensile strength of the plates of 80 N/mm² and more.

Set-up during production

The system for quick change, turn and stock of upper and lower tooling reduces cost-intensive set-up and downtimes. The die plates and the dies can be changed within 15 minutes.

Through a second tooling change carriage the equipment can be changed over outside the press during production.



The benefit

Through this one plant tasks are managed that previously could only be managed by at least three machines.



Precisely Manufactured Rings



Rolling mills

The radial-axial ring rolling mills produce rings made of steel and special materials such as nickel-based, titanium and aluminum alloys with diameters up to 6,000 mm and more.

With the aid of many engineering details we achieve an extraordinarily high precision. Thus the axial gap can be adjusted through hydraulic precision axes with a resolution of 0.05 mm.

Especially for ring rolling Siempelkamp developed the SicoRoll 3.0 control combining planning of the rolling process and control technology.

Together with our blanking and piercing presses Siempelkamp covers the entire process of ring manufacture starting with the blank to the finished ring.

Ring Rolling Technology

“Through the SicoRoll software our customers exactly control the rolling sequence. By means of data exportation to FE-Solvers they can optimize the process in detail.”

Dipl.-Ing. Klaus Schürmann, Head of Computer-Aided Design





Type: Axial-radial ring rolling mill

Radial force:	10 MN
Axial force:	8 MN
Outer diameter:	up to 6,000 mm
Ring height:	up to 600 mm

Precise control

The software solution SicoRoll 3.0 developed by Siempelkamp especially for ring rolling provides the highly precise control of speed and torque of the drives. The program determines the rolling parameters through a simulation considering the material properties and the limits of the machine. In doing so, a database is used where tool and material data are stored including the prevalent rolling curves and strategies as planning basis.

Due to the open-source software the operator has extensive possibilities to intervene – he can easily add special individual rolling sequences. The calculated rolling parameters are communicated to the machine control, highly dynamic control drives ensuring the optimum rolling sequence.

The technological kernel of the software also indicates the blank dimensions for the forging press.

Optimum ring growth

Owing to SicoRoll the datasets of axis control can be directly transferred to FEM systems such as Simufact. In this way, the rolling process for difficult-to-form materials or extraordinary geometries can be optimized in detail. Through the programs information is provided on local distribution of material properties across the entire ring cross-section or roll temperatures.

As result thereof it can be learnt how blank geometries or the rolling process have to be adapted for achievement of uniform strain rates.

High throughput also for small lots

The “universal cassette design” allows for the application of different configurations of main rolls in the same machine. The cassettes can be replaced within 30 to 50 minutes. The rolling caps can also be changed quickly resulting in minimum set-up times.

Custom-fit and economic

Forming of Titanium

"Titanium shows the highest strength-to-weight ratio among all metallic materials. The difficulty to form it comes along with it. We provide complete solutions for the entire process chain starting from compacting the titanium sponge to the near-net-shape component requiring either no machining or simply a minimum."

Dip.-Ing. Götz Sondermann, Head of Engineering Metal Forming





Near-net-shape components made of titanium are sought after in many fields such as machine and plant engineering, automotive and aerospace industry. Here titanium and titanium alloys in jet engines or for highly stressed components such as undercarriage and support structures are indispensable.

The light and high-tensile material particularly challenges the forming process: optimum results can only be achieved through presses that are specially laid out for this metal.

The special feature of the material titanium is that it has to be compacted in a first step. After that it can be forged or – for the manufacture of rings – rolled. Siempelkamp provides presses for the complete process chain of handling and manufacture of titanium.

The titanium sponge compacting presses are characterized by high forming pressure. They produce compacts that are ideally suited for subsequent processing.

The open-die forging presses that are applied for processing of titanium and titanium alloys run at high forging frequency since a very narrow range of temperature has to be observed for titanium forging. In doing so, this reduces not only the machining time: As a result of additional energy input the workpiece stays longer at ideal forging temperature.

Through their externally arranged main cylinders and the hydraulic control of parallelism our closed-die forging presses achieve an all-time contour accuracy of the parts being indispensable for titanium forming, even in case of high eccentric load.

Our ring rolling mills stabilize the position of the ring during the rolling process through a centering device. The axial gap can be adjusted through hydraulic precision axes with a resolution of 0.05 mm. In doing so, highly precise titanium components are produced that meet challenging specifications.

The outcome:

Near-net-shape and stress-relieved components with very uniform properties.

Titanium Sponge Compacting Presses





Specific forming pressure unrivaled so far

Due to our long experience in forming of titanium workpieces we rank among the few manufacturers of presses being able to manage also the central process stage of compacting the titanium sponge.

Under compaction of the extremely porous semi-finished product "titanium sponge" the compacts evolve which the electrodes provided for melting are composed of.

Another distinct feature is the double-sided action of our presses: They generate a specific forming pressure of 2 x 80 MN that has not been realized in this range so far for the compaction of titanium.

The advantages: The density of the compacts is particularly high and uniformly distributed along the cross-section. The double-sided action of the Siempelkamp presses provides customers with a pre-product that is easy to process efficiently.

The compressing speed of the Siempelkamp presses that can be exactly adjusted to the product ensures utmost repeatability and dimensional accuracy for the operator.

The outcome:

Higher density of compacts and consequently, improved workability of the material as well as higher quality of the finished products.

Retrofit and Upgrading

“Retrofit and upgrading are – in particular for large presses – attractive options in comparison to new installation as the framework of many plants is still in good condition. Having upgraded with modern hydraulics and control technology they again comply with utmost requirements.”

Dipl.-Ing. Erich Stelzhammer, Head of Upgrade and Service





Example Alcoa

For the retrofit of the “super giant” at the age of more than 50 years – with a pressing force of 450 MN one of the biggest closed-die forging presses worldwide – provided for Alcoa Forging & Extrusions in Cleveland/Ohio Siempelkamp designed and delivered the spheroidal casts of up to 250 metric tons of weight. Having installed these components, the press became the most modern and productive forming press of its category.

Within the scope of supply the Siempelkamp engineers at first analyzed the construction dated from the fifties, then made FEM calculations and optimized the new casts on the basis of a specified maximum component weight. For the engineers, it was particularly challenging to install the new parts – provided with 50 years of technological development – accurately to the millimeter into the existing framework of the press.

The outcome: A modern press with structural parts that are fatigue-resistant due to construction and material properties performing for more decades to come.

Example Stupino

For Stupino Metallurgical Company in Russia Siempelkamp retrofitted two open-die forging presses with pressing forces of 46 and 100 MN that had been constructed more than 70 years ago. The mechanics of the press frame could still withstand mechanical load. Siempelkamp reworked guides and cylinders and replaced the complete hydraulics and control technology.



Within only eight months both plants including peripheral equipment were disassembled, the new components were delivered and both presses including manipulators were re-commissioned.

After upgrade, the presses meet with state-of-the-art requirements regarding all details.

Example Durgapur

At Durgapur Steel Plant located in India Siempelkamp realized an upgrade of three presses of a forging line for rail wheels. The project included the new electric and hydraulic control of all presses, delivery of new structural parts as well as a new press frame for the existing 20-MN dishing press.

The wheel line consists of a hydraulic 63/12-MN press for preforming and piercing of wheels, a 20-MN dishing press delivered by Siempelkamp in the year 1993 and commissioned, as well as of a 3-MN marking press.

In addition to the improved quality of the wheels – on the one hand, through precise positioning of the sliding bolsters and the lifting and centering devices and on the other hand, via modern measuring and control technology – Siempelkamp clearly improved the manufacturing capacity resulting from the upgrade.

Siempelkamp also provided an interface to the customer’s management information system by means of which the press is provided with production orders reporting working data back to the system.



Energy Efficiency

“The best way to save energy is not to create the need for energy and additionally, to utilize energy being already available in the system. Our product innovations improve the usage of energies.”

Dipl.-Ing. Götz Sondermann, Head of Engineering Metal Forming



Competitive edge and cost benefits in view

In addition to economy ecological issues become more and more important for manufacturing processes. Energy efficiency has been developing to a strategic factor ensuring considerable cost benefits and competitive edges for plant operators.

An efficient drive technology is the most important changing parameter. Our answer is „intelligent drives“. Wherever it makes sense we apply frequency-controlled, speed-variable drive units. In case of some presses we control the pumps not only in function of the existing demand, but switch them off completely in process-typical rest positions.

Often, we combine tradition and innovation: In our closed-die forging presses quick lifting and lowering are realized via frequency-controlled, speed-variable drives without control valves; the proper forming process running with classical control valve technology. In doing so, our control and hydraulic specialists make use of their experience they have been gathering for more than 30 years in the application of energy-saving motors.

Our customers benefit from the process-related high weight of some components: When lowering moving crossbeams, we make use of their potential energy to recuperate electricity and to supply it back to the system. Based on this principle, we built the biggest hydraulic press worldwide equipped with a “hybrid drive”.

Also through pressure relief of the hydraulic system we recuperate energy. And through multi-stage accumulators for hydraulic oil we minimize the pumping losses in the system and consequently, the heat to be dissipated.



Service: Driven by Perfection





From our factory in Krefeld to the sites of our customers it is often a long way. And the individual components are not explicit lightweights. For this reason, we developed extensive logistics know-how in the course of our corporate history.

Assembly and commissioning are monitored through experienced supervisors who have been accompanying the new installation from the start of construction process and knowing each detail. That means for the operators: start-up without surprises.



Transportation and Assembly





Well-coordinated logistics, clear concept

The dispatch of particularly heavy parts such as beams weighing nearly 300 metric tons or moving crossbeam components of up to 11 m of length and more than 7 m of width calls for special expertise and routine at the same time.

That is why our scope of supplies also includes the transportation to the construction site – the Siempelkamp logistic department organizing and coordinating the best way.

This includes professional packing matched to the volume to be transported, assembly sequences and prompt customs clearance. Here it pays off that the Siempelkamp headquarters are not far away from Krefeld harbor – and that the way on the Rhine River is thus cleared for the worldwide transportation of components of any sizes and weights.

Efficient organization, smooth cooperation

During assembly, we also support in presence so that production can start as scheduled.

Prior to dispatch we check and test all hydraulic components and their interaction with the control technology in the Krefeld factory. In doing so, our customer can rely on the fitting accuracy required on site of the customer and on an uninterrupted realization of the assembly.

The assembly on site is principally executed through our specially trained staff that knows the plant and is involved in the order from start of the project and manufacture. We integrate all peripheral systems and make sure that all components smoothly interact.

Service

“Our service staff works on the basis of a sustainable concept to make sure that our plants operate with maximum availability for decades to come.”

Dipl.-Ing. Götz Sondermann, Head of Engineering Metal Forming



Comprehensive services

During the complete life cycle of a plant we provide for comprehensive support of our customers on the basis of a holistic concept. That means for the operators: Commissioning without surprises, prompt aid in case of downtimes and generally high plant availability.

Local field service

As OEM Siempelkamp is the competent partner for spare parts service, upgrades and retrofits of metal-forming presses in the field of

- mechanics
- electrics/automation
- hydraulics.

Our global field service is present on site during commissioning of the plant including training of the users. Experienced specialists support you with plant start-up. During operation, they give advice and support the users through regular inspections, for maintenance of the plant and analyses in case of downtimes.

24-hours hotline and teleservice

The 24-h hotline is at your disposal for any prompt help required for all issues around mechanics, electrics, automation and hydraulics.

On request, we provide for monitoring of the plant condition. Our presses are equipped by default with teleservice systems. Thus, we can quickly analyze and remedy defects. In doing so we are supported through our DAHMOS software, as basic version being part of all our plants. The condition monitoring also offers the advantage of a specific and preventive maintenance strategy.



Service and logistics center

More than 100 employees of the Siempelkamp Logistics & Service GmbH provide for quick service including well-coordinated processes at three locations. Owing to the new service and logistics center in Bad Kreuznach/Germany and its excellent warehouse capacity our customers are assured more than ever that they receive the correct spare part as quickly as possible.

Subsidiaries and representations

Siempelkamp Worldwide

Machinery and Plants



Siempelkamp

Maschinen- und Anlagenbau

Siempelkamp Maschinen- und Anlagenbau GmbH
Krefeld, Germany



BÜTNER

Büttner Energie- und
Trocknungstechnik GmbH
Krefeld, Germany



CMC TEXPAN

CMC S.r.l.
Italy



Siempelkamp

Maschinenfabrik

Siempelkamp Maschinenfabrik GmbH
Krefeld, Germany



PALLMANN
TOP PERFORMANCE IN SIZE REDUCTION
Pallmann Maschinenfabrik GmbH & Co. KG
Zweibrücken, Germany



WOLFANGEL
GRANITTECHNIK
Wolfangel GmbH
Ditzingen, Germany



Siempelkamp

Siempelkamp (Qingdao) Machinery & Equipment
Co. Ltd., China



Siempelkamp

Siempelkamp L.P.
USA



Siempelkamp

Siempelkamp (Wuxi) Machinery Manufacturing
Co. Ltd., China



Siempelkamp

Siempelkamp CZ s. r. o.
Czech Republic



VENTAPP
Ventilatoren – Apparatebau
Kerpen, Germany



Siempelkamp

Prof. und Sachverständigen

Siempelkamp Prüf- und Gutachter-Gesellschaft mbH
Dresden, Germany



Production and construction facilities



Sales representative offices

 Sicoplan <small>Engineering</small> Sicoplan N.V. Belgium	 STROTHMANN <small>Machines & Handling</small> W. Strothmann GmbH Schloss Holte-Stukenbrock, Germany
 ATR ATR Industrie-Elektronik GmbH Krefeld, Germany	 hombak <small>Construction Technology Group</small> Hombak Maschinen- und Anlagenbau GmbH Bad Kreuznach, Germany
 Siempelkamp <small>Logistics & Service</small> Siempelkamp Logistics & Service GmbH Bad Kreuznach, Germany	Sales companies/ Representatives
 Siempelkamp Siempelkamp Pte Ltd. Singapore	Australia Siempelkamp Pty Ltd. Brazil Siempelkamp do Brasil Ltda.
 Siempelkamp Siempelkamp India Pvt. Ltd. India	China Siempelkamp (Wuxi) Machinery Manufacturing Ltd., Beijing
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Siempelkamp Krefeld Headquarter

The Siempelkamp group as technological OEM is globally oriented including the three business divisions such as machine and plant engineering as well as casting and nuclear technology. As complete system solution provider of presses and press lines

for the metal industry as well as of complete plants for the wood composite industry the company enjoys worldwide recognition.

The group employs 2,750 staff members all over the world.



Siempelkamp