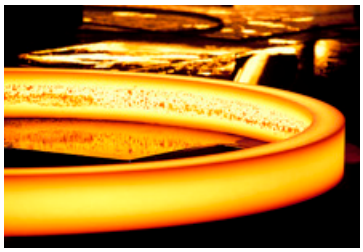
SMS group

Ring and wheel rolling

Top quality for discerning customers






Ring and wheel rolling

Gaining measurable advantages with a strong partner

Rings and wheels large and small – these are the pivot points of progress. They come in a very wide range of different profiles and materials. Without rings and wheels, for example, today's mobility would come to a standstill. They ensure that everything stays in motion, and that pipelines and tanks can withstand enormously high pressure. SMS group offers tailor-made solutions for exacting fields of application requiring rings and wheels. The portfolio extends from individual machines such as ring blank presses, rolling machines and ring expanders to complete plants.

Benefitting from experience

SMS group can draw on more than 150 years of experience in ring and wheel rolling. This goes back to the Keller & Banning Maschinenfabrik und Eisengießerei (machine works and iron foundry) and to the Wagner Maschinenfabrik. Both of these pioneering firms were founded in the second half of the nineteenth century and were later acquired by SMS. Today, SMS group's ring- and wheel-rolling activities stand for innovative technology, precision and top quality. More than 530 completed ring-rolling machines, over 100 complete plants and facilities and satisfied customers all over the world are solid proof of the company's leading position. All customers can rest assured: SMS group knows their business.

Made-to-order solution

Together with the customers, SMS group develops suitable plant and machinery concepts for rings and wheels which precisely meet the needs of the market. The employees possess extensive know-how in terms of forming processes and metallurgical properties. The customers set the objective and SMS group supplies the matching process solution.

Remaining flexible – even with the most exacting demands

Application of the products extends from antifriction bearings in all forms, to the aerospace industry, to crawler-mounted and rail-bound vehicles. The highest precision levels are required when it comes to gearbox and machine construction, and maximum load-bearing capacity is a must for tank and vessel construction. Rings are likewise indispensable in power plants, in the oil and gas industry and in the chemicals industry. The machines and plants from SMS group are designed so flexibly that they can produce an extremely wide range of rings and wheels, covering today's and tomorrow's demands.

Finding contacts close by and the world over

Machines and plants from SMS group are in operation worldwide. The employees likewise. Customers benefit from the close cooperation with other product units at SMS group, for example with the SMS group subsidiary SMS Elotherm, the specialist for inductive heating and hardening facilities.

Typical products manufactured on ring and wheel rolling machines

- Roller bearing rings
- Flanges
- Mast flanges for wind turbines
- Running rings
- Wheel tyres
- Tyres for large ring gears/rings for large swivel gears
- Weld-on parts for steel structures
- Bearing bushes
- Reinforcement rings
- Ball valves
- Rope pulleys
- Deflector rolls
- Gear sprockets
- Synchronizer rings
- Jet-engine components
- Segments (shells) for pressure vessels for equipment or nuclear reactor construction
- Solid wheels
- Wheel discs

From the customer's viewpoint

"SMS group has been our partner for ring rolling for more than 20 years now. The machines and plants are of excellent quality: They are precise, robust and flexible, and for this reason they are also suitable for demanding products – for example for our customers in wind-power generation."

Mikel Redín Pérez de Nanclares, Owner of Euskal Forging SA, Spain

Portfolio

Nothing left out: From the individual machine to the complete rolling line

Whether individual machines or complete plants – for every requirement, SMS group offers the correct solution for ring and wheel rolling. Customers benefit from the wide range of supplies and services and from SMS group's engineering expertise. This is because the employees understand the background and take a holistic approach: They take into account the entire production process, from the cutting of the raw material to the marking and quality control.

Seamlessly integrated solution

SMS group's core machines such as blank presses, rolling machines and ring expanders are integrated seamlessly into the process chain. The electrical controls of the individual machines and the automation of the integrated plants enable trouble-free production. Sophisticated technological planning and simulation systems provide supremely efficient plant control. Integrated plant solutions are thus achieved, in which all components are mutually harmonized.

Control and au

Planning and simul

Raw materials

All forgeable materials: steel in various alloys, NF metals

Cutting of the raw material

- Sawing
- Shearing
- Parting-off

Heating and descaling

- Heating furnaces (gas, oil, electrical)
- Induction heating systems from SMS Elotherm

Forging into blanks

- Ring- and wheel-blank presses

Advice and Service –

In the concepts for integrated plants SMS group takes account of all transport systems such as manipulators, shop cranes and industrial robots. The objective is the intelligent interlinking of the production processes. SMS group thus attains the greatest possible throughput and can guarantee short change-over times and the flexible utilization of the plant. The customers benefit from maximum productivity.

Reliable support

SMS group sees itself as a partner for its customers and supports the construction or revamping of a rolling machine right from the very first idea. This also includes the joint development of new technologies. SMS group employees provide advice and assistance at the start of production and, of course, train the operating and maintenance personnel. The customers can rely on SMS group after commissioning, too. They can be assured of the service for the whole lifetime of the plant.

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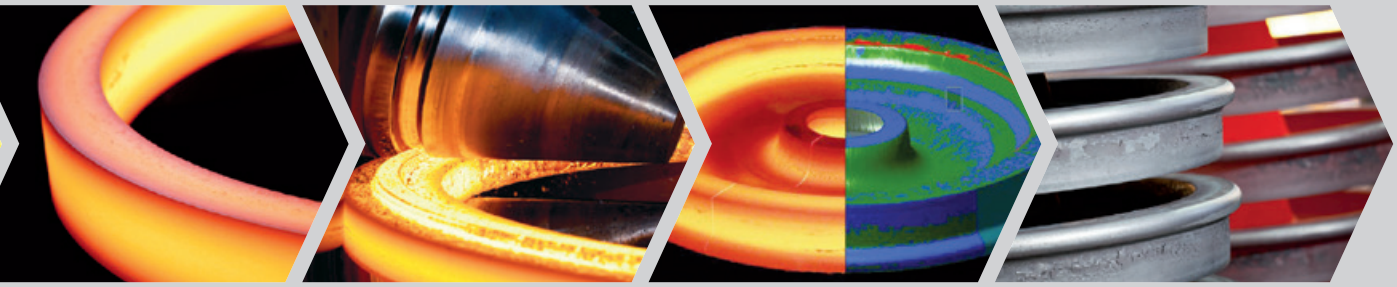


Intermediate reheating

- Heating furnaces (gas, oil, electrical)

Rolling into rings/ wheels

- Ring rolling machines
- Ring expanders
- Axial closed-die rolling machines
- Wheel rolling machines

Marking and quality control

- Stamping units
- 3D laser measuring devices

Products

- Rings from 100 mm to more than 16,000 mm in diameter, solid wheels and wheel discs
- Bevel gears and axle drive wheels

for a whole plant lifetime

Ring blank presses

Quality starts with the blank

An important aspect regarding ring blanks is that the better the starting product is adapted to the final ring shape, the more cost-efficient the downstream processes are and, consequently, the higher the productivity. SMS group ring blank presses are the synthesis of 150 years of rolling and forging experience with new automation and process techniques. Customers benefit from reliable, future-proof ring blank presses with up to 100 MN press force.

Needs-based solutions

Upsetting, pre-piercing and piercing – this is how the presses forge ring blanks. Profiling should also be added to these for profile blanks. Sleeve-like rings are forged in the pot. SMS group can supply the right ring blank presses for every application and all power ranges.

Highly flexible

Thanks to their modular design, ring blank presses can be efficiently adapted at any time to changing plant demands or market requirements. Depending on the ring and lot sizes, the lines operate with different concepts with respect to the arrangement of press cylinder and ram for the forging process. Efficient solutions for quick tool-changing also permit cost-effective implementation in automated production lines.

From the customer‘s viewpoint

“We have been working with SMS group for over 40 years now. Their solutions are intelligently designed and precisely tailored to our requirements. We can change over to other product sizes within a few minutes, and the maintenance, too, is really simple. The Service staff assist us whenever we have queries. They know every detail of the plants.”

Nadir Spezzapria, President, FORGITAL Group, Italy

Radial- and radial-axial ring rolling machines

Achieve more with less

Producing rings by enlarging the diameter of ring blanks – that is the task of SMS group's ring rolling machines: For this purpose, the blanks are heated up to forging temperature and, for radial ring rolling, their wall thickness is reduced by using a main roll and a mandrel. For radial-axial ring rolling, two axial rolls reduce the height of the blanks simultaneously.

Multifaceted in size and shape

On SMS group ring rolling machines, rings with diameters of between 100 mm and 16,000 mm can be rolled, and for heights from 20 mm to more than 5,000 mm.

The ring rolling machines produce rings with rectangular cross-sections and also with a wide range of inside and outside profiles. The machines are just as versatile when it comes to the materials they can roll, because all forgeable materials are also rollable:

- Carbon steels
- Low and high-alloy steels
- Austenitic steels
- Superalloys such as Inconel, Hastelloy, Waspaloy, Incoloy, Nimonic
- NF metals such as titanium, aluminium and copper alloys

Advantages through automation

SMS group has almost fully automated the ring rolling machines and optimized right down to the very last detail. The company combines advanced mechanical and hydraulic engineering with modern computer control. This allows SMS group to fully exploit the machine's capacity and at the same time ensure a high level of plant availability. Customers are thus able to achieve better quality and productivity with low expenditure on energy, material and personnel. This generates monetary benefits in all markets.

Different drive systems for different machine sizes

To achieve its aim of optimizing energy consumption by utilizing the most advanced drive systems for linear axes, SMS group employs electrohydraulic direct drives for the rolling axes in its small and medium-size ring rolling machines. As a result, a central hydraulic power station for generating the drive power for the hydraulic cylinders is not required.

Major benefits for ring rolling machines of type RAW-EH equipped with this innovative drive technology includ

- Lower investment costs
- Reduced operating costs thanks to lower energy consumption
- Lower noise emissions
- Less space required for the machine and its ancillary equipment
- Shorter erection and commissioning times

Larger RAW-type ring rolling machines still utilize the concept of a central hydraulic power station to produce the drive power for the rolling axes.

The refinement of control function and regulating functions and the use of precise, high-sensitivity sensors now enable the seamless rolling of rings in sizes that were considered technically impossible even just a few years ago.

Even ring cross-sections that are very small in relation to the extreme diameter can be produced.

Rings that are both high and very thin-walled at the same time can also be used as starting material, for example in pressure vessel construction.

Cost-effective complete package

Cost benefits for procurement and operation

The new and innovative drive system featuring electrohydraulic direct drives is also employed in the newly developed RAW ecompact® series – a fully automatic, CNC-controlled ring rolling machine that produces rings with rectangular and profiled cross-sections. Plant owners can guarantee reliably reproducible ring quality thanks to the well-established CARWIN and ROLLTECH ring programs.

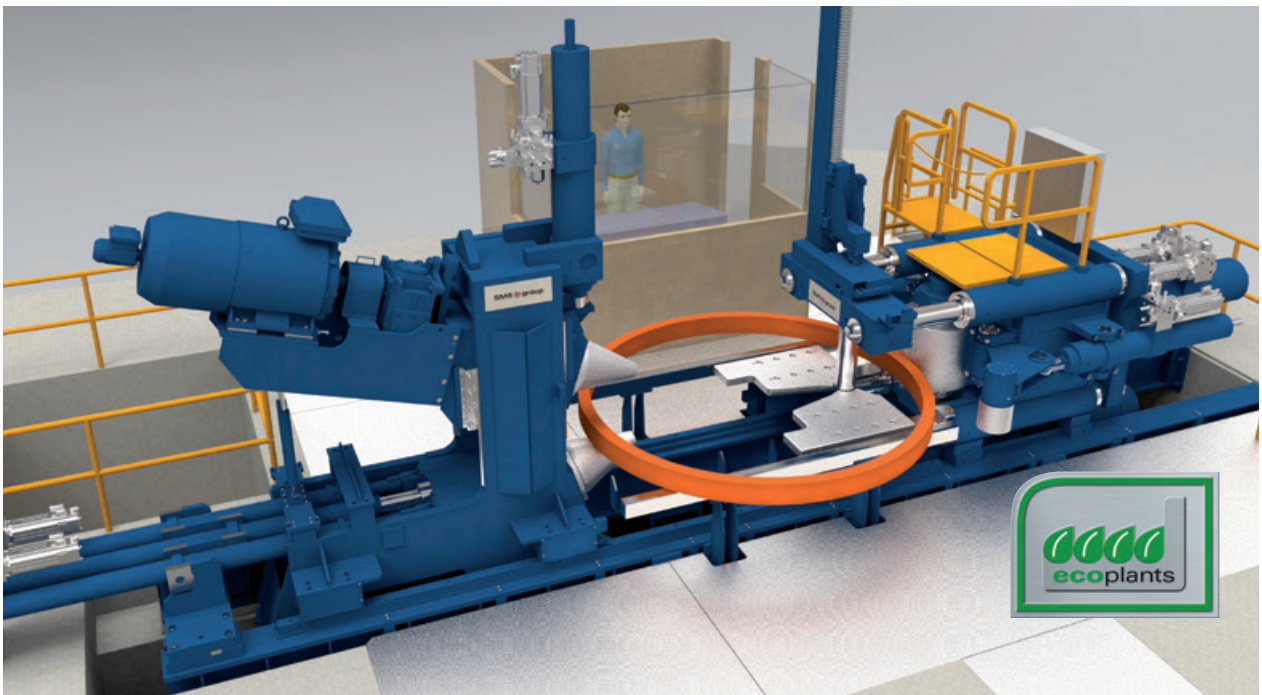
Efficient drive model, shorter payback period

With its RAW ecompact® series SMS group has replaced the central hydraulic system with electrohydraulic direct drives which are mounted on the rolling axes. This design offers two key advantages: On the one hand, the investment costs are far lower than with conventional ring rolling machines, because the elimination of the central hydraulic system also means the entire machine and foundation pipework is no longer required. This also reduces the amount of space required as well as foundation-related costs. On the other hand, the design allows savings to be made in terms of operating costs. Depending on the relevant application, 25 to 50 percent less energy is consumed.

In addition, the use of hydraulic oil can be reduced by more than half, and the noise level is around 15 percent lower. This means the costs of energy, oil, and soundproofing measures can be reduced significantly.

Fast delivery and commissioning

Our RAW ecompact® solution enables short delivery times as well as fast installation and commissioning. The standardized acceptance procedure for verifying the performance parameters ensures that the machine reaches its full performance in a minimum of time – and if time is particularly critical, SMS group can perform the hot commissioning in advance in its own works.



Ring expanders

Higher cost efficiency in ring production

SMS group designs and supplies ring expanders suitable for the ring rolling machines. These expanders consist of a hydraulically movable expanding cone and the expanding jaws fitted against the cone. They cause the ring to become plastically deformed. The control system automatically takes up the ensuing spring-back and compensates this during the following expanding stroke. An integrated turning device helps to improve the precision of the expanded rings. For operation in an automated plant, SMS group can supply expanders which calibrate the ring in just one expanding stroke. The control system with the user-friendly EXPANTRONIC software enables fully automated or manual execution of the expanding sequence, and ensures the highest precision levels. The advantage for the user is a greater degree of cost efficiency in ring manufacturing.

Material, time and cost savings

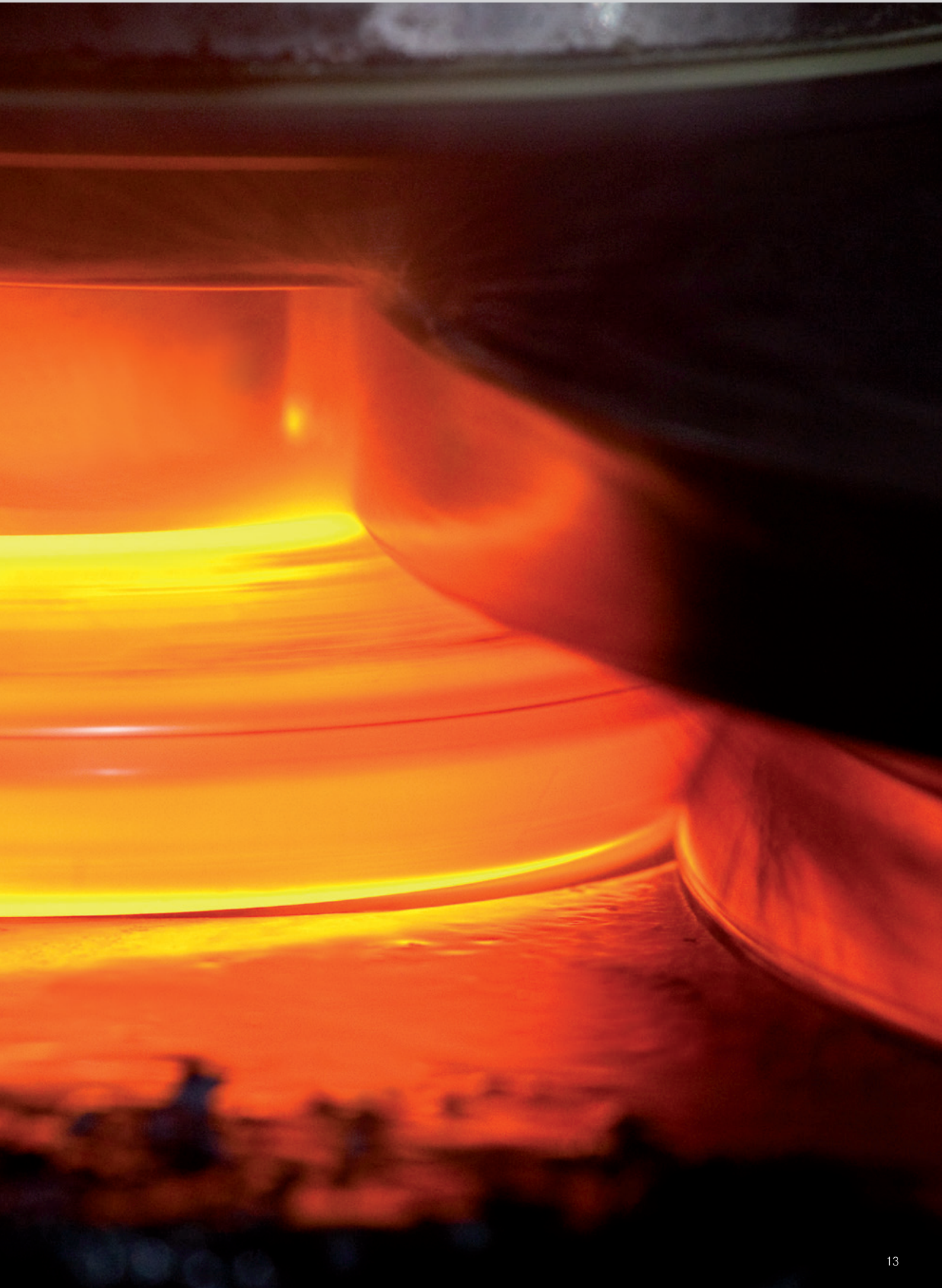
The more precisely the ring already corresponds to its final contour, the less the amount of material is required for the manufacture of the ring. Furthermore, the subsequent heating and machining processes can be significantly reduced and hence production costs cut.

More robust aluminium rings

Ring expanders from SMS group are used for hot, warm and cold expanding. All forgeable materials can be expanded. Aluminium alloys have a special position here. They require the expansion process for cold hardening of the microstructure. This improvement in the microstructure properties increases the yield strength and fracture limit of aluminium rings.

A milestone in ring rolling

Temperatures of around 1000 °C and a rolling force of 160 kN – these are the conditions under which the MERW multi-mandrel radial ring rolling machine produces bevel gears for the automotive industry. The machine concept has been distinguished with the Supplier Award from American Axle Manufacturing, one of the world's leading automotive suppliers. The reason being that maximum precision is required when medium and high unit quantities need to be produced. The manufacture of profiled rings places particular demands on man and machine. Nothing the MERW cannot handle.



Small-ring rolling machines

Compact solutions for higher productivity

SMS group has developed a special machine concept for ring diameters of between 100 mm and 500 mm: the small-ring rolling machine of type MERW for operation in an automated plant. It is suited precisely to the customer‘s requirements and rolls profiled and rectangular rings in a precise and economic manner. SMS group‘s customers thus benefit measurably from the know-how in rolling technology and the expertise in the design of plants.

Intelligent machine design

The small-ring rolling machines from SMS group possess a purely mechanical drive concept for all machine movements. This allows rolling with maximum precision. Loading and unloading takes place simultaneously by using a turret head, thus guaranteeing high productivity. The mandrel is supported on both sides during the rolling process. This makes it possible to use mandrels with a small diameter, thus enabling material losses to be kept low during piercing of the blank. Rapid tool-changing reduces the non-productive time of the machine. A further contribution to this is also made by a scale-flushing system which removes the scale from the machine in a controlled manner. The machine concept is particularly easy to maintain and to operate, thus keeping non-productive times to a minimum.

For exacting applications

The small-ring rolling machines are suitable for the manufacture of rings for the following applications:

- Axle drive wheels
- Bevel gears
- Sliding coupling sleeves
- Ball bearings
- Roller bearings
- Thrust bearings
- Rolling-stock bearing rings
- Bearing bushes
- Spring rings for railway buffers
- Rings for the aircraft industry

Axial closed-die rolling machines

Saving up to 30 % in material and costs

Low material consumption and thus lower costs, these are the advantages of the axial closed-die rolling machines from SMS group. They are used, for example, for the production of axle drive wheels. Compared with the traditional close-die forging process on mechanical presses, manufacturers save up to 30% in starting material with SMS group's integrated plant solutions. This also reduces costs for heating and machining.

Small forming force and ultra-high precision

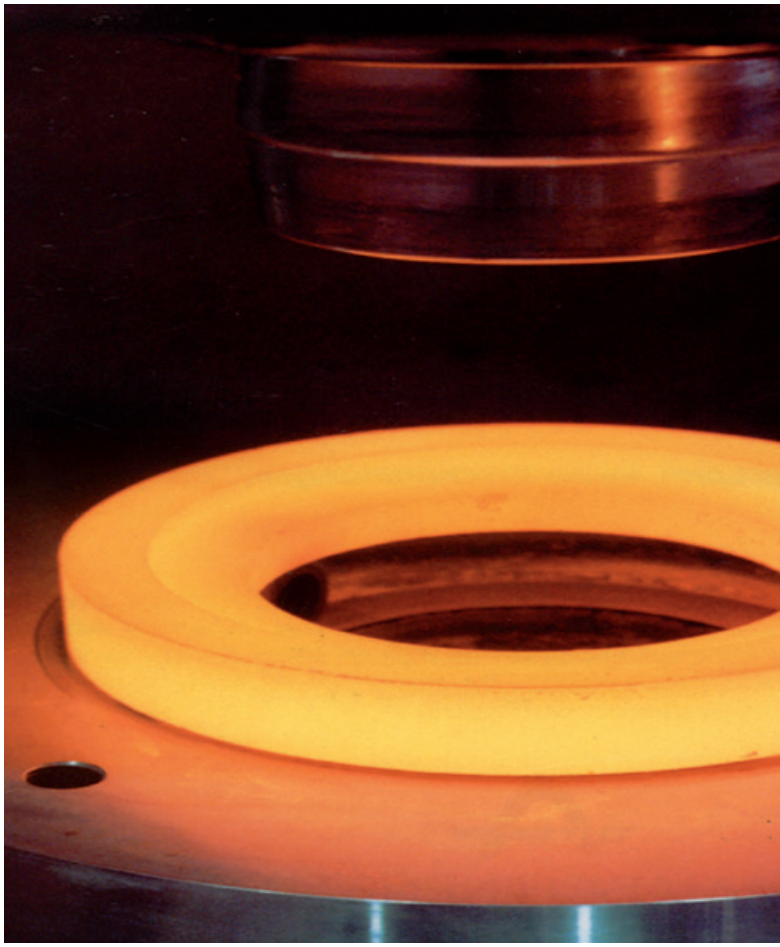
The axial closed-die rolling process is a partial forming process. Pre-rolled rings are placed in the rotating bottom die of the axial closed-die rolling machine. The top die, which also rotates, is inclined at an angle against the vertical axis. Depending on the construction, the dies are vertically adjusted and the ring is rolled in the impression. The rolling force required here amounts to only about 5 to 20% compared with a conventional closed-die forging press. Workpieces are rolled without flashes using the specially developed control system.

A universal process

The axial closed-die rolling process is suitable for a variety of applications. Basically, all rotationally symmetrical workpieces can be rolled from all forgeable materials. In addition to axle drive wheels, these also include aluminum wheels which thanks to their excellent properties are mainly used in motor racing.

An overview of potential applications:

- Axle drive wheels
- Bevel gears
- Flanges
- Roller bearing rings
- Synchronizer rings
- Engine parts
- Aluminium wheels
- Turbine discs



Wheel rolling machines

Unique in terms of cost efficiency, precision and service life

SMS group‘s wheel rolling machines produce solid wheels and wheel discs from pressed blanks. They are used for rail-bound vehicles, for example locomotives, railway carriages, trams and underground trains.

Profiles close to the final contour
The wheel rolling machines are designed such that the blank is rolled in vertical position. Two web rolls simultaneously roll the wheel web and the inside of the wheel tread. This ensures exact and precise running of the machines. They produce a wheel profile which comes very close to the desired final contour, thus saving time and costs during further processing.

Seamless process integration
Wheel rolling machines from SMS group are extremely cost efficient, precise and durable. The machines have a highly rigid construction. The required forming forces are provided as close as possible to the forming dies. Each web roll has its own variable-speed drive. Tool changing cassettes enable very short tool changing times. Thanks to the modern automation system with its

own control desk, the process parameters can be adjusted quickly. Specialised presses for manufacturing of the necessary wheel blanks and for dishing and piercing the wheels after rolling round off SMS group's expertise as a technology leader in this specialised sector. The result: integrated plants in which all the components are perfectly coordinated with one another.

High quality and long service live

SMS group wheel rolling machines and lines are capable of both radial and axial profiling of the wheels, as well as rolling of wheels with webs that are offset from the hub or wheel flange. The railway wheels produced comply with international and customer-specific standards. The wheels are measured contact-free using laser measuring equipment. Machine modification and upgrade possibilities ensure future viability for customers, too. This allows even older models to be upgraded inexpensively to meet new demands.

Planning and simulation systems

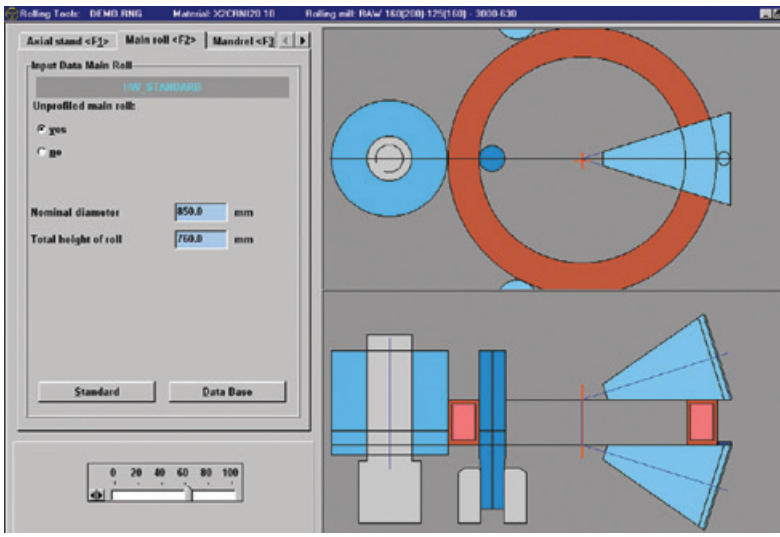
Exploiting the full plant potential

SMS group knows the mechanics, hydraulics, control and drive engineering of its machines down to the last detail, after all the employees designed and built them theirselves. Added to this is unique experience and, with it, process know-how. All this know-how goes into the planning and simulation systems, with which the owners can best plan their processes and control the machines. The systems ensure that the capacity of the machine is ideally exploited and yet at the same time protected against overload. This guarantees high availability and a long service life. The technology systems are of modular design, thus allowing for low-cost modifications, expansions and modernisation.

ROLLTECH gets the processes rolling
One of the most important and powerful technology systems for ring and wheel rolling is ROLLTECH – ROLLing TECHnology. This technology software runs on commercially available standard PCs. The process performs all planning and simulation tasks, generates NC data and transmits them to the machine controller. The user is guided by an intuitive interface and merely has to enter data on the finished ring geometry and on the material. ROLLTECH then calculates the appropriate machine setting on the basis of stored process models. Available program packages are:

- ROLLTECH RINGS for reproducing the entire process chain of ring production
- ROLLTECH FLANGES as a special design module for the standard „welding flanges“ product.
- ROLLTECH WHEELS to support the production data acquisition during the production of railway wheels and geometrically similar products.

CARWIN-controlled rolling process
CARWIN is also a real eye-catcher with its easy-to-learn user interface. The name stands for **C**omputer **A**ided **R**olling under **Win**dows. After input of the target data of the ring to be produced, the software checks the data for plausibility. Together with the CNC system of the ring rolling machine, **CARWIN** then ensures an automatic rolling process.



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