

PREESE
HARTEREI

Whether tool, machinery, plant and vehicle construction or aerospace, medical, and drive engineering, refined metallic materials provide the basis for developments in these technology sectors.

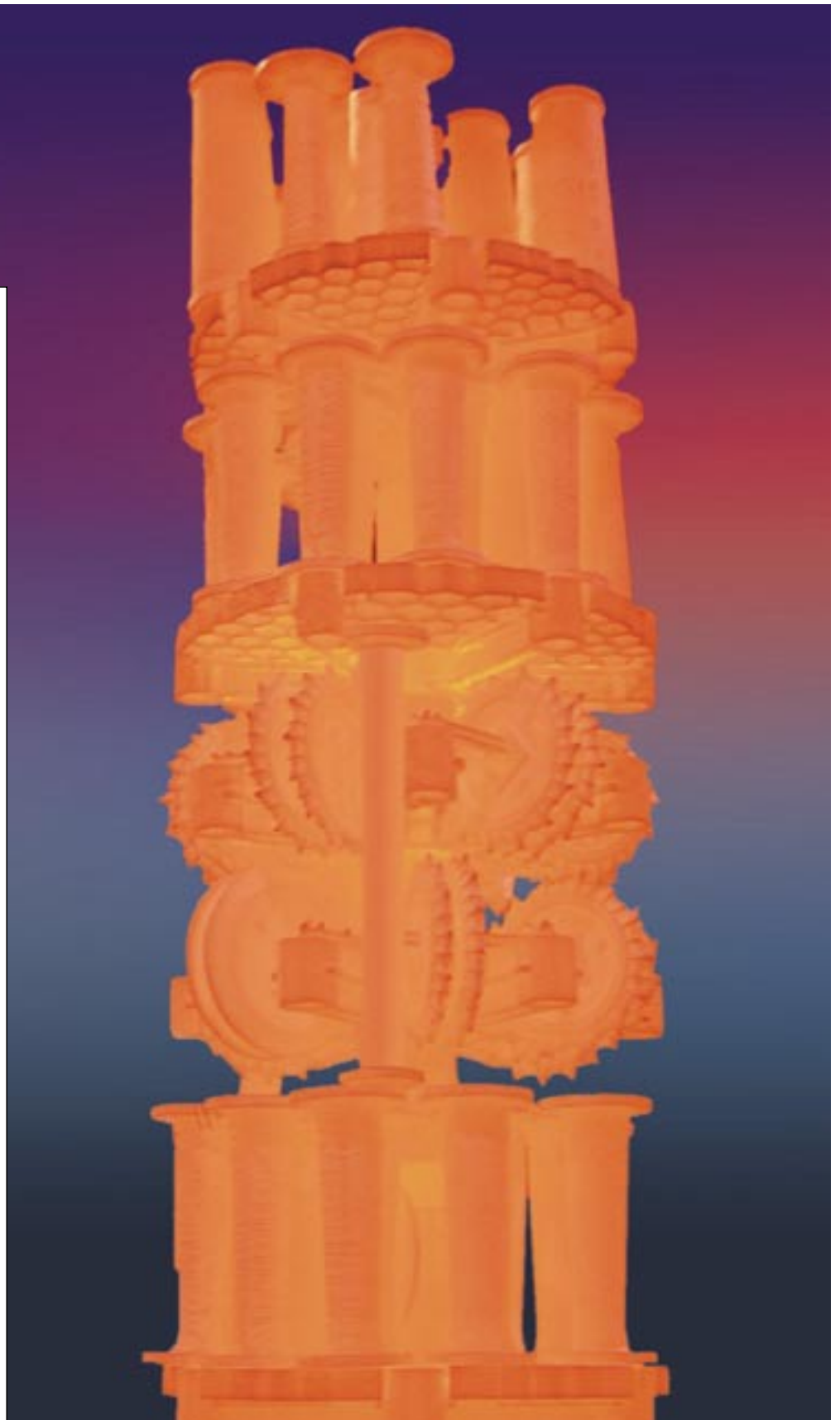
Lightweight design, miniaturisation, and special surface properties all demand highly differentiated refining processes. The most frequently applied method involves heat treatment, which modifies the properties of the metallic materials until they comply precisely with the given production and application conditions.

Since its founding in 1948 the hardening plant Härterei Reese has not only supported, but also decisively affected the progress of heat treatment.

Our company's career has since been exemplary, and we are now a service provider with claims to high quality and strong customer loyalty in this business sector.

Our five sites at the centres of metalworking have created the basis for customer focus with the potential for future expansion.

This brochure presents an overview of our range of services. At the same time it is intended to provide information and to promote the sharing of experience – with the object of continuing to improve the heat treatment of metallic materials and the application properties of components.



The Art of Hardening

Also hardening technology has progressed in line with the developments: automated heat treatment plant ensures efficient, reproducible processes on a high quality level, and methods such as plasma technology, etc., present new fields of potential for the designer.

Härterei Reese has invested in these technologies and methods with a view to providing our customers with additional advantages. New process-controlled plant has been commissioned, and supplies logistics has been expanded at all sites for enhanced customer focus.

The quality of experience

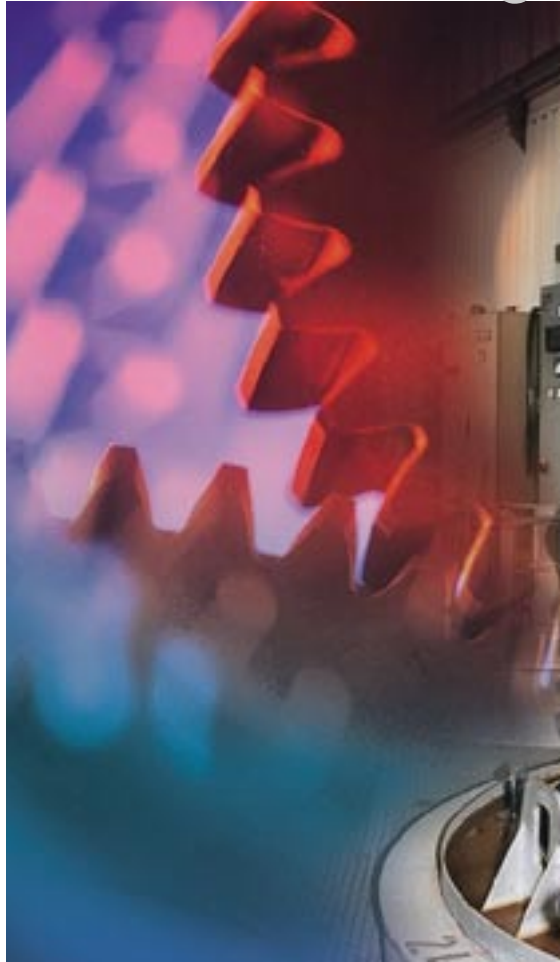
Now as before, the success of heat treatment is still founded on experience – experience gained not only in the development of new and existing hardening methods, but also in day-to-day practice.

After all, know-how and the competence of personnel adopt a greater role in highly-qualified heat treatment than in many other fields of industrial production. For this reason, Härterei Reese is not only investing in plant technology, but also implementing training and further training courses for personnel and expanding its research and development.

Advice from the outset

As a universal hardening plant, Härterei Reese provides over a dozen different heat treatment methods. Choosing the ideal method can contribute decisively to economy, e.g. by reducing finishing costs.

Specialists at all five sites advise the user in the choice of materials and methods, determining the precise targets of heat treatment and generating customised solutions.



The know-how

The advantages of traditional heat treatment methods gained from our extensive know-how are combined with ultra modern control and process engineering: this is the Art of Hardening as interpreted by Härterei Reese.

Not only the ideal furnace types, also every process and heat treatment sequence must be precisely matched for the optimal results.

In this manner we can provide convincing solutions that aim to safeguard and extend our lead in technology and business.



Hardening, quenching, and tempering

When a steel in the austenitic phase (at temperatures over 723 °C) is suddenly cooled, the austenite transforms into martensite, a structure characterised by great hardness. Some toughness can be restored when the steel is tempered.

The optimal values for the steel's mechanical properties are obtained when the steel is tempered at high temperatures up to 700 °C. This is the preferred method for workpieces that must exhibit high toughness under dynamic loading.

Vacuum hardening

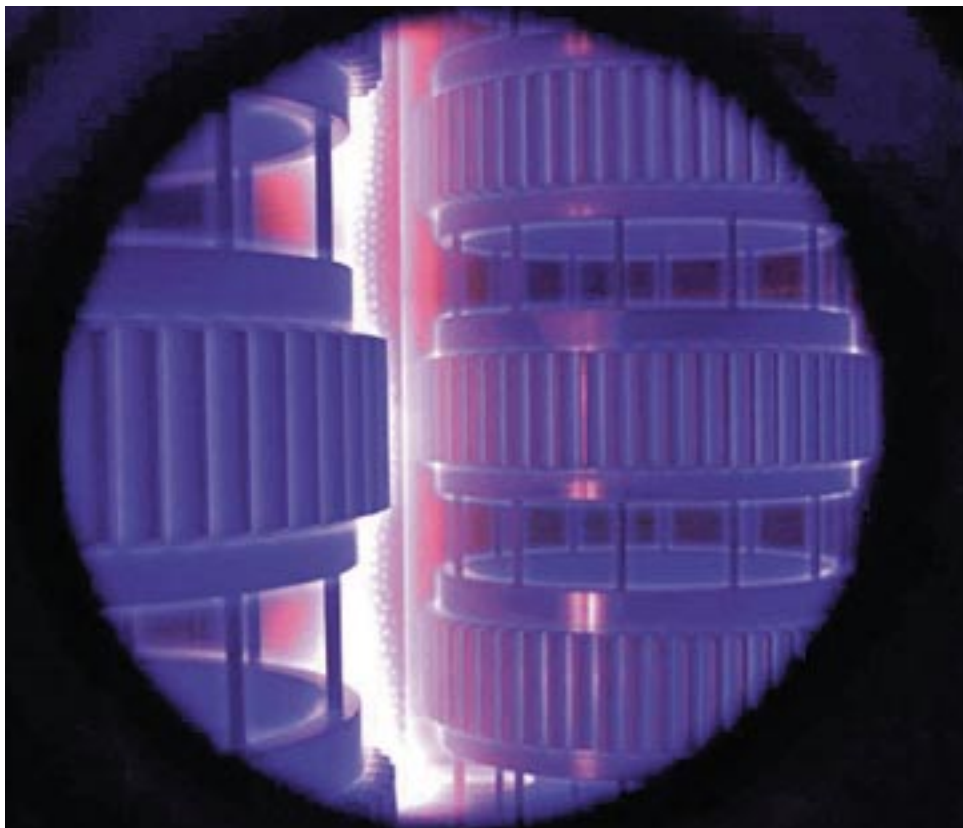
Hardening in the vacuum furnace is ideal for mould components, all tools, and precision components highly susceptible to distortion. The workpieces are quenched in a stream of nitrogen pressurised to 20 bar. The workpieces do not oxidise in vacuum, so their surfaces are metallurgically clean.

At all of its sites Härterei Reese uses process-controlled vacuum furnaces featuring highly precise temperature control, and therefore ideal for hardening low-alloy steels. The users include renowned tool makers and automotive part suppliers.

Nitriding

Nitriding is a method for enriching the surface layer of ferrous materials with defined quantities of nitrogen or, in the case of nitrocarburising, of nitrogen and carbon. This not only enhances the hardness, but also the abrasion resistance, fatigue strength, and corrosion resistance. Also improved are the antiseize and antifrictional properties. At the same time, there are no structural transformations from austenite to martensite, so high dimensional stability is ensured. As a rule, nitriding penetrates to depths of max 0.8 mm. Profundinieren, a deep nitriding method developed by Dr.-Ing. Helmut Reese, even penetrates to depths exceeding 1.0 mm, depending on the material. Provided that the corresponding steels are used, non-deforming nitriding is in many instances a viable alternative to case and surface hardening. Nitriding steels are listed under DIN 17211 and EN 10085.

Our specialists at Härtereie Reese assist the designer in the choice of materials.



Plasma nitriding

Initial trials investigating the glow discharge nitriding of steel parts in a low-pressure nitrogen atmosphere were conducted as early as 1930.

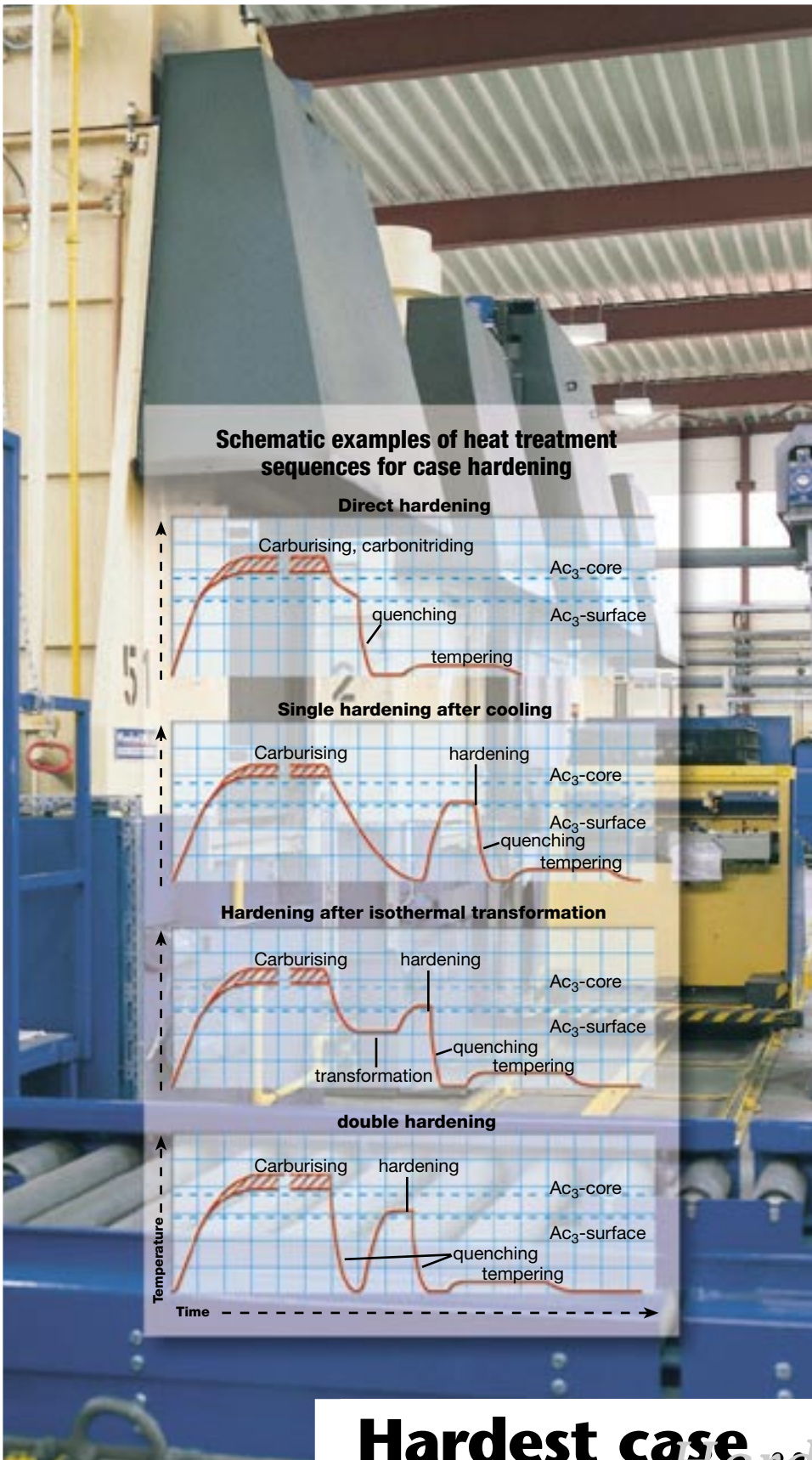
These experiments involved "shooting" ionised gases against the workpieces to harden them – a method that is still used today. Yet it wasn't until the arrival of microprocessor technology that nitriding could be controlled precisely in the so-called fourth state of matter, plasma.

Plasma nitriding shortens the process times for building up highly reproducible special layers. The method is primarily used on sliding and rolling pairs (e.g. pistons, drive train components) and workpieces that have to exhibit particularly high abrasion resistance.

Härtereie Reese operates plant designed for non-distorting pulsed plasma hardening on extremely large workpieces.

High-tech surfaces

High-tech surfaces



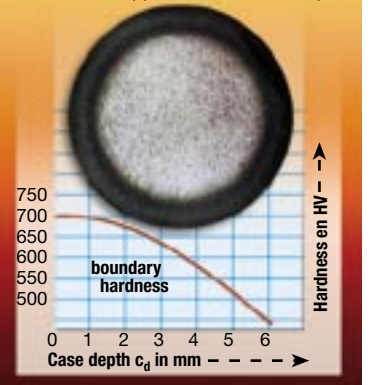
Case hardening

This thermochemical method adds defined quantities of carbon to the workpiece. At Härtereie Reese this method functions on the principle of gas carburising, which allows very precise control and therefore precise specifications of future hardening profiles.

After carburisation, the components are hardened and tempered to relieve internal stresses. In addition to a high surface hardness (max 850 HV) and abrasion resistance, the heat-treated workpieces exhibit good reverse bending and fatigue strengths. Specific time and temperature variations in the carburising, hardening, and tempering processes can be introduced to optimise the material properties and minimise the changes in dimensions associated with the respective



Hardness v depth in a round specimen
17 CrNiMo6; approx. 4.5 mm case depth



Hardest case ...
Hardest case ...

charging techniques – here, too, lies the Art of Hardening.

Härterei Reese works with highly automated multipurpose batch furnace lines for the case hardening, carbonitriding, and hardening and tempering of mass-production parts. The workpieces enter and leave the furnaces automatically, all key process parameters can be precisely controlled and documented.

This plant is used primarily for the heat treatment of automotive parts, drive train components, tools, etc. In addition, Härterei Reese operates state-of-the-art shaft furnaces suitable for the case hardening of particularly large workpieces.



Surface hardening

This method can also be used to harden large components or complex geometries. Induction or flame heating is applied to the loaded zones on the workpiece until the respective hardening temperature is reached, after which the workpiece is quenched.

Our personnel's know-how and qualifications adopt an especially important role in the surface hardening of large workpieces, and this has been a decisive factor in establishing the reputation of Härterei Reese as a company with a particularly high quality

awareness and customer orientation. This experience over many years has been instrumental in optimising methods and finding component-based solutions for both flame and induction hardening, whereby reproducibility is greatly enhanced by specific definitions of machine parameters.

All this makes surface hardening a technical and economical alternative to conventional case hardening in many instances.

The plant run by Härterei Reese can surface-harden workpieces up to 16 t and 10 m in length. Induction coils are available for many standard workpieces, minimising job times.



Boriding

Boriding is suitable for forging tools and workpieces subjected to sliding or rolling friction.

Up to 0.3 mm thick, the boride layer generated on the surface of the workpiece can exhibit a microhardness of over 2000 HV. Borided components are resistant to corrosion, erosion, and cavitation.





Straightening

Many workpieces, e.g. shafts and rollers, invariably suffer distortion during heat treatment. Precise measures to determine and counteract this distortion also belong to the Art of Hardening.



For this purpose, Härterei Reese uses precision straightening presses that can exert pressing forces up to 8000 kN on components up to 10 m in length to yield precisions up to 0.1 mm. Without this combination of heat treatment and straightening plant, it would not be possible to manufacture extremely large workpieces, pinion shafts, and rollers in one piece. In developing heat treatment methods to minimise the distortion in such high-quality components, Härterei Reese has access to extensive know-how that is also benefiting customers from other European countries.

Annealing

Various annealing methods are used to improve the strength and machining properties of metallic materials and to relieve internal stresses in the workpiece or component. Härterei Reese provides all of the usual annealing methods. These include not only normalising, diffusion annealing, stress relief annealing, recrystallisation annealing, and high-temperature ferrite-pearlite annealing, but also ferritising and isothermal annealing as well as special annealing methods for cast components.

Surface treatment

There are several methods to choose from for generating the required surface quality on the workpiece, ranging from abrasive blast cleaning to burnishing, from the Blackrapid® method to oxidation. Our range of services also include vapour degreasing on components and downstream process sequences, e.g. heat shrinking.

Perfection by tradition

Heat treatment is a process that contributes decisively to the quality and service life of the component. The crucial factors therefore are the precise determination of the hardening parameters, precise process management, and the documentation of the hardening results. Certified in accordance with the current DIN EN ISO standards, Härterei Reese's hardening plant at all sites has all the requisites for consistently high quality levels. However, the standards regulate the quality management only. Whether quality is in fact delivered depends on the care taken, the age of the plant, the know-how applied by the personnel, and the customer orientation throughout the company. Härterei Reese takes these factors extremely seriously: both personnel and management live the quality philosophy. Not only quality management, also environmental compatibility adopts a key



role in our corporate strategy. In March 1999 the Härterei Reese plant in Bochum was the first German hardening plant to pass the Eco Audit as specified under DIN EN ISO 14001. In August 2001 the Härterei Reese plant in Weimar was the first hardening plant in the former East German states to operate an environmental management system in accordance with the EC regulation 701/2001, authorising it to use the EMAS symbol for approved environmental management.



Testing and documentation

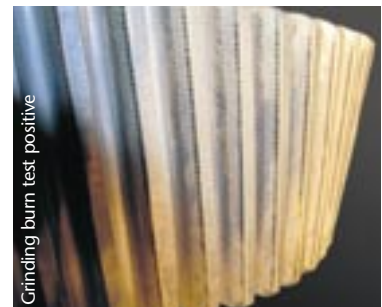
The materials laboratories at each site can conduct extensive material tests and failure analyses. Laboratory tests on components relevant to safety just as rightly belong to our range of services as the documentation of hardening results according to customer specifications.

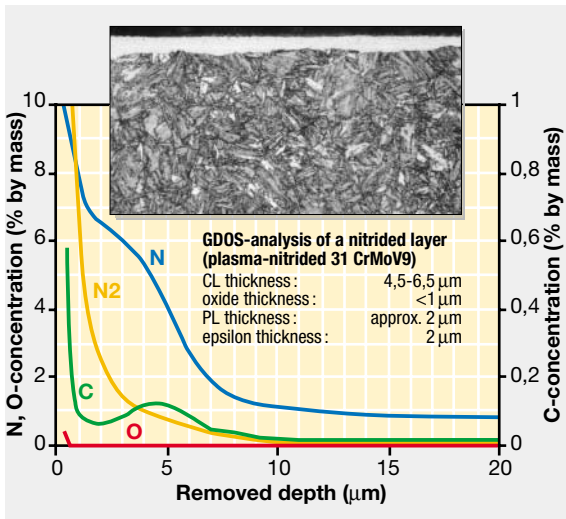
There are also testing instruments for determining hardness values on surfaces difficult to access.

Many gear and tool manufacturers are taking advantage of our nital etching method. This is applied on machine-finished surfaces of high-quality workpieces

for detecting grinding burn as per ISO and US standards.

This test for grinding burn was initiated in 1999 with the object of eliminating one of the primary causes of failure in highly-loaded gears and tools.





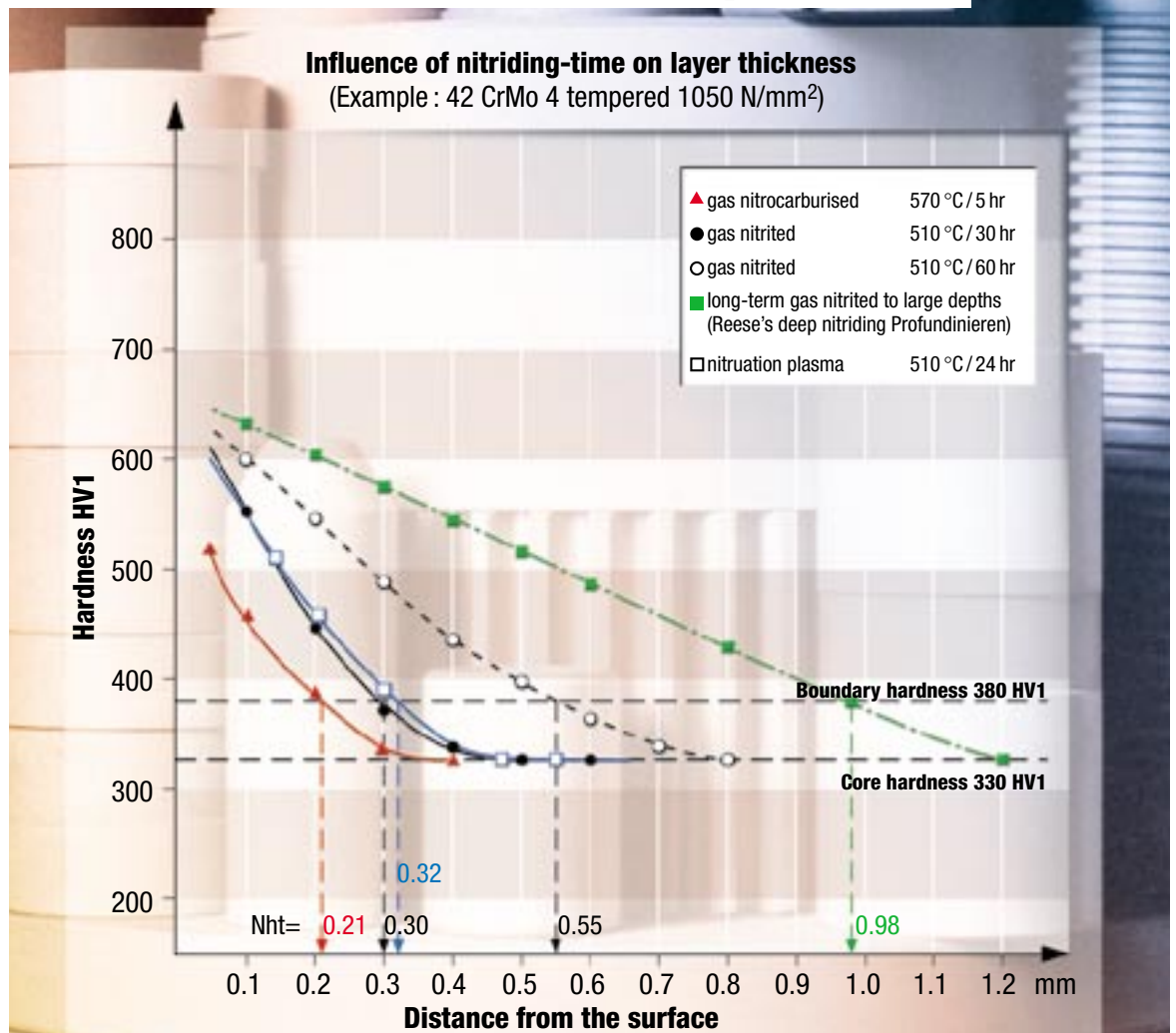
Why should a medium-sized company invest so much in extensive research and development?

At Härterei Reese this is tradition: as early as our founding over fifty years ago Dr.-Ing. Helmut Reese had been contributing towards the progress of hardening methods. One result of this work is Profundinieren, a deep nitriding method. Härterei Reese invests in research and development so that our customers can benefit from the advantages – whether improved methods or minimised post-treatment deformation. That this is an important subject is reflected in Härterei Reese’s collaboration in "Be-

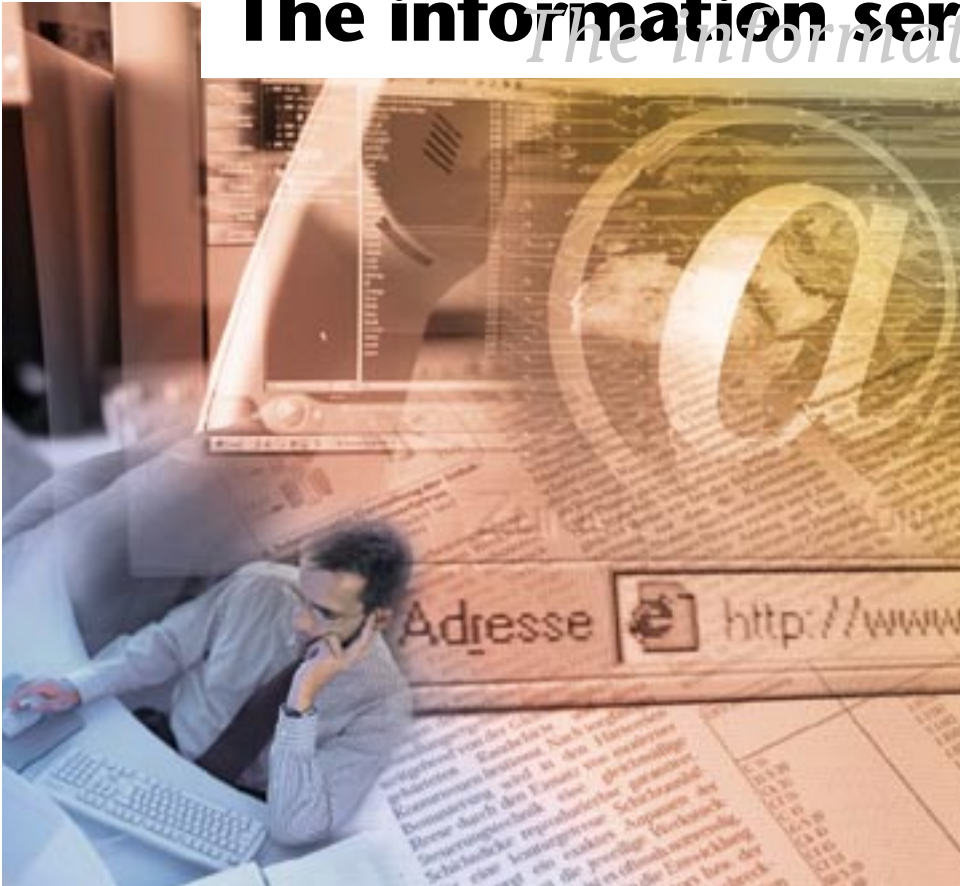
herrschung von Wärmeprozessen im Fertigungsablauf", a work group supervised by the Bremen Institut für Werkstofftechnik for investigating controlled heating processes in production sequences. In addition, Härterei Reese has been an actively collaborator in the AWI, a registered cooperative group for heat treatment and materials engineering.

Research and development at Härterei Reese is concentrated primarily at the Bochum and Weimar sites. In addition, all our sites operate well-equipped materials laboratories that are also available for joint projects with customers.

Research and development



The information service



As a universal hardening plant, Härtereiree can provide objective advice drawn from the complete range of modern heat treatment methods.

www.haertereiree.com

Since 1997 this has been a central source of information for all interested in the basic principles and progress of hardening plant technologies.

The Härtereiree web site not only provides detailed information on the group and its service programmes.

Our home page also presents extensive and objective descriptions of each heat treatment method and its range



Advice

The Art of Hardening not only lies in the individual determination of parameters such as hardening time and quenching temperature based on the material and the required component properties.

Also the competence behind the advice provides an essential foundation for the quality of services a modern hardening plant provides, and it should take effect as early as the design phase.

Traditionally, the component is first designed, the material selected, and then the hardening method determined on the basis of the strength requirements. At a great number of points along the way, efficient heat treatment is not given adequate consideration. If components are to be optimised and the most economical methods determined with the maximum effects, cooperation and advice must be integrated in the design as early as possible. Our experience has shown



that this procedure cuts finishing costs and even renders individual production steps superfluous.

This service has a simple name: CC&M, or Cooperation, Construction & Management.



of applications, including a fast register finder explaining the technical terms. This information portal on the Art of Hardening is open to all internet users.

But if you prefer your information in black and white, you can use our literature service for keeping up to date on the latest news and hardening technologies from our company.

Call us on +49 (0)234 9036-50 for special prints of the latest papers. If you wish, we can enter you in our customer information mailing service.

Case hardening and carbonitriding

Inert gas hardening, hardening and tempering

Nitriding and nitrocarburising

Vacuum hardening

Annealing

Surface hardening

Straightening

Abrasive blast cleaning

Grinding burn test

QA · Advice · Service



Härterei Reese

Bochum GmbH

Oberscheidstr. 25
D-44807 Bochum
tel. +49 (0)234 9036-0
fax +49 (0)234 9036-96
bochum@haertere.com
www.haertere.com

Härterei Reese

Brackenheim GmbH

Plant 1:

Gaswerkstr. 17
D-74336 Brackenheim
tel. +49 (0)7135 9740-30
fax +49 (0)7135 9740-339
brackenheim@haertere.com
www.haertere.com

Plant 2:

Domierstr. 2
D-66804 Altlussheim
tel. +49 (0)6205 3085-28
fax +49 (0)6205 3085-29
altlussheim@haertere.com
www.haertere.com

Härterei Reese

Chemnitz GmbH & Co. KG

Otto-Schmerbach-Str. 19
D-09117 Chemnitz
tel. +49 (0)371 81583-0
fax +49 (0)371 81583-49
chemnitz@haertere.com
www.haertere.com

Härterei Reese

Weimar GmbH & Co. KG

Otto-Schott-Straße 4
D-99472 Weimar
tel. +49 (0)3643 4809-0
fax +49 (0)3643 4809-87
weimar@haertere.com
www.haertere.com