Wichard's Commitment to Quality & Technology

Hot Forging Process

Introduction

Wichard is a global industry leader in the manufacture of marine fittings and other metal parts for industrial applications. Since its establishment in 1919 in Thiers, France by Henri Wichard, the company has specialized in producing high-quality, high-performance hot-forged components.

The hot forging process heats metal beyond its recrystallization point to make it malleable. Once the material is sufficiently heated, it is worked into the desired shape. The high heat employed mitigates the risk of strain hardening during deformation of the material. By using the isothermal hot forging technique, fabricators—such as Wichard—also reduce the risk of oxidation.

Hot forging is suitable for the fabrication of technical components and formable metals. It creates a more consistently formed, solid product with a homogeneous grain structure. Compared to cold-forged or warm-forged products, hot-forged products have the following advantages

- **Increased ductility.** Ductile metal parts can withstand tensile—or stretching—stress that pulls the ends of a product in opposite directions. They return to their original form with little to no damage or deformation.
- **Options for additional treatments.** Hot-forged metal products can be hardened, machined, and finished after the forging process has taken place.
- **More design options.** Heated metal is more malleable and flexible than cold metals or metal that hasn't been heated beyond its recrystallization point. This greater malleability and flexibility allows for the production of parts with more complex geometries.

Hot Forging

Hot forging is a dynamic process. Slight changes in temperature, pressure, and raw material quality significantly impact the final end product. To ensure the consistency, accuracy, and quality of our products, the Wichard team employs strict quality control measures, including:

- **Spectrographic analysis.** Spectrometry is the field of measuring and analyzing material composition. ICP mass spectrometry (ICP-MS) and atomic emission spectroscopy (AES) tests verify the materials and metal concentrations in forged alloys and metal parts. Depending on the nature of the product, it may undergo spectrometry tests at one of three stages: (i) prior to forging, (ii) immediately after the product has been forged, and (iii) after the final product has been heat-treated.
- **Batch-based tensile tests.** Tensile testing is a type of mechanical testing that measures the amount of force required to elongate a product to its breaking point.
- **Individual testing as needed.** If too many products within a batch fail to meet Wichard's quality standards during the initial testing phase, each individual component within the batch undergoes additional testing and analysis.

The results of each test are compared to the set standards for each alloy and product design. Through these tests, our quality assurance team can ensure that each batch of hot-forged metal products acts within acceptable limits and demonstrates the desired chemical and mechanical qualities specified by the client.

The Forging Process

Compared to other manufacturing processes, such as casting and cold forging, hot forging produces stronger, more durable parts. These advantageous qualities are achieved largely due to the hot forging process aligning the grains of the metal along the curves of the load-bearing axis and forming solid components free of internal voids.

By aligning material grains with the load-bearing axis, the hot forging process improves:

- **Elasticity.** The grains in a hot-forged metal part form a lattice of loose bonds that enable the material to stretch when force is applied. This quality allows the forged part to return to its standard form when deformed.
- **Resistance to fatigue stress.** In forged parts, the orientation of the material grain rows follows the form of the metal piece. For example, a hot-forged T-shaped bar would have downward-oriented grain lines that squeeze closer and then blend together to form the stem of the 'T' shape. This quality increases the strength and fatigue resistance of the part.

Additionally, unlike cast and cold-forged parts which may have internal gaps, cracks, or empty pockets, hot-forged parts generally have solid forms. As internal hollows reduce the overall strength of the part or product—leading to a greater risk of premature failure—hot-forged parts offer better reliability and longer service lives.

Production Equipment

To turn an initial part design into a finished, hot-forged product, we employ several precise processes and specialized equipment. Our production equipment includes:

- Heat treatment furnaces
- Eight inertia and hydraulic drop hammers (capable of generating forces between 650 Kg/m to 2,000 Kg/m) for parts ranging from 1 gram to 1 kilogram
- Two automatic, double-action forging lines (capabilities for up to 2,200 pieces per hour)
- High-speed machining centers
- Four electro-erosion machines
- Tribofinishing facilities (for polishing and finishing processes)
- Mechanical de-burring presses
- Penetrant inspection facilities (NDT technique that checks for cracking)
- Salt spray testing facilities (evaluates part for corrosion resistance)

In addition to the abovementioned equipment, our facility maintains a variety of machining and assembly equipment and specialized machines to produce specialty products.

Advantages of Hot Forged Steel Products

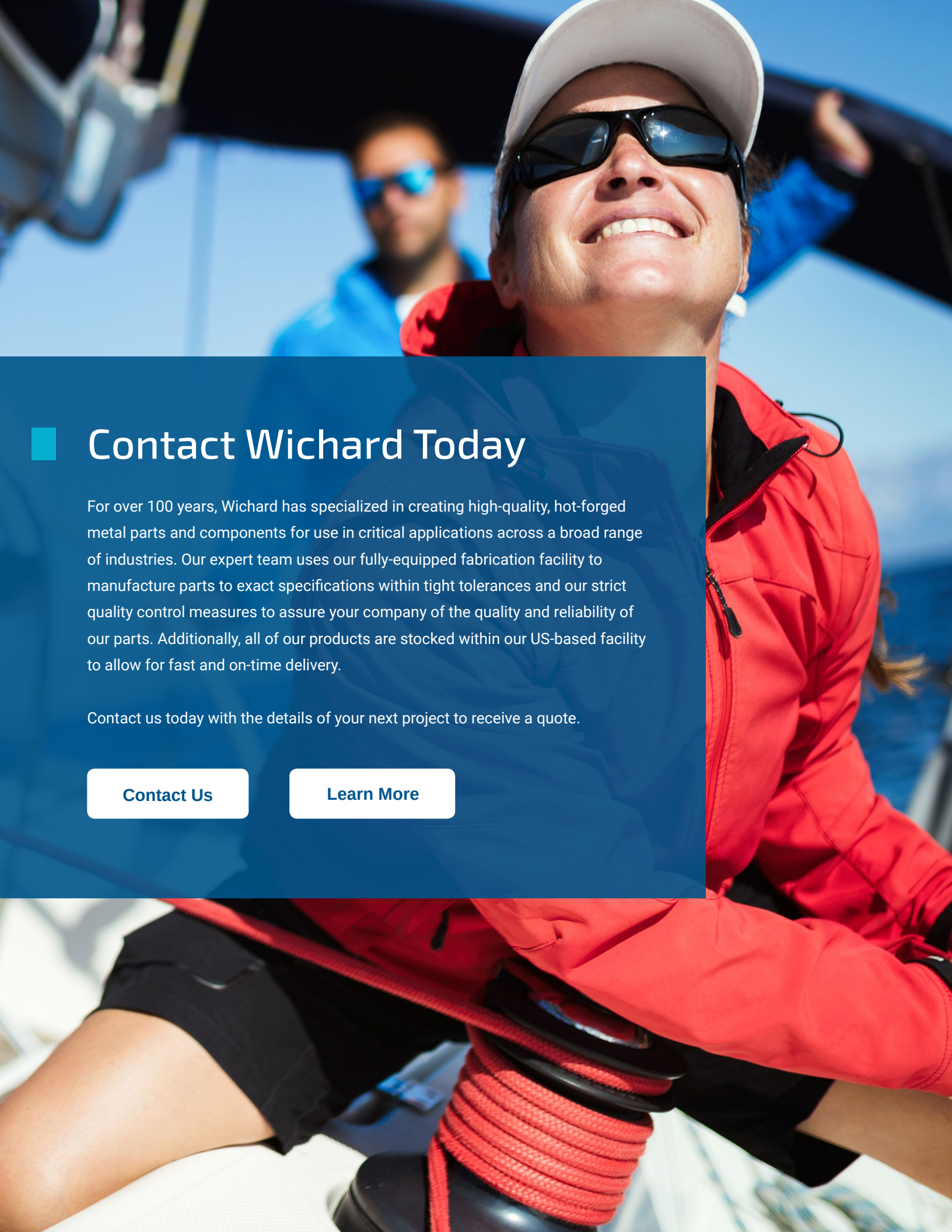
As indicated previously, compared to other manufacturing processes—such as casting—hot forging offers a variety of functional advantages. In particular, hot forged steel products demonstrate:

- **Higher tensile strength.** The realignment of the steel grains during the hot forging process increases the material's elasticity and ductility, resulting in higher tensile strength in the finished product. These qualities allow hot forged steel products to stretch—rather than snap—under excessive loads.
- **Greater fatigue and mechanical strain resistance.** The proper orientation of grain flow also decreases hot forged steel products' susceptibility to fatigue and mechanical stress (such as impact). This effect increases their expected service lives.
- **Increased structural strength.** As hot forging results in solid forms without internal hollows, hot forged steel products demonstrate greater structural strength than steel products formed by other methods. This characteristic results in greater durability and longevity.

Industries We Serve

At Wichard, we provide safety-related products to a variety of industries. Our high-quality, hot-forged metal products often find application as critical components in industries where failure is not an option. Some of the industries that use our products include:

Aerospace | Marine | Search & Rescue | Military | Recreation | Medical



Contact Wichard Today

For over 100 years, Wichard has specialized in creating high-quality, hot-forged metal parts and components for use in critical applications across a broad range of industries. Our expert team uses our fully-equipped fabrication facility to manufacture parts to exact specifications within tight tolerances and our strict quality control measures to assure your company of the quality and reliability of our parts. Additionally, all of our products are stocked within our US-based facility to allow for fast and on-time delivery.

Contact us today with the details of your next project to receive a quote.

Contact Us

Learn More