

POWER VISION



Forging Division
Processes, products and technologies

1. VALUES

Our story lives on
Shaping value
The strength of our numbers

2. QUALITY

Reliable quality, total safety
The value of research
Our quality system

3. APPLICATIONS

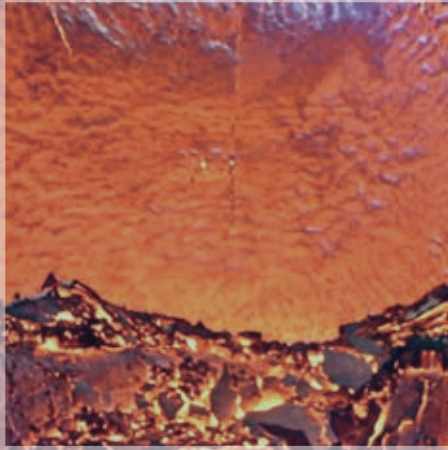
A soul of steel

4. OUR PLANTS

Our plants

**INDUSTRY,
ENERGY
AND
INFRASTRUCTURES
RELY ON A SOUL
MADE OF STEEL,
FORGED BY OUR
PEOPLE WITH
PASSION, SKILL
AND INNOVATION.
AN EXTRAORDINARY
STRENGTH YOU
CAN COUNT ON,
TO IMAGINE
THE FUTURE.**





OUR STORY LIVES ON

Over 130 years of experience and constant growth

Our birth certificate dates back to 1884, when the “Società degli Alti Forni, Fonderie e Acciaierie di Terni” (SAFFAT) was founded. The Terni steelworks industrial complex was founded to meet the demand for steel generated by the second industrial revolution and, in particular, by navy as well as the newborn Italian heavy industry. Since then, we have never stopped growing, also thanks to our strategic geographical location in an area that became key in the development of an integrated and diversified industry. In 1990, Terni’s large-scale iron products started to be manufactured and marketed under a separate brand: Società delle Fucine (SdF). In 2015, SdF was incorporated into Acciai Speciali Terni S.p.A. and became the Forging Division of the company, today part of the thyssenkrupp AG holding. AST’s Forging Division now upholds the legacy of over 130 years of history and experience, and is one of the few forges in the world to offer a wide range of medium and heavy forged steel products, utilizing cutting-edge manufacturing techniques and always up-to-date equipment.

We forge the future, also thanks to the support of the RINA - Centro Sviluppo Materiali S.p.A. that serves the entire Acciai Speciali Terni industrial complex in an integrated way.





SHAPING VALUE

Acciai Speciali Terni.
A Group geared towards the future with top-quality service

We believe in the importance of the innovation and in the continuous research for the quality improvement.
We merge passion and customer care, while viewing safety as a cornerstone of all our production processes.
Belonging to a group that has made caring for customer and pursuing innovation two of its key drivers for growth has opened new opportunities for us – in terms of both markets we can reach and goals we can achieve in customer care and product quality.
Our 130 years of history have clearly forged our technical progress, as well as our working method and philosophy.

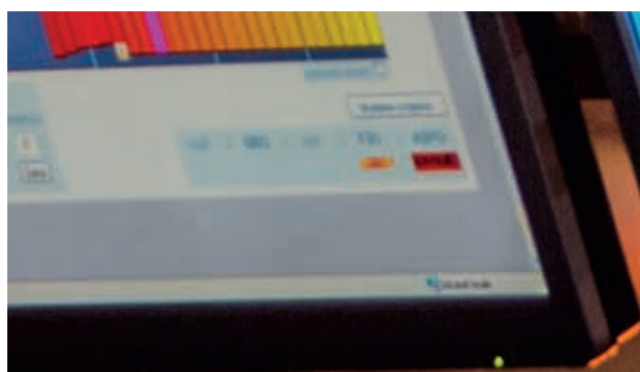
Research

Reliability

Safety

Design





Monitor displaying a data table with multiple columns and rows, likely representing process parameters or quality control data.

TESTIMONE	PRODOTTORE	PRODOTTO	PAI
101	101	101	101
102	102	102	102
103	103	103	103
104	104	104	104
105	105	105	105
106	106	106	106
107	107	107	107
108	108	108	108
109	109	109	109
110	110	110	110



TREND PIROMETRI SFORNAMENTO

SCELTA PROCEDURA UTILIZZABILE

NUMERO OPZIONE	DESCRIZIONE OPZIONE
01	NOTIFICA INFORMAZIONI SOSTE NON PROGRAMMATE
02	NOTIFICA INFORMAZIONI SOSTE PROGRAMMATE
03	SCELTA RAPPORTI ISTANTANEI
04	SCELTA RAPPORTI PERIODICI
05	AGGIORNAMENTO ANALISI CHIMICA COMBUSTIBILE
06	AGGIORNAMENTO CORRELAZIONE STELA ACCIAIO-SANGUELLA
07	AGGIORNAMENTO DATI SANGUELLA ACCIAIO
08	MODIFICA PARAMETRI DI CONTROLLO PUNTO A LAMINAZIONE
09	GESTIONE CARICA CALDA
10	VISUALIZZAZIONE PROGRAMMA DI LAMINAZIONE
11	REVISUALIZZAZIONE ALLARMI
12	AGGIORNAMENTO TABELLE CURVE DI RISCALDO
13	AGGIORNAMENTO TABELLA PUNTO DI LAMINAZIONE-PRODOTTORE
14	FORNITURA SET POINT RAPPORTO ARIA/CAS
15	FORNITURA PANGAGGIO IN RACIA PARALLELA
16	FORNITURA CURVA DI RISCALDO DA OPERATORE
17	RITORNO AL MENU PRECEDENTE

NUMERO OPZIONE 1

PER TUTTI I PRODOTTI TESTARE

THE STRENGTH OF OUR NUMBERS

The reliability of our steel travels the world

To measure the value of a company, you may consider the quality of its products and services or perhaps the milestones, figures and percentages recorded along its history. Today, AST's Forging Division extends over an area of 120,000 square meters and manufactures a wide range of forged steel products. The operative unit is made up of the headquarters and factory, both located in Terni (100 km north-east of Rome) and ideally connected to roads, railways, the Rome airport and international trade ports of Civitavecchia (Rome), Genoa, Salerno (Naples), Venice and Livorno.

120,000-sqm
productive unit

Ingots up to **530**
metric tons

700 T* meter
manipulator

Shipments up to
260 metric
tons





RELIABLE QUALITY, TOTAL SAFETY

Our service is always tailor-made, from design to testing

We comply with the stringent standards in the industry, have a dedicated lab for testing and always hire skilled experts – all to guarantee our forged steel products undergo thorough quality control of the highest level.

Our non-destructive testing lab includes:

- an automated ultrasonic test machine for shafts up to 150 metric tons
- twelve portable UT units
- eight 6000-10000 A units for tests with colored or fluorescent magnetic particles
- endoscopes for axial bore examination
- equipments for visual examination and penetrant testing.

All personnel dedicated to non-destructive testing are certified at Level II as per ASNT-TC-1A and ISO 9712. Experienced and certified Level III technicians guarantee testing is carried out fully, exactly and according to leading national and international regulations, as well as coherently with customer's specifications.

Our destructive testing lab is equipped with:

- ovens for thermal treatment of samples' simulated distension
- machines for tensile testing at ambient, high and low temperatures
- charpy pendulum impact test
- brinell, Rockwell and Shore durometers, both fixed and portable
- machines for high temperature creep testing
- one machine for fatigue testing
- one machine for "Pellini test" (drop-weight test)
- portable quantometer for antimix test.

Our destructive testing lab is also equipped with optical and electron microscopes for metallographic analysis and dilatometers for steel characterization.

Our quality control structure includes a Measurement and Calibration Control Laboratory. The lab is equipped with all the most modern instruments to guarantee measurements are reliable, repeatable and reproducible. Quality control also avails itself of Chemical Analysis and Metallographic Examination Labs, located within the industrial site.



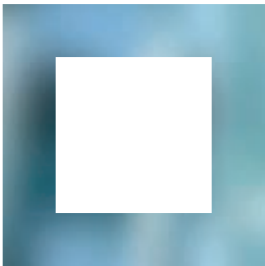
THE VALUE OF RESEARCH

Our plants, labs and know-how come together to forge innovation

Throughout history, metallurgy has been one of industry’s engines – and therefore has always been a target of innovation and investments in research and development. International standards change, possible applications evolve and increase, and as a consequence different requirements are imposed on steel and finished products. Keeping up with the most rigorous international standards and the most sophisticated parameters is part of our daily efforts. That is why we constantly carry out research to perfect and rationalize technologies – as we did when we optimized the forging and thermal treatment cycles, or when we studied the solidification of large ingots through mathematical models.

When sophisticated equipment is required, the Forging Division can count on the support of AST’s RINA - Centro Sviluppo Materiali S.p.A., in an invaluable cooperation that effectively brings together basic research and research targeted at solving specific problems.

The high quality of our products stems from a combination of key elements: plants with cutting-edge technology, top-level labs and instruments, and most importantly the work of a team of skilled engineers who are highly qualified for the complex and delicate tasks required in material analysis.





OUR QUALITY SYSTEM

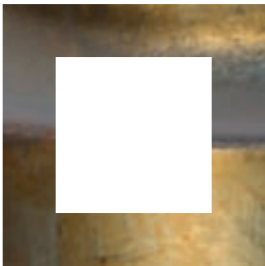
One of the first to be certified by ASME

QUALITY

On the strong foundation of our work philosophy, we have complied for decades with a strict Quality System in all the phases of product manufacturing and controlling. This system has been evaluated and approved by all our main customers, as well as by leading certification bodies such as Italy's IGQ – Istituto di Garanzia Qualità, member of IQ-Net, and Germany's TÜV SÜV.

Ours was one of the very first Quality Guarantee Systems in Italy to be accepted by ASME for the manufacturing of forged steel products for nuclear applications, which must comply with the requirements in Section III, NCA-3800. AST's Forging Division achieved the current ASME QSC-622 Certification for the following scope:

"Material Organization that produces iron based materials, including suppliers' qualification and control in the headquarter of Viale Benedetto Brin 218 - Terni - 05100- Italy". Our quality system is regularly updated and aligned with increasingly strict rules and regulations in the field, as well as with our customers' requests.





A SOUL OF STEEL APPLICATIONS

We work at our best where reliability, quality and safety are a must

The forged steel products manufactured in our Terni plants are mostly delivered to customers in the energy, heavy, or chemical and petrochemical industries. These are all fields where the reliability of machines and components is a crucial requirement for safety on the workplace, service continuity and managing activities with financial profit. Our forged steel products turn into turbines, rotors and generators, steel for tools and components for the transportation of nuclear waste, rolls for rolling mill and parts for presses and off shore plants. Our trademark is unfailing compliance with the highest quality standards, certified by global authorities, and with the most stringent safety regulations. We see reliability as much more than a rule to abide by: it is at the core of our productive process and a constant in our work method. Every single piece we produce is a unique and independent product that must uphold our reputation, because in our field every commitment is a world apart. Our productive processes always consider customers' requests and the technology needed to make the types of steel and the finishes they demand.

Energy

**Heavy
industry**

**Chemical/
Petrochemical
industry**



ENERGY

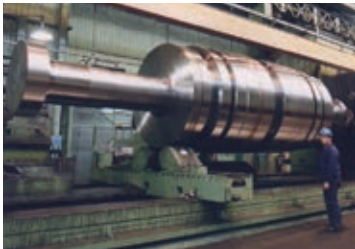
AST's Forging Division is one of the most important manufacturing companies in the world for large forged steel products for the field of electricity generation.

Our products are installed in power plants of different types:

- **Nuclear**
- **Fossil fuel**
 - Coal
 - Natural Gas
 - Combined Cycle
- **Renewable**
 - Hydraulic
 - Thermal Solar
 - Geothermal

The main products we supply are:

- Low-pressure monobloc **rotors**
- High- and medium-pressure monobloc **rotors**
- **Generators**
- **Shafts, spindles and disks** for welded or splined rotors
- **Central cores** for crankshafts and hydraulic generators
- **Rings** for hydraulic turbines
- **Hubs** for Pelton wheels
- **Shafts and disks** for gas turbines







HEAVY INDUSTRY

AST's Forging Division manufactures a wide range of products for the heavy industry: perforation systems for the foundations of wind farms and oil plants, aerospace components, parts for isostatic presses, ship masts, rolls for rolling mill and die blocks.



Ram weight, rings, anvils

Components for soil perforation (both terrestrial and marine) to allow for on- and off-shore platform anchorage.

Press components

Crosspieces, cylinders and pistons that can be assembled in building isostatic presses, extruded or open die.

Propeller shafts

Drive shafts for ships.

Endoreactor cones

Used in the aerospace field as exhaust systems.





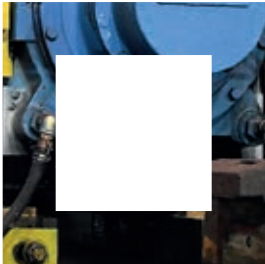
HEAVY INDUSTRY

Rolls for rolling mill

We manufacture a wide range of back up roll for steel lamination and work and back up roll cylinders for aluminum lamination for flat or shaped products. We deliver rolls weighing up to 260 metric tons. The chromium and alloy elements selected allow us to achieve a perfect mix of various properties: hardenability, hardness, fatigue resistance, toughness and to thermal stress. All mechanical processing steps are carried out using modern CNC lathes. AST's Forging Division delivers machined status, ready-to-use rolls.

Die blocks

Our factory manufactures a wide range of steels for die blocks, especially designed for molding of plastics, steel hot pressing, and the die casting and hot extrusion of light alloys and auxiliary components. Our die blocks are mainly used in the automotive sector to make cars' bumpers and dashboards. To ensure die blocks are suitable for use, steel is selected according to its overall characteristics – including its physical, mechanical and technological features. Workability, hardness, polishing, photo etching, tenacity and resistance to wear, thermal shock and corrosion are the main features required by a variety of applications.



NUCLEAR, CHEMICAL AND PETROCHEMICAL INDUSTRY

Over the past years, AST's Forging Division has developed a strong experience in manufacturing components for the chemical, petrochemical and nuclear industry – in the case of the latter, since the early days of Italy's nuclear program in the 1980s. Examples of our products are shells and tube sheets for the chemical, petrochemical industry or nuclear applications, and containers for exhaust nuclear fuel (cask).

In the third millennium, the Forging Division's experience in the nuclear field has translated into the production of components for third-generation nuclear plants, compliant with ASME and RCC-M codes.

As proof of further growth, in 2010 the division achieved ASME's Material Organization certification. General improvements in organizational outcomes make AST's Forging Division a reliable partner even for components related to safety.

We manufacture a wide range of components for the nuclear, chemical and petrochemical sectors.

- **Tube sheets**
- **Shells**
- **Pumps and valves**
- Forged metal **components** for nuclear reactors, steam generators, pressurizers etc.
- **Containers** for the transportation of nuclear waste (cask).
- **Section dedicated to welding activities**; skilled welders as defined by the ASME code, paragraph IX; welding processes: SMAW, SAW, MIG, MAG, TIG.

Special nuclear power plant components

Making special nuclear components, such as channel heads and shells, is one of the biggest challenges for large forged steel product suppliers. The Forging Division is investing huge resources – skilled technicians, equipment and tools – to win this challenge.

AST's Forging Division is currently able to provide almost 100% of the forged steel products required by modern, third-generation nuclear power plants.

The hollow ingot technique

One of the company's main research investments is in the hollow ingot technique. Hollow ingots allow for improved quality in steel, minimizing the effects of micro- and macro-segregations in hollow products. We have already produced 225-metric-ton ingots, but the available technology aims for a final goal of 425 metric tons.





OUR PLANTS

A complete cycle, from fusion to final testing

We are able to manufacture components of the highest quality standards because we constantly invest in updating our plants – which today are some of the most advanced in the field.

For steel manufacturing, AST’s Forging Division avails itself of:

- two 180 metric tons electric arc furnaces
- an ASEA-SKF refining plant with ladle up to 180 metric tons
- two completely automatic converters for decarbonization with argon and oxygen (AOD), 140 metric tons capacity
- a VD/VOD plant with a maximum capacity of 140 metric tons
- tanks for vacuum casting of ingots up to 530 metric tons
- bottom pouring casting pits for solid and hollow ingots up to 450 metric tons.

**Steel
manufacturing**

Forging heating

Forging

**Machine
processing**

**Thermal
treatment**

**Final mechanical
processing**

**Destructive and
non-destructive
testing**

The forging heating division is equipped with:

- four heating, natural gas furnaces with 1000 metric tons of maximum capacity and centralized remote temperature control.

The forged division is equipped with:

- a 12600 metric tons hydraulic press with integrated 700 metric tons*meter manipulator
- a 5000 metric tons hydraulic press with integrated manipulator
- an oxy-fuel cutting machine for ingots and forged steel products of up to 3000 mm in diameter.

The thermal **treatment workshop finishes** off the product with:

- vertical and horizontal furnaces
- vertical and horizontal tanks for hardening in water
- two rotating ovens equipped with hardening machine
- a vertical tank for hardening in oil.

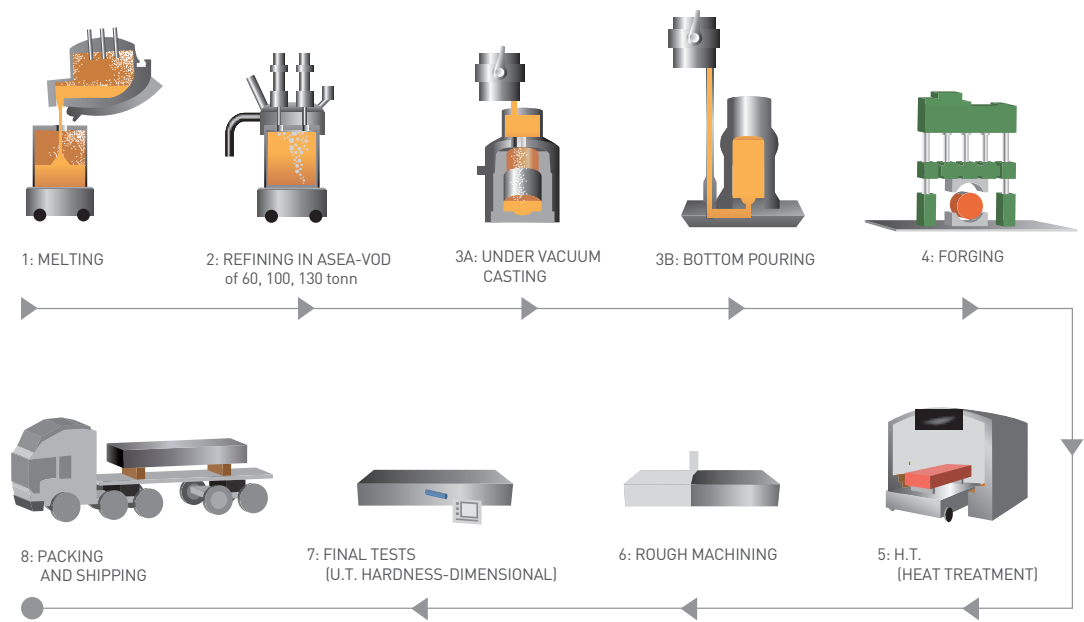
Our mechanical workshop can perform a wide range of operations, thanks to:

- thirteen horizontal CNC lathes with a maximum capacity of 360 metric tons
- five vertical CNC lathes with a maximum capacity of 250 metric tons
- four milling machines
- two grinding machines with a maximum capacity of 300 metric tons
- two boring and honing machines with a maximum capacity of 300 metric tons.

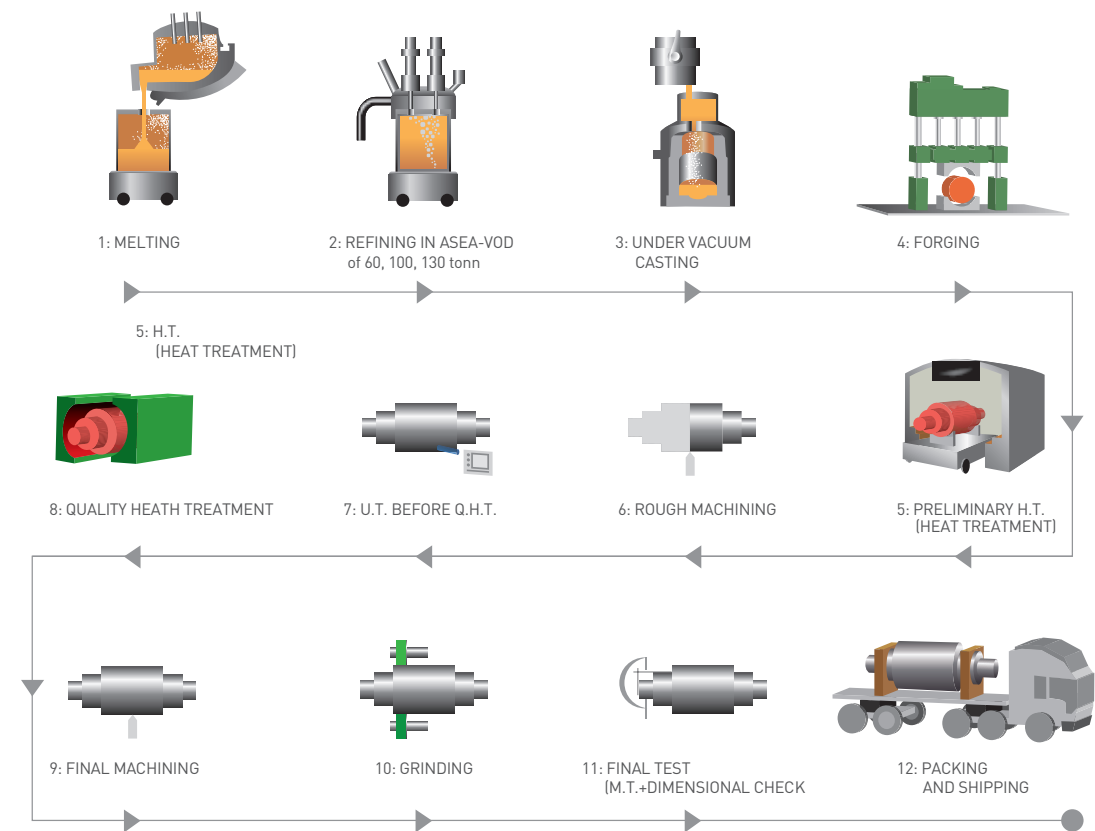
Final mechanical processing is carried out on dedicated vertical and horizontal lathes and on two grinding machines with maximum capacity of 300 metric tons.

Destructive and non-destructive testing is carried out with ultrasonic test machine, complying with standards and specific procedures and using manual and automatic equipment.

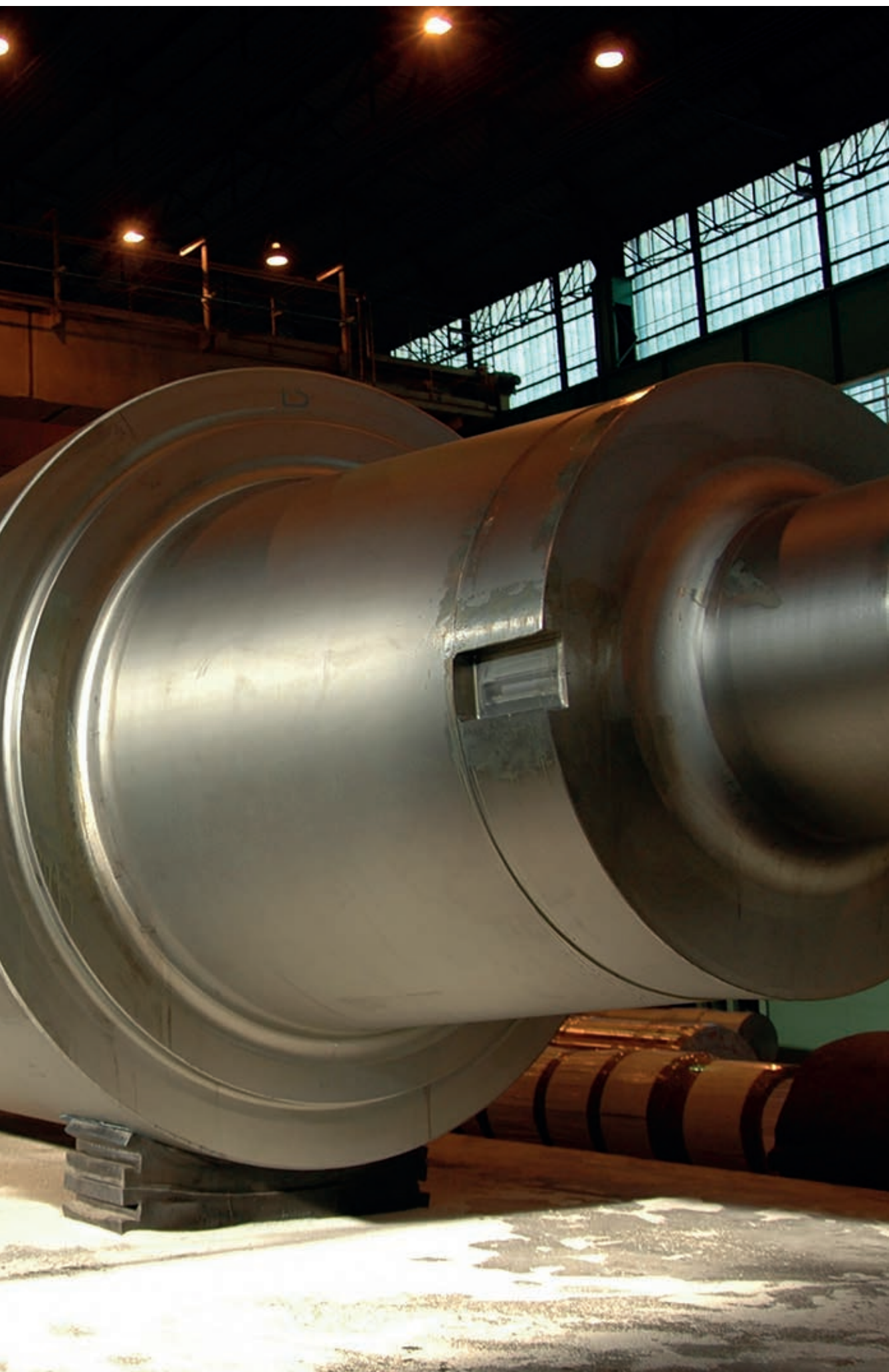
Die block manufacturing cycle (flow chart)



Roll manufacturing cycle (flow chart)

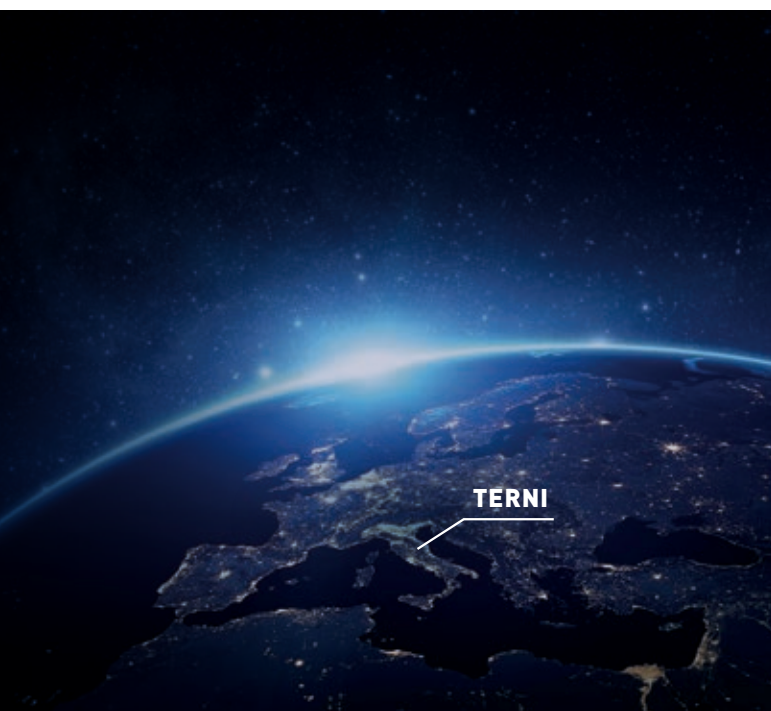












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FUCINE DIVISION**



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“No market is too far away for our knowledge, passion and spirit of innovation.”



The strength of **a unique global sales network** along with a manufacturing plant in Italy and sales headquarters in Germany



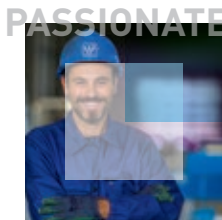
Focus on **customers as the heart** of the business. **Tailor made** solutions developed to meet specific needs



Customers requirements, our every day commitment. A dedicated **cross-functional team** for each customer



An innovative **research center** and customized **IT solutions** for process, product and service innovation



The experience, competence and passion of **our workforce**

