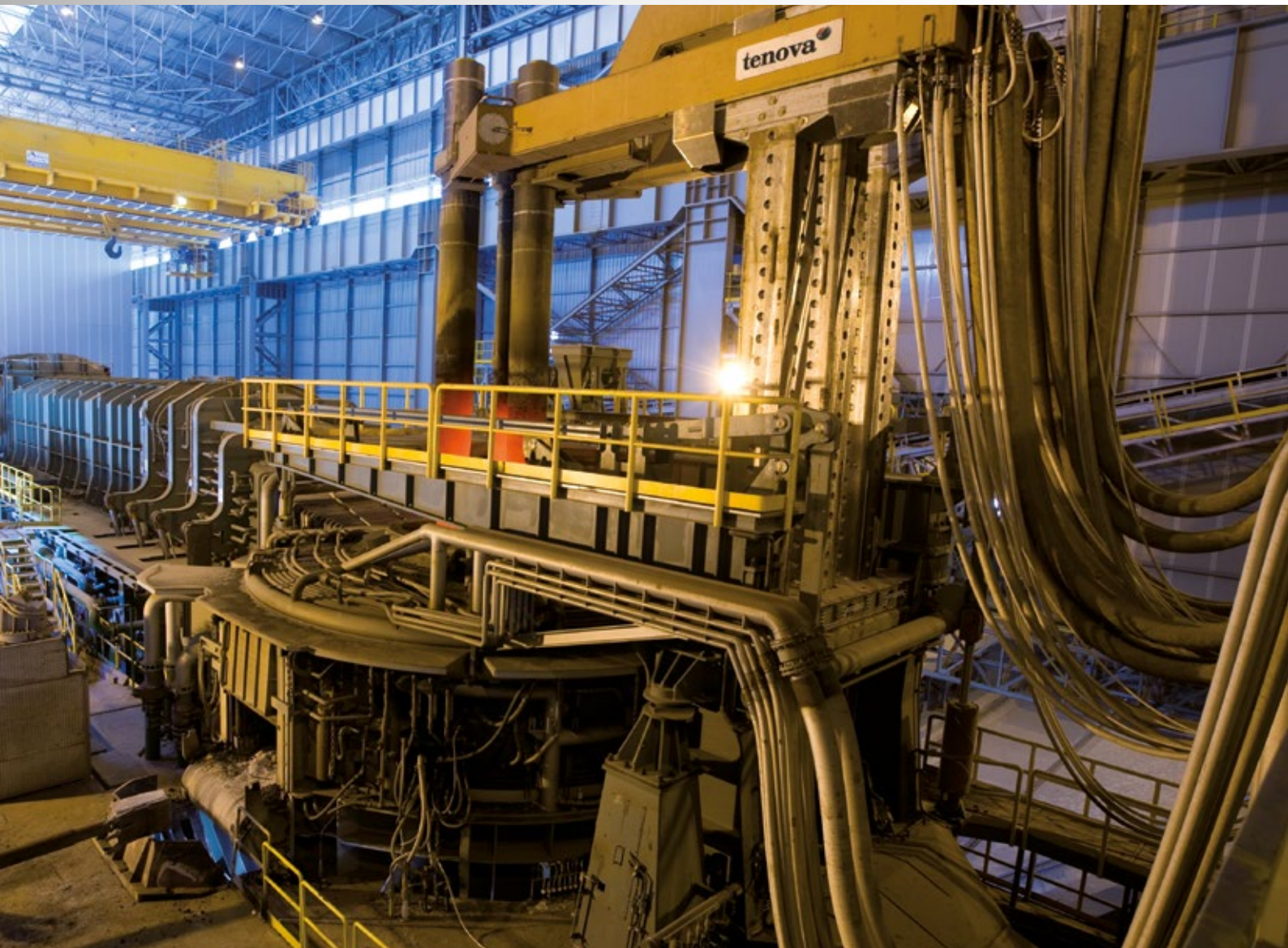


tenova<sup>®</sup>



# ELECTRIC ARC FURNACES

A complete range of Leading-edge Products  
for the Steelmaking Industry

TENOVA. INNOVATIVE SOLUTIONS FOR METALS AND MINING





Ternova is a worldwide partner for innovative, reliable and sustainable solutions in the metals and mining industries.

Building upon decades of experience, Ternova develops solutions that help mining and metals companies reduce costs, save energy, limit environmental impact and improve working conditions for their employees.

Ternova believes in on-the-job passion, and actively seek out professionals who truly love what they do. Their contributions to the business have helped make Ternova the industry-leading company it is today, and their passion is the driver behind the company business approach.

This approach can be summed up in four key pillars: Innovation, Reliability, Sustainability and Safety.

## Global Presence

Tenova Melt Shops Business Line is a global benchmark supplier of Electric Arc Furnaces. It boasts engineering offices for the development of steelmaking technologies in Italy and the USA, an R&D center of excellence for EAF process in Canada, operations offices in China, Russia, India and Vietnam: an integrated network focused on the global market to offer cutting-edge products and technologies delivering tangible benefits for all customers.



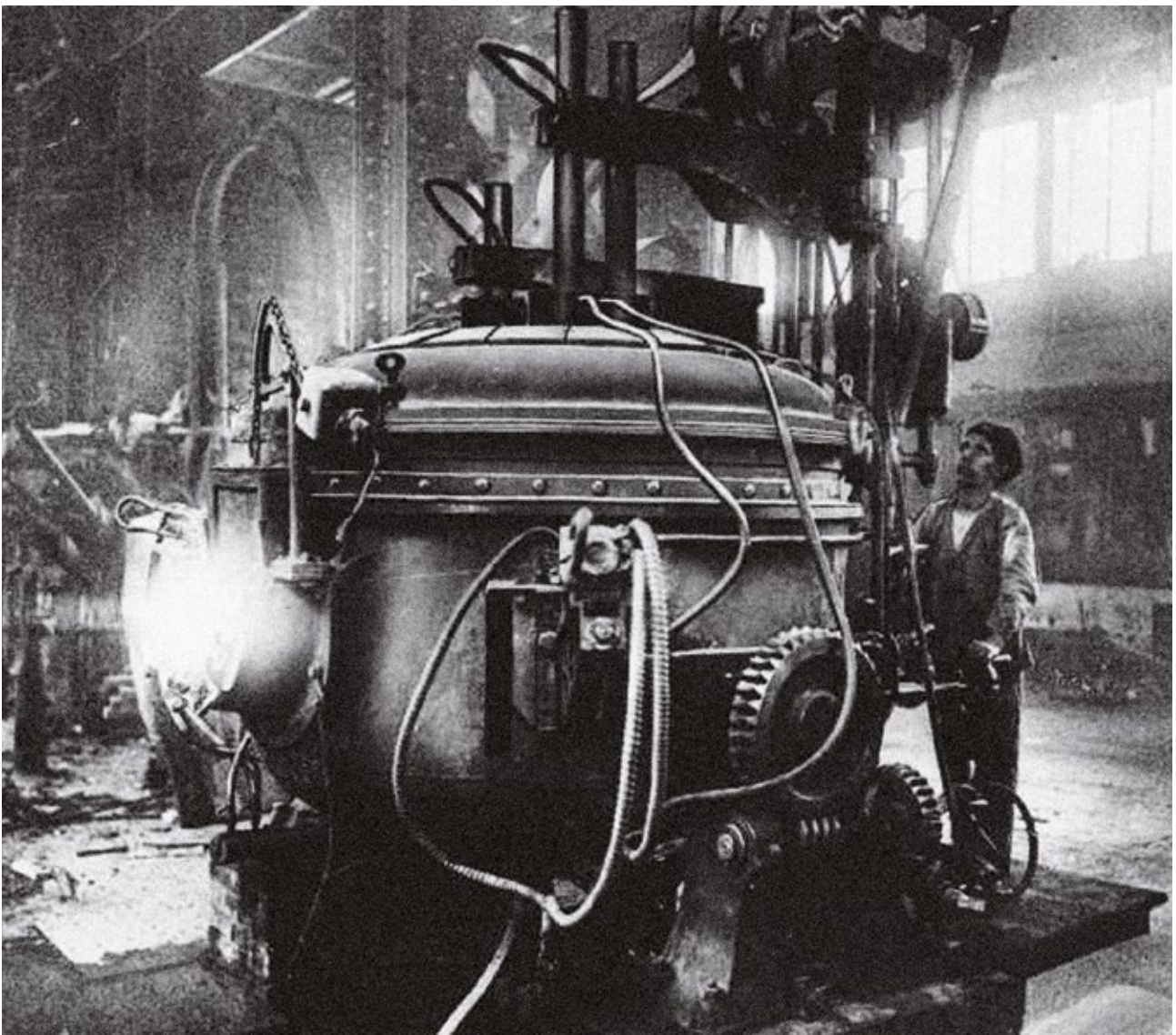
## Heritage

The Tenova Melt Shops Business Line heritage embraces historical brands such as Tagliaferri, associated with EAF design and manufacture since the earliest days of electrometallurgy, and younger process brands such as EMCI, Core Furnace Systems and Goodfellow, focused on R&D and secondary metallurgy.

More than 2,000 EAFs have been designed and manufactured during 100 years of successful activity.

Today, tradition, experience and a solid steelmaking background qualify Tenova Melt Shops Business Line to offer some of the most advanced technologies for new EAFs.

Tenova Melt Shops Business Line is the owner of Consteel®, the continuous EAF scrap feeding and pre-heating technology with more than 50 operating references worldwide. The TDRH Digital Electrode Regulation system, the KT Injection System® and the EFSOP® NextGen real-time off-gas dynamic control system complete its technological offer for the steel industry.



## Business

Tenova Melt Shops Business Line projects range from complete new melt shops to customized technological upgrades and revamps of existing production units.

Its work also covers installation, modification and replacement of individual parts, for example electrode arms, the electrode regulation system or the TBT (Tenova Bottom Tapping) system.

Tenova Melt Shops Business Line' success is built largely on innovative technology, flexibility in meeting customer requirements and timely project execution.



# Electric Arc Furnaces

Tenova Melt Shops Business Line supplies complete EAF packages providing technology and equipment for every type of charging mix:

- 100% scrap, batch charged or continuously charged with the Consteel® system
- Up to 100% DRI or HBI, continuously charged
- Up to 90% hot metal, charged by ladle tilting devices

Tenova Melt Shops Business Line also designs and supplies Fume Treatment Plants, Material Handling Systems and all EAF auxiliary equipment.



## Electric Arc Furnaces

Tenova Melt Shops Business Line EAFs deploy cutting-edge proprietary technologies:

- Consteel<sup>®</sup>, the exclusive continuous feeding technology for liquid steel production, with more than 50 references
- EFSOP<sup>®</sup> NextGen, the off-gas control system for the melting process
- *i*EAF<sup>®</sup>, the innovative dynamic process control for real-time management of arc furnace melting
- Flexible Modular Furnace (FMF<sup>®</sup>), to produce liquid steel using the cheapest mix from any metallic raw material, and starting from Zero Electric Power, facilitate also transition from BOF to EAF production.

Tenova Melt Shops Business Line furnaces capacity ranges from 5 tons to 350 tons processing any metallic raw material: scrap, DRI, HBI, pig iron, hot metal and even waste material such as skulls and beach iron.

Tenova Melt Shops Business Line supplies also tailor-made melting solution for special purposes such as the recovery of precious metals from waste and the production of ceramic materials.





The success of Tenova Melt Shops Business Line Electric Arc Furnaces is based on an intrinsically sensible and performing design concept for reliable, long-life furnaces with a sturdy mechanical structure. The innovative TDRH digital electrode regulation system provides a fast and accurate response, allowing a better transfer of the electric power to the melting charge. As a result, electrode regulation is faster and more accurate and the electrodes are not subject to the bending stress of oscillating electrode arms.



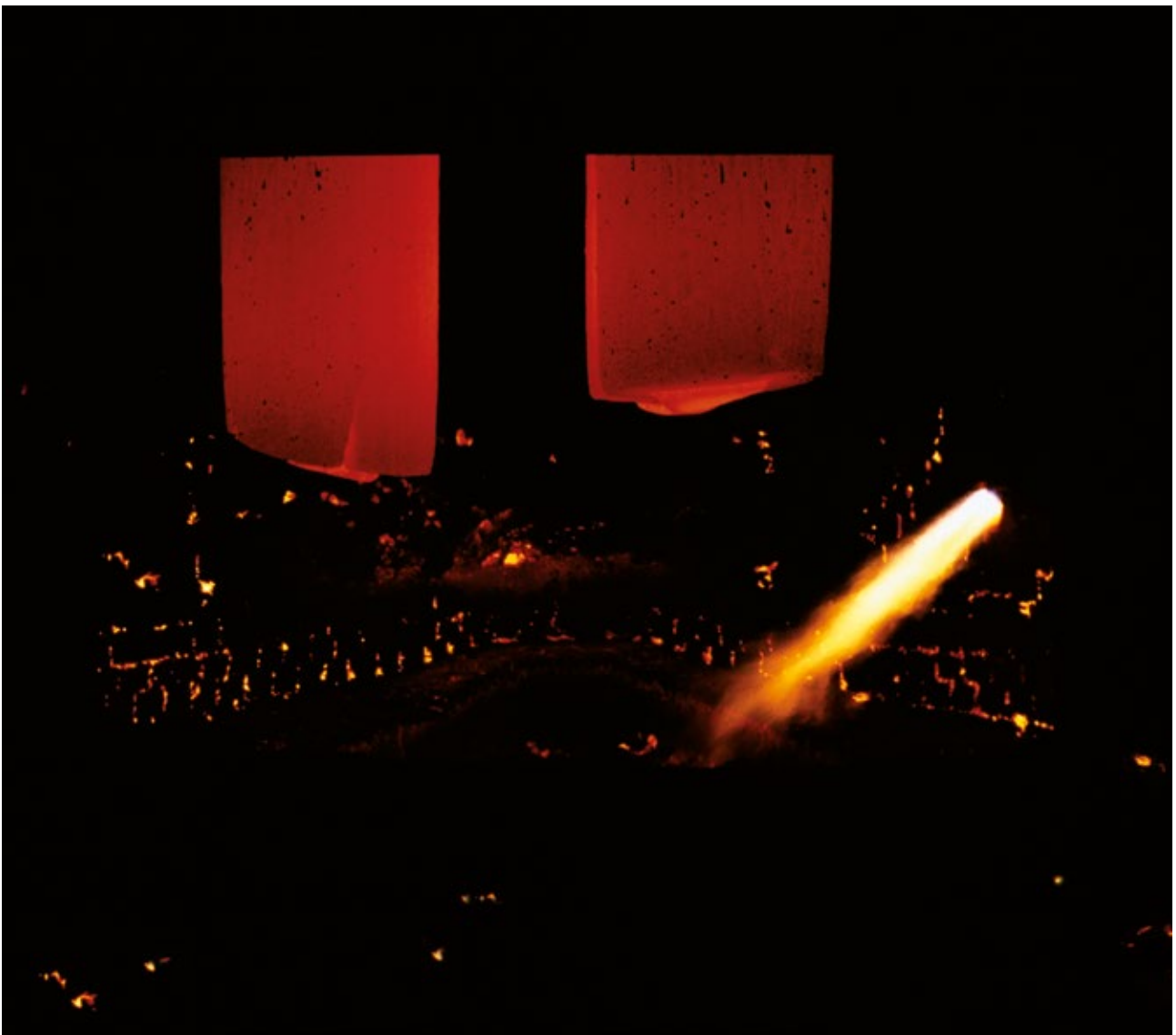
## Electrode Arms

Tenova Melt Shops Business Line offers the latest concept in power conductive arms for maximum reliability. Built using bimetallic sheet (steel+copper), the arms combine the high strength of steel with the current carrying capability of copper. Tenova Melt Shops Business Line also supplies power conductive arms in aluminium for a lighter structure. The electrode clamps are made from forged copper for high-pressure contact with low electric contact resistance. Water-cooling channels are drilled inside the clamp body for efficient heat dissipation. The electrode clamping force is achieved by a series of spring washers. The clamps can be hydraulically released for electrode slipping or electrode column change.



## KT Injection System®

The KT Injection System® is a modular, wall-mounted, multi-point system for decarburizing, providing chemical energy and inject a wide range of fines: carbon, lime, DRI and others. In respect to other technologies, KT lances allow bringing the nozzles closer to the bath and achieve higher efficiency, assuring at the same time optimal durability and maintainability. Combined with the KT® carbon and lime powder injectors, the lances create a homogeneous layer of foamy slag over the whole bath surface. The KT® burner-postcombustor, installed in the upper shell, is a highly specialized tool to recover chemical energy from the uncombusted offgases as well as a powerful burner to accelerate scrap melting during the initial process phase. KT® system automation optimizes system start-up and enables process engineers to optimize the process itself.



# TDRH Digital Electrode Regulation

The TDRH Digital Electrode regulation system uses state-of-the-art pc based Linux operating system microprocessor technology in order to achieve a real-time regulation loop.

TDR matches the latest connectivity standards for the industry and ca process data from a wide range of optional sensors to provide maintenance support and process optimization.

HRR valves provide a customizable response curve to guarantee greater stability during flat bath melting and greater speed when a fast rise is necessary due to a short circuit event. HRR valves are designed to operate smoothly even with highly polluted fluids (up to NAS10).



# Automation

Tenova Melt Shops Business Line automation solutions are based on industry 4.0.

Thanks to their modular structure, they cover every level from basic plant control (Level 1) to integration with production tracking functions and management of manufacturing orders in-progress (Levels 3 and 4). Specific Control Process modules optimize operations and provide shop floor workers and process technologists with essential support. Tenova Melt Shops Business Line automation systems can be combined with cutting-edge technology solutions for optimization of energy savings and productivity such as the EFSOP® NextGen system and the *i*EAF® package. Moreover, the automation solutions employ innovative sensors, which work together with sophisticated control models for dynamic, real-time control.



## Safety

Tenova Melt Shops Business Line offers the most advanced EAF's technologies to improve safety:

- EAF's eccentric centre-of-mass
- Water Detection System™
- Movement interlocks supervisor
- Limit-switches monitor and supervisor
- TAT® - Tenova Auto Tapping (man-free EAF's tapping and preparation)
- Tenova *i*Temp® (contact free automatic liquid steel temperature measurement)
- “No man on the floor” program
- Safety Plus EAF with innovative cooling solution
- PLC fail safe configuration

The reduction of man-tended operations increases the process consistency to reach better performances.

## Environmental Responsibility

Tenova Melt Shops Business Line provides the most advanced technologies for environmental impact control.

Its technology is designed to improve the steel plant environment by:

- reducing dust
- reducing fumes and gaseous emissions
- reducing GHG (Greenhouse gases) emissions
- reducing noise levels
- reducing electric network disturbances



## Service

Tenova Melt Shops Business Line provides training programs for personnel in charge of operations and equipment maintenance. Courses include practical and theoretical sessions on technologies, equipment functions, maintenance and operational procedures. Rapid commissioning and a fast learning curve are guaranteed by Tenova expertise and assistance. After-sales assistance offers a comprehensive spare parts service. Customer requests are handled by a special internal office.



## R&D

Technological innovation is the main pillar of Tenova Melt Shops competitiveness. Its successful R&D work is based on effective co-operation with:

- Customers, through joint research projects combining Tenova's engineering capabilities with the customer's production expertise
- Production specialists in the Techint Group
- Network of research centers where dedicated facilities are available to test R&D project results
- Universities and other Research Institutes

The Tenova Melt Shops R&D Team is an international network of specialists and engineers from the Group's companies and business units around the world.





## Focus on People

People are vital to success and growth at Tenova Melt Shops Business Line. Qualified engineers and technicians across 5 continents are the lifeblood of the network.

Outstanding technical and management expertise in every area of activity, a strong focus on the customer, a passion for innovation and continuous flexibility: these are the features that distinguish Tenova Melt Shops Business Line professionals.

With their varied nationalities, Tenova Melt Shops Business Line specialists execute projects all over the world. Their multicultural backgrounds equip them to take on new challenges in any location. Tenova Melt Shops Business Line enhances and optimizes the talents of the individual for the good of the team and to the benefit of the customer. By supervising every stage of professional growth and providing on-going knowledge and skills training, Tenova Melt Shops Business Line guarantees the expertise of its people.







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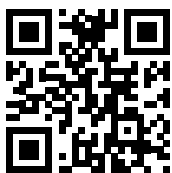
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