

MORE
INNOVATION IN STEELMAKING



— — — — —
TECHNOLOGICAL
— — — — —
PACKAGES

FOR
RE
FE

STEELMAKING TECHNOLOGIES

INNOVATION IN STEELMAKING

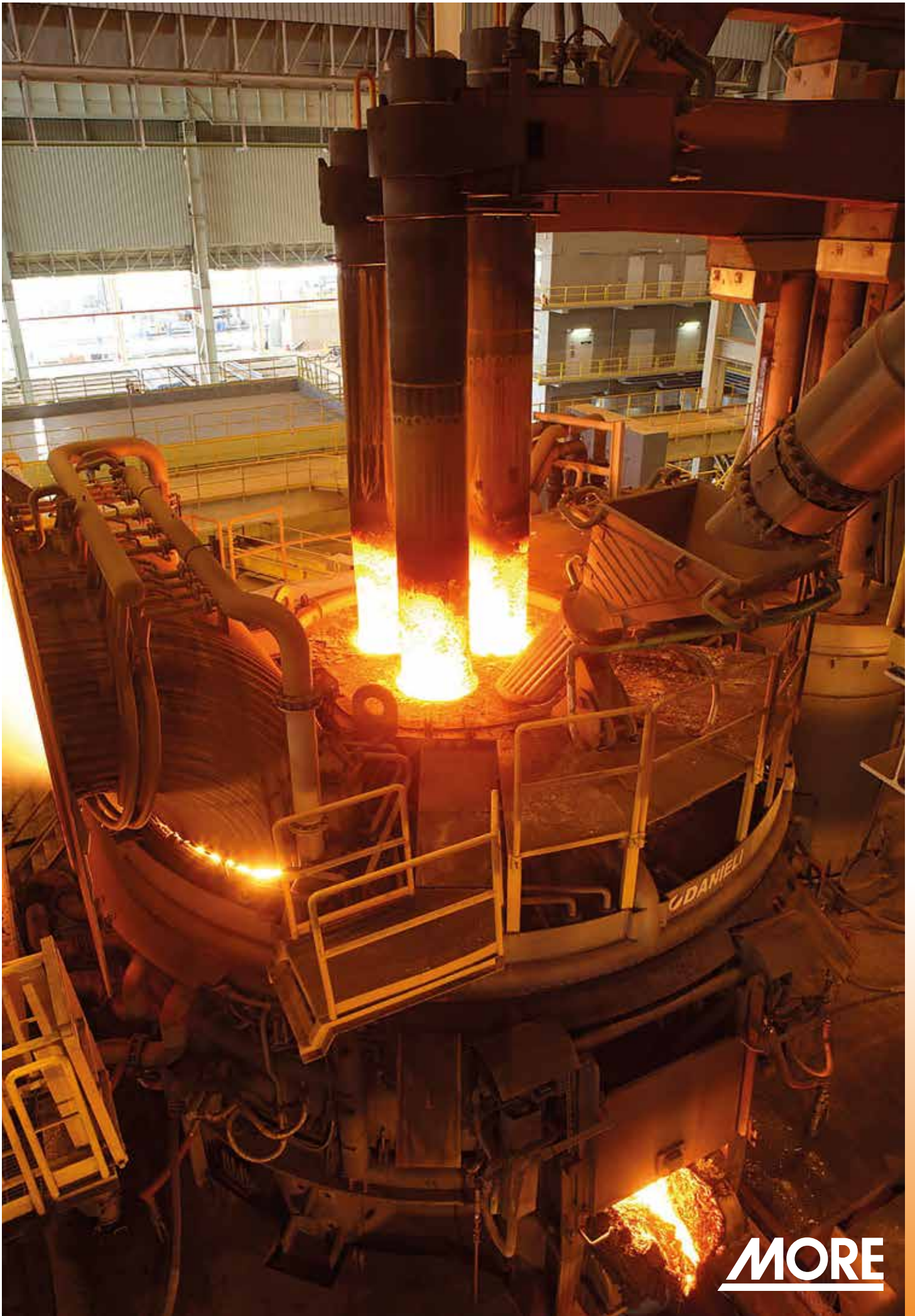
MORE is a worldwide leading manufacturer of process technology packages related to chemical energy and auxiliary equipment for the steel making industry.

MORE has developed an international reputation for quality products since the company was established in 1984. Special equipment and manufacturing techniques are employed to ensure that maximum strength and durability are built into every item we produce.

MORE makes a wide range of products which are suitable for all kinds of EAF applications. The in-house manufacturing facility gives us the flexibility to supply our products quickly, custom work can be manufactured to your particular requirements by our specialists.

All products are built and tested in our modern workshop using specially designed heavy duty, automated equipment, made to our own demanding specifications. Uniformity of quality control is achieved through an integral automatic checking system supplemented by our quality control program.

MORE is ISO 9001 certified ensuring all products are manufactured according to strict international standards, and OHSAS 18001 Occupational Health and Safety management certification.



MORE

STEP BY STEP AT YOUR SIDE

Since 1984, technological research and development has been the backbone of **MORE** and the building block for the future development of advanced products and services

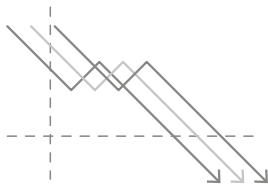
For us, it is vital to meet evolving customer demands with high performance solutions. Highly skilled engineers are constantly working to study new products. This makes us forerunners in the exploration and industrial application of new technological solutions **MORE** manufactures and assembles all equipment which is then subjected to trial tests prior to delivery. This ensures that thorough checks are carried out on both working sequences and functionality





OUR EXTENSIVE WORKSHOP FACILITY, STAFFED BY OUR OWN EXPERIENCED ENGINEERS, WILL WORK WITH YOU TO ASSESS THE MOST COST EFFECTIVE SOLUTION WITHOUT LOSING PERFORMANCE

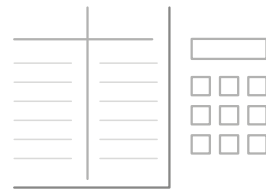
ANALYSIS FOR REDUCTION OF TRANSFORMATION COSTS



FEASIBLE INSTALLATION STUDIES



HEAT AND MASS BALANCE CALCULATION



TAILOR MADE INSTALLATION MEET THE EXACT REQUIREMENTS OF OUR CUSTOMER



TO ENSURE QUALITY, RELIABILITY AND SAFE EQUIPMENT; MANUFACTURING AND ASSEMBLY IS ENTIRELY CARRIED OUT IN MORE'S WORKSHOP

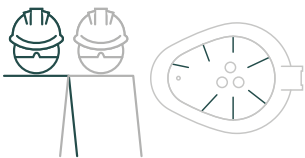
MORE



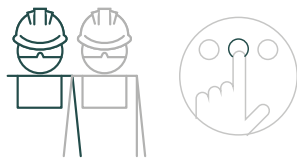
BEFORE DELIVERY, THE EQUIPMENT IS ASSEMBLED AND TESTED IN-HOUSE TO CHECK THE WORKING SEQUENCES AND FUNCTIONALITY TO ENSURE EASY ON-SITE INSTALLATION AND START-UP



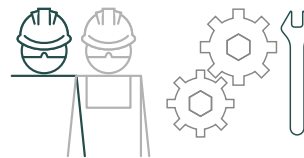
OUR TEAM INCLUDES EXPERIENCED AUTOMATION AND MECHANICAL ENGINEERS AS WELL AS HIGHLY SKILLED PROCESS SPECIALISTS SUPPORTING OUR CUSTOMERS ALONG THE ENTIRE CHAIN FROM ERECTION TO START-UP AND FINAL ACCEPTANCE OF THE SUPPLIED EQUIPMENT



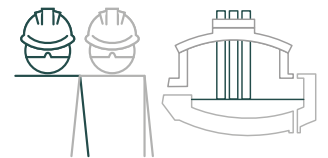
ERECTION,
COLD START-UP
ASSISTANCE



HOT START-UP
ASSISTANCE



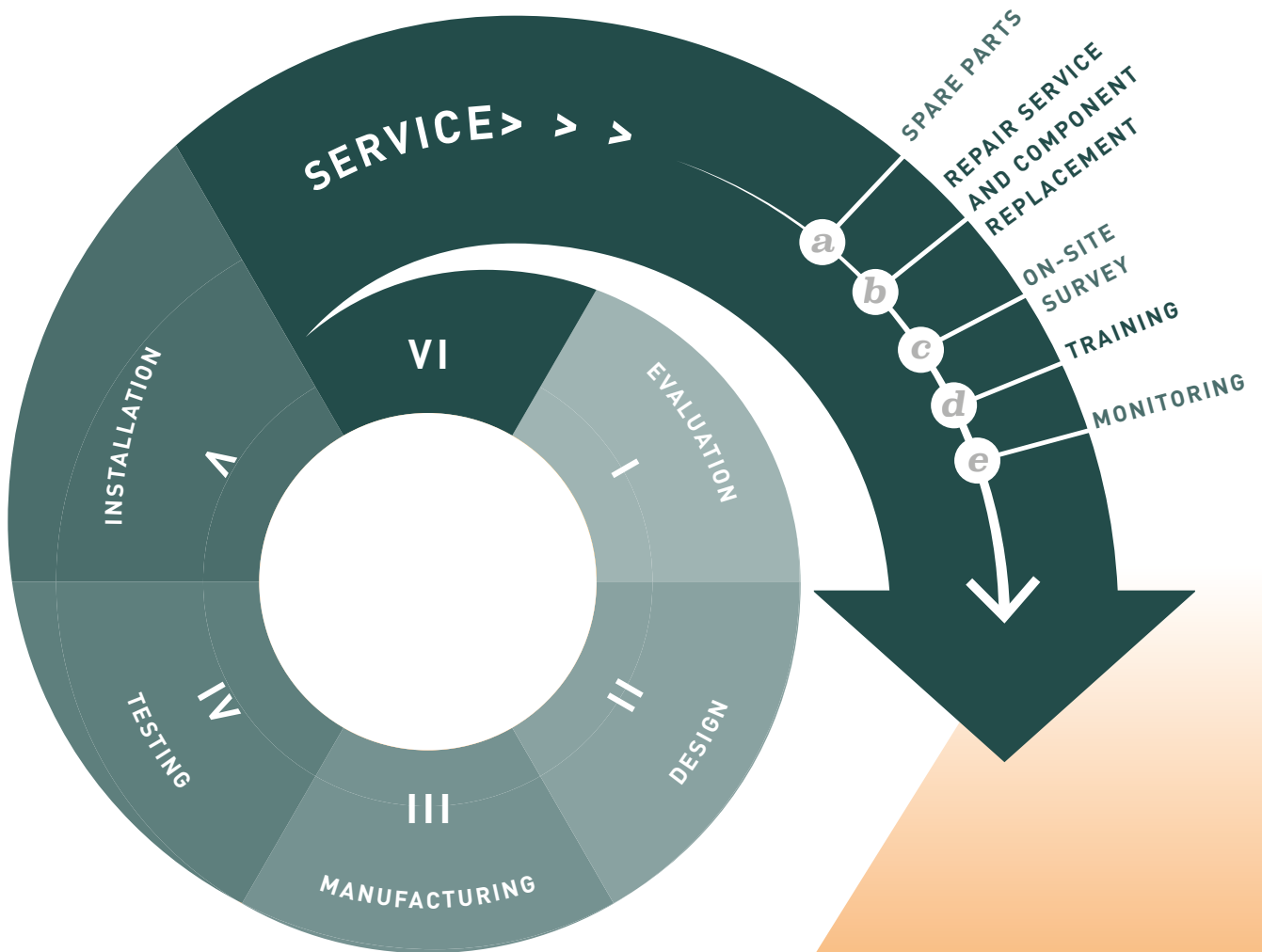
PRODUCTION AND
MAINTENANCE
TRAINING



PRODUCTION
ASSISTANCE



PROCESS ANALYSIS - TECHNICAL AND PROCESS ENGINEERS ARE AVAILABLE FOR IMPROVEMENTS, PROBLEM SOLVING, TRAINING AND TECHNICAL ADVICE



MORE

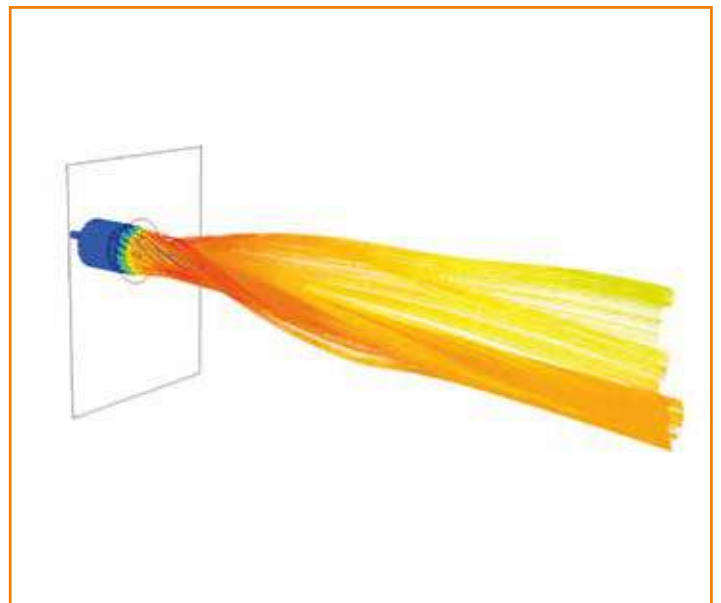
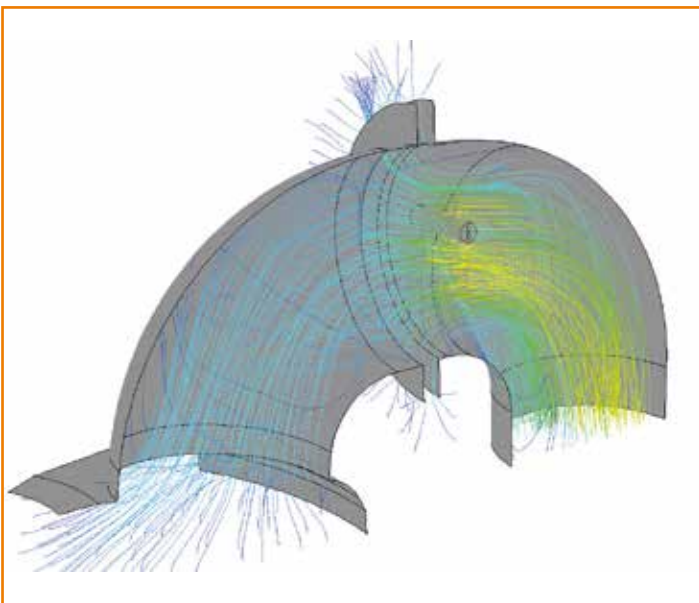
RESEARCH & DEVELOPMENT

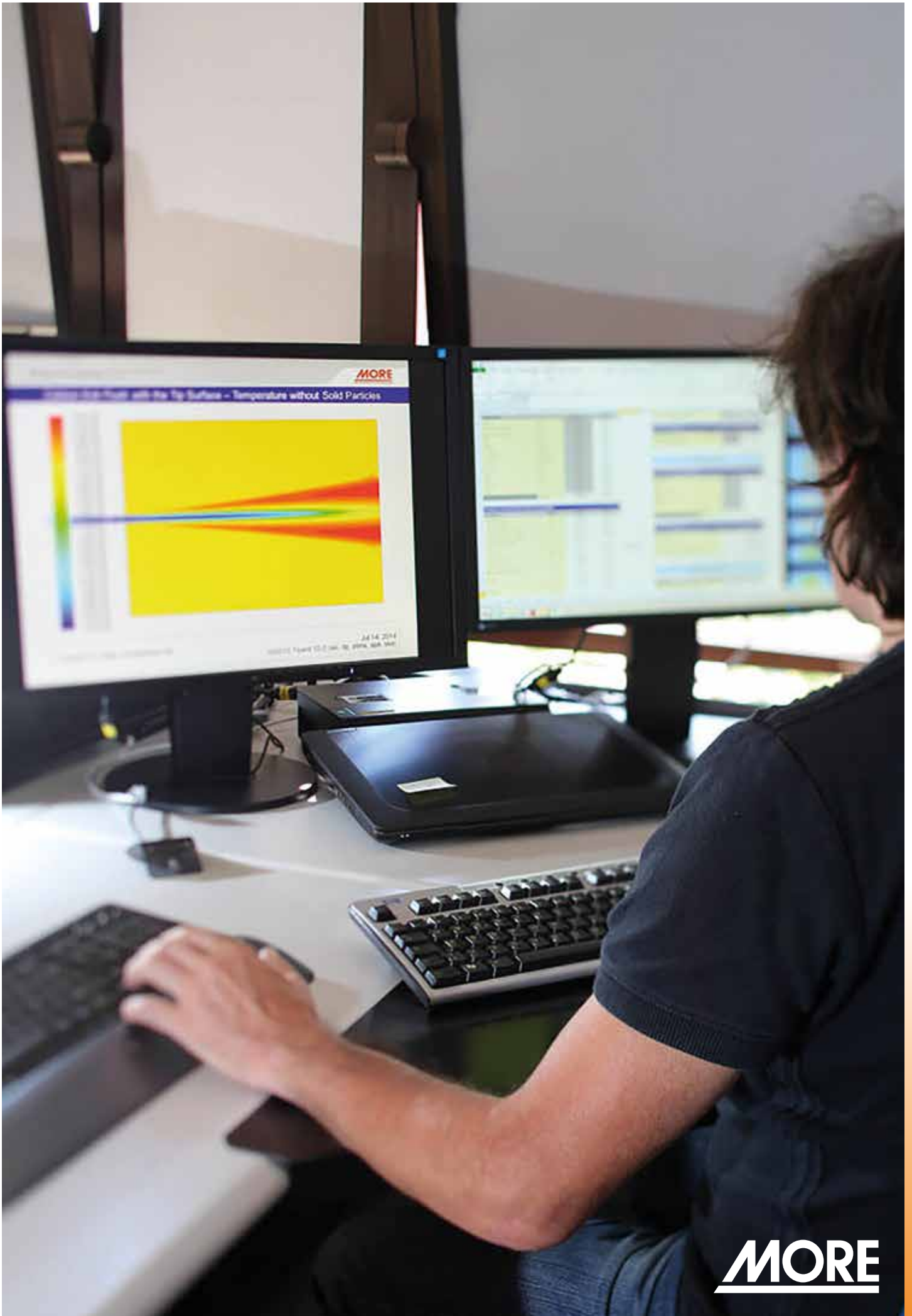
Our leadership in this field is the result of constant research for innovation and improvement, making us the ideal partner for the most important international steelmakers.

Since 1984, technological research & development are intended as a mission, to be accomplished by way of innovative equipment that must be continuously improved.

The technical department makes use of up-to-date software such as CAD/ CAE/CAM, Finite Element Method and Computational Fluids Dynamic (CFD) to perform its tasks without compromise.

In order to ensure that our customers get the best solutions, we continuously work to improve our processes and invest in research and development. Many of our projects include developing tailor made installation meets the exact requirements of our customers.





MORE

CHEMICAL ENERGY PACKAGE

Fast metallic charge melting requires appropriate capability to manage the chemical energy in the most efficient way, according to the rapidly changing conditions within the furnace environment. The melting power and the metallurgical processes can be managed only by specialized equipment and careful process control to attain high productivity performances at minimum energy consumption.

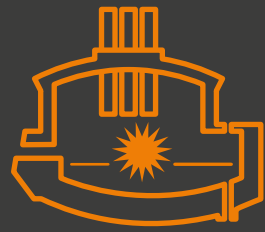
Sinergy between electrical arc power schedule and correct chemical action can lead to consistent savings in consumptions and time.

Melting material in an Electric Arc Furnace requires a number of process functions to be fulfilled:

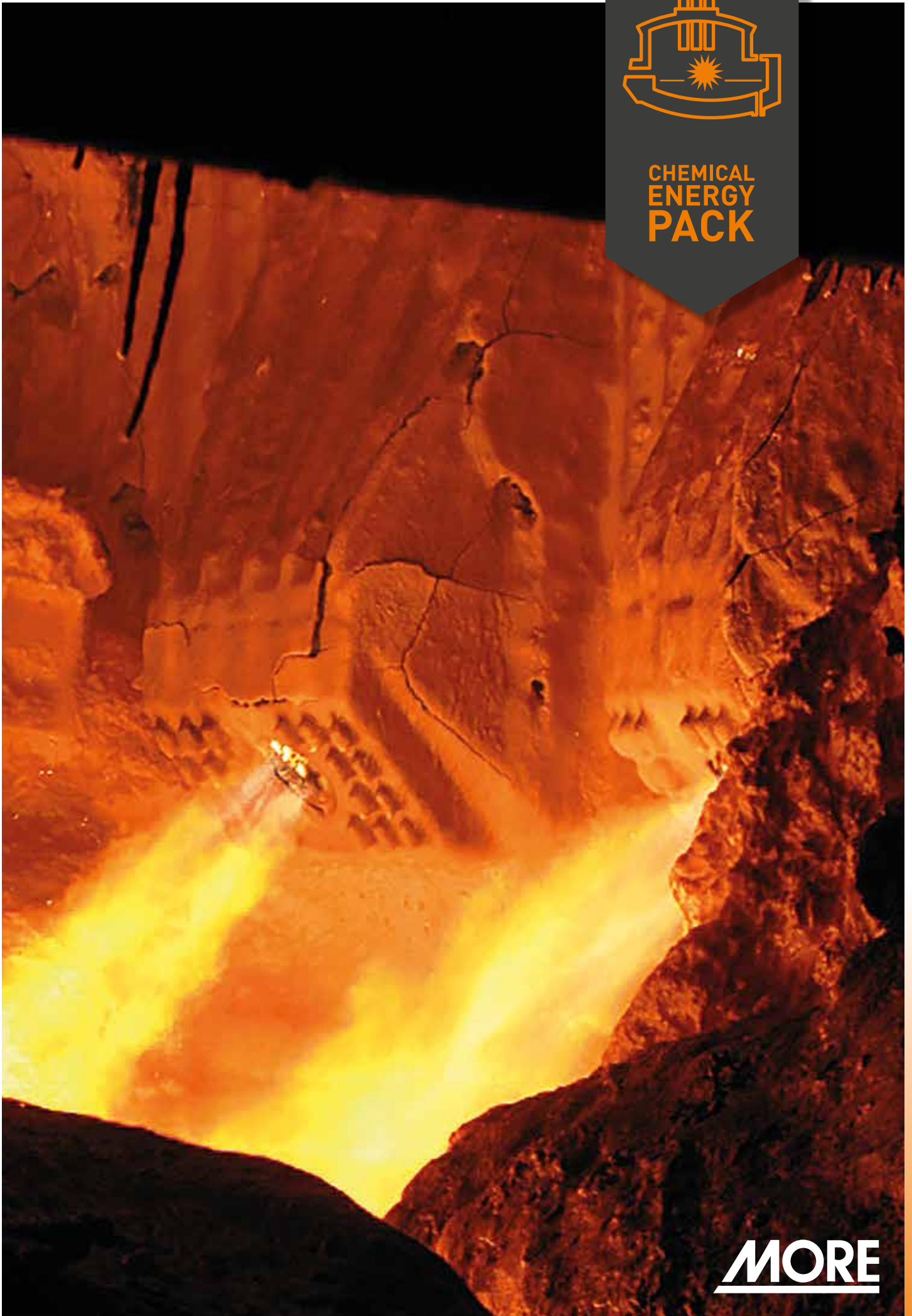
- Heat and melt down the metallic charge.
- Oxidize silicon, phosphorus, chromium and carbon.
- Correct the slag chemistry and control the iron oxide production.
- Foam the slag.
- Limit the carbon monoxide output and control the combustion within the furnace.
- Protect the refractory lining from corrosive wearing.

Steelmakers can profit from the appropriate management of all these actions only if their furnace is equipped with an efficient and reliable chemical package. The most important figures required to such equipment are:

- Specialized mechanical design completed by a dedicated assembly on the furnace layout.
- Fast and precise regulation according to the melting program and the process control.
- Flexibility, reliability and consistency.
- Equipment stiffness and maintainability.



**CHEMICAL
ENERGY
PACK**

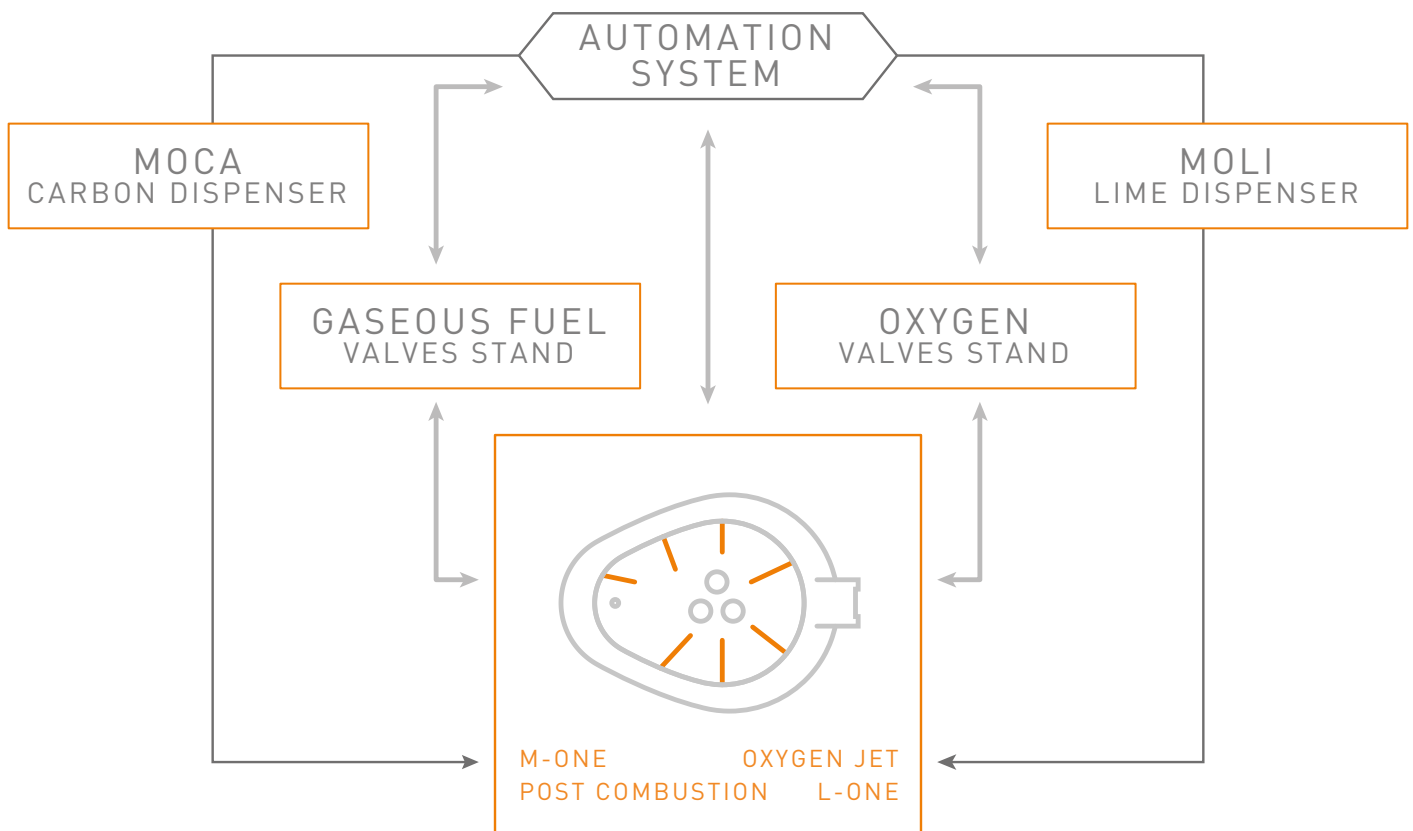


MORE

MODULE TECHNOLOGY

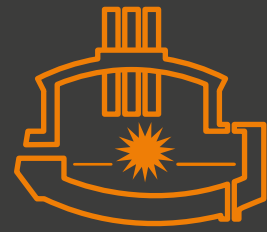
OXYGEN, CARBON AND LIME SIDE WALL INJECTION TECHNOLOGY FOR ELECTRIC ARC FURNACES

The **MODULE TECHNOLOGY**: state-of-the-art chemical energy package for electric arc furnaces, combines a variety of fixed injectors and related control devices (i.e.: valve stands, carbon/fluxes dispensers, automation system and Human Machine Interface). Injectors add chemical energy by exothermic reactions, post-combustion control and foaming slag optimization to improve the overall EAF performances and to reduce transformation costs.

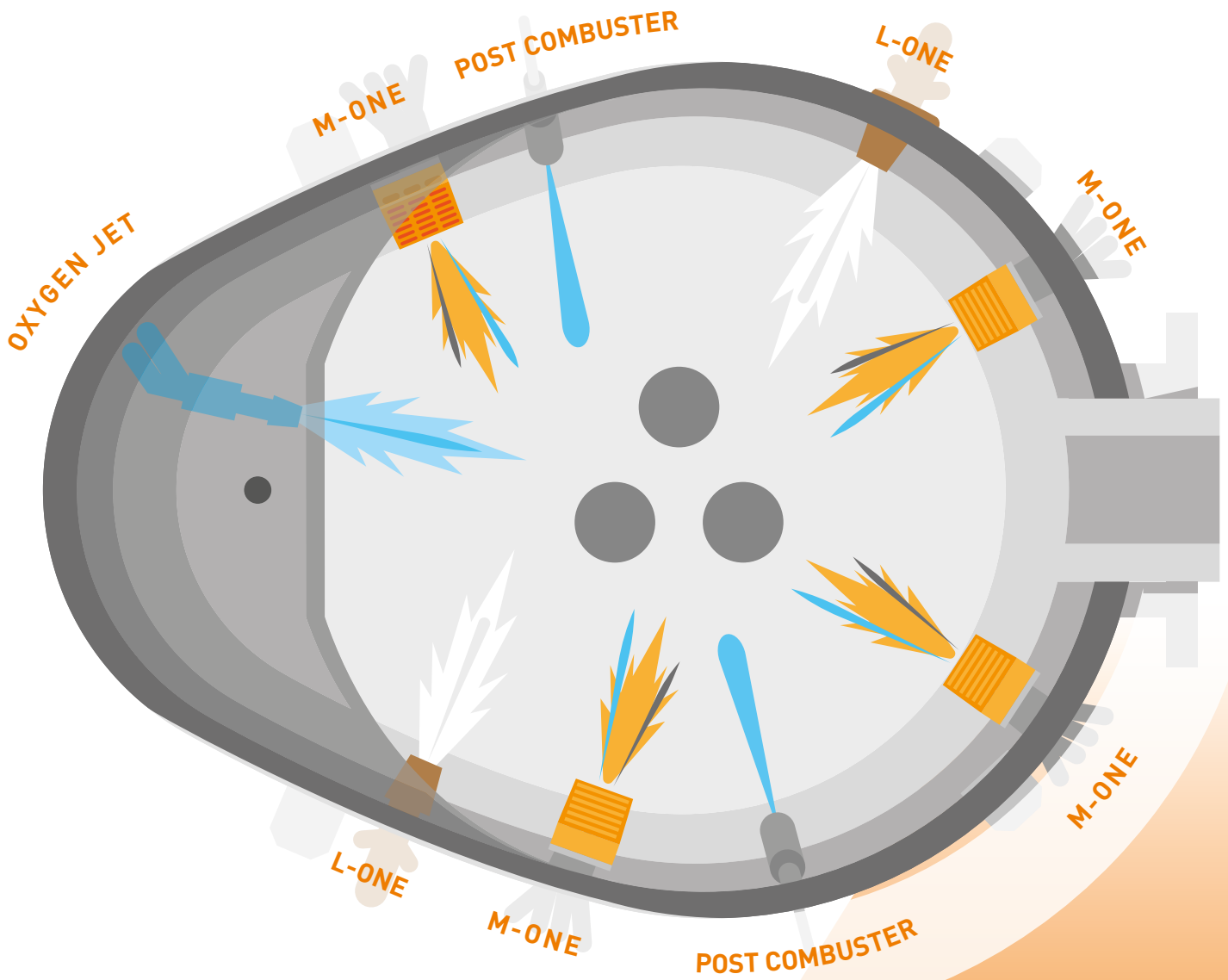


BENEFITS

- Increased oxygen efficiency and carbon recovery.
- Increased metallic yield.
- Increased productivity.
- Improved foaming slag conditioning.
- Improved metallurgical process control.
- Improved overall operating efficiency.
- Improved process gas emission.
- Reduced fuel usage.
- Reduced electrical energy usage.
- Reduced power-on time.
- Reduced conversion costs.



**CHEMICAL
ENERGY
PACK**



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M-ONE

M-ONE is an advanced side-wall injector which integrates three functions in a single unit: burner, supersonic oxygen and high-efficiency carbon injection.



MIXED SWIRLED FLAME
BURNER



HIGH EFFICIENCY SUPERSONIC
COHERENT OXYGEN LANCING



HIGH MOMENTUM COAL
INJECTION



OXYGENJET

OXYGENJET is dedicated supersonic oxygen for lancing. It is mostly used as a supplementary injection point, especially to clean the scrap and the skulls at the sump area, in order to assume EBT free-opening.



MIXED SWIRLED FLAME
BURNER

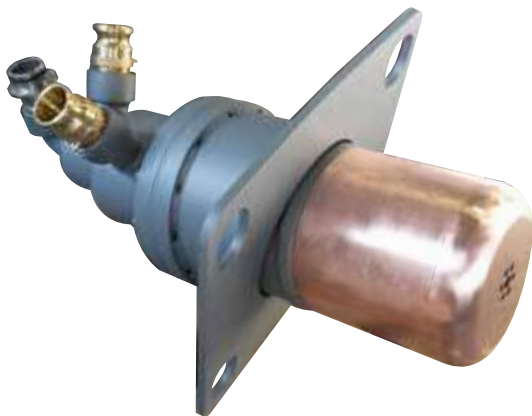


HIGH EFFICIENCY SUPERSONIC
COHERENT OXYGEN LANCING



POST COMBUSTOR

The **POST COMBUSTOR** is a dedicated tool to manage the post combustion within the EAF shell by injecting low speed oxygen during every melting phase.



MAXIMIZATION OF THE POST-COMBUSTION INSIDE THE FURNACE



DYNAMIC CONTROL OF THE OXYGEN FLOW RATE BY THE CO₂ AND CO READINGS FROM THE OFF-GAS ANALYSIS SYSTEM



L-ONE

The **L-ONE** is a side-wall injector specifically designed to inject grain sized slag formers with a speed up to penetrate the thick slag layer.



MIXED SWIRLED FLAME BURNER



HIGH MOMENTUM LIME INJECTION



REFRACTORY HOT SPOTS PROTECTION

MORE

MIXED SWIRLED FLAME

MSF BURNER TECHNOLOGY

All **MORE** injectors work as highly efficient oxyfuel burners for heating and assisting melting of scrap after each scrap bucket charge.

The flame makes use of the innovative MIXED SWIRLED TECHNOLOGY (MSF).

A specific research project has been performed to improve combustion and heat transfer efficiency to the scrap surface. The particular burner tip design dramatically improves the mixing of reactants and prevents the generation of a cold flame.



EXTREMELY
HIGH FLAME
TEMPERATURE



IMPROVED HEAT
EXCHANGE WITH
SCRAP PILE



OPTIMUM MIXING
OF GASSES
AND COMBUSTION

MIXED SWIRLED FLAME



Stable and hot flame close to the injector tip.

TRADITIONAL AXIAL DIFFUSION FLAME



Blue colored flame due to the poor mixing of oxygen and natural gas.

FLASH STOP

BACKFIRE PREVENTING SYSTEM FOR SIDE WALL BURNERS AND INJECTORS

The **FLASH STOP** system has been developed to prevent accidental damages due to oxygen and fuel backfiring in the copper front face, injector tip and water cooled panels caused by the presence of a thick piece of heavy scrap in front of the injector tip.

The system is made up of temperature sensors continuously detect the variance of the copper temperature. In case of backfiring, the temperature on the front panel will rapidly increase over the alarm threshold. Then, the automation system will automatically reduce the burner power or switch-off the injector. As soon as the temperature returns to its normal value, the system will turn on the injector again.



INCREASED LIFE TIME
OF INJECTOR TIPS, COPPER
BLOCKS AND WATER COOLED
PANELS



ADDED SAFETY BY REDUCING
WATER LEAKAGES INSIDE
THE EAF

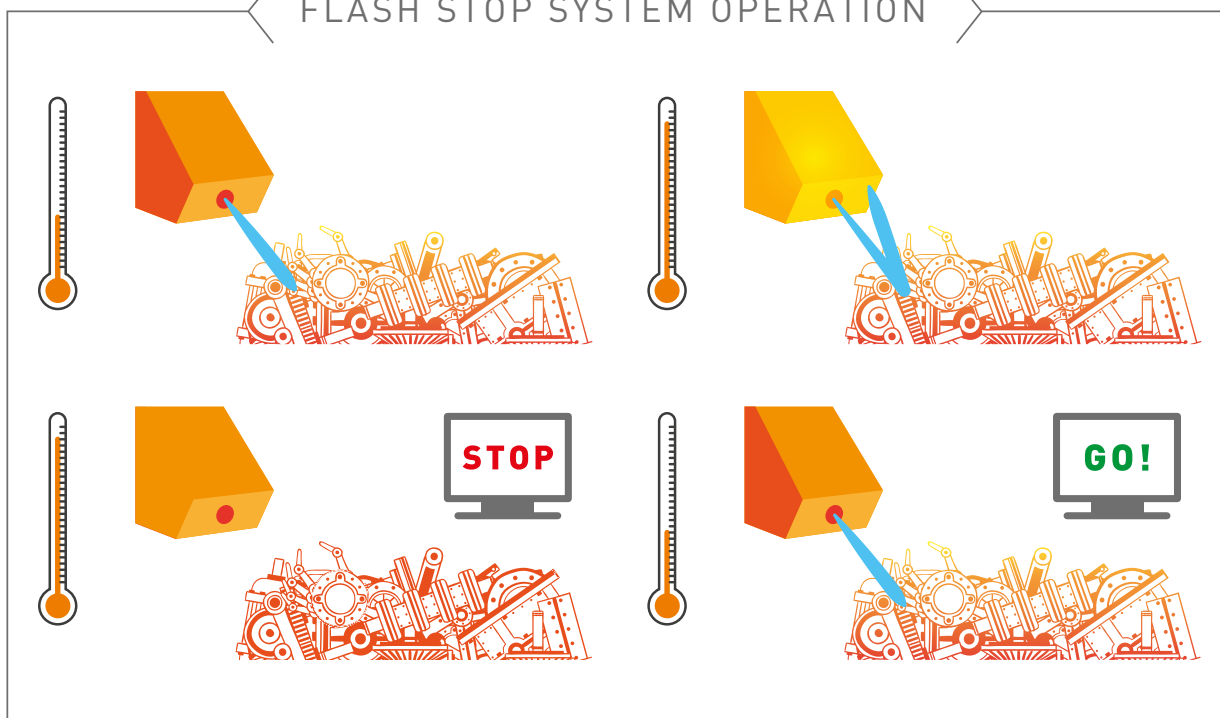


HIGHER BURNER EFFICIENCY



REDUCED MAINTENANCE

FLASH STOP SYSTEM OPERATION

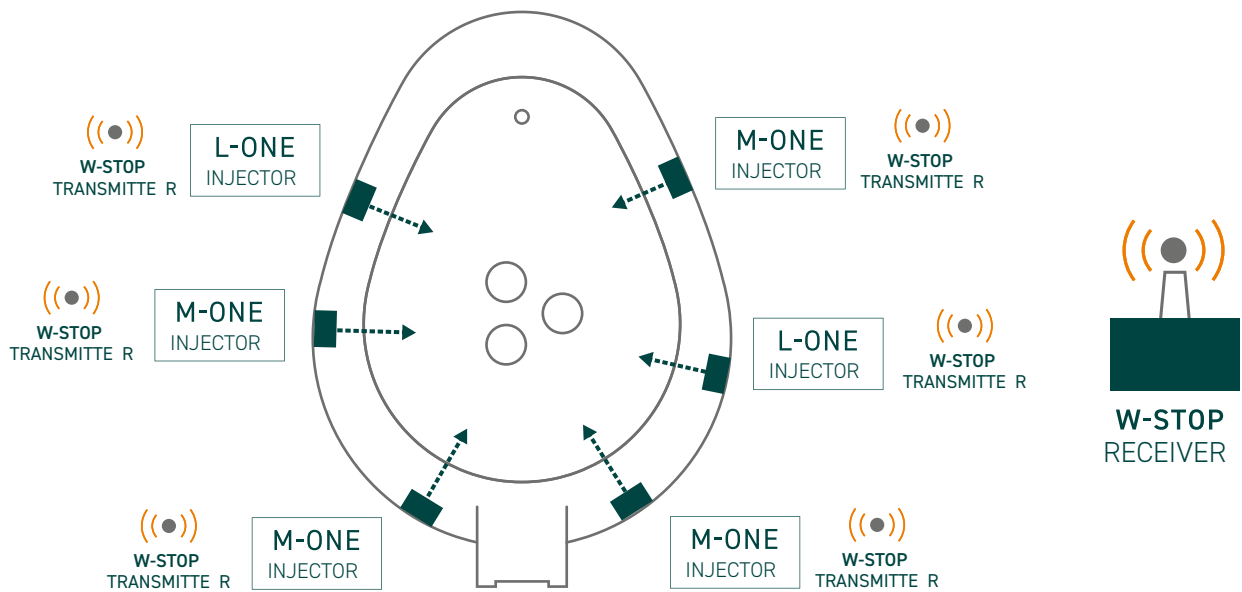


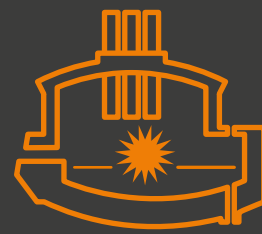
MORE

W-STOP

SMART WIRELESS BACKFIRE PREVENTING SYSTEM FOR ELECTRIC ARC FURNACE

The **W-Stop** transmitters placed next to the injectors communicate wireless continuously with the **W-Stop** receiver to monitor the temperature of the copper front faces and automatically shut the injectors down in case of backfire.





CHEMICAL ENERGY PACK



MORE

COPPER BULGED BLOCKS

Copper Bulged Blocks are made from cold rolled copper slabs that guarantee exceptionally high thermal conductivity avoiding all the usual problems related to cast copper parts (i.e embedded impurities or cavities). Copper and steel welding is done by **MORE's** highly qualified welders.

- More than 70% extended lifetime compared to traditional cast items.
- No embedded impurities nor cavities caused by casting technology.
- Exceptionally high thermal conductivity.
- Copper faces are designed for simple on site replacement (steel to steel welding on the sides and top and easy unbolting for changing of the front face) by the maintenance team.
- Low warehouse.
- Robust and sturdy to resist heavy mechanical impacts.
- Tailor made design.



Extruded copper slabs



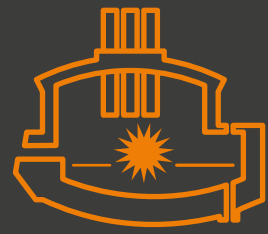
CNC machine



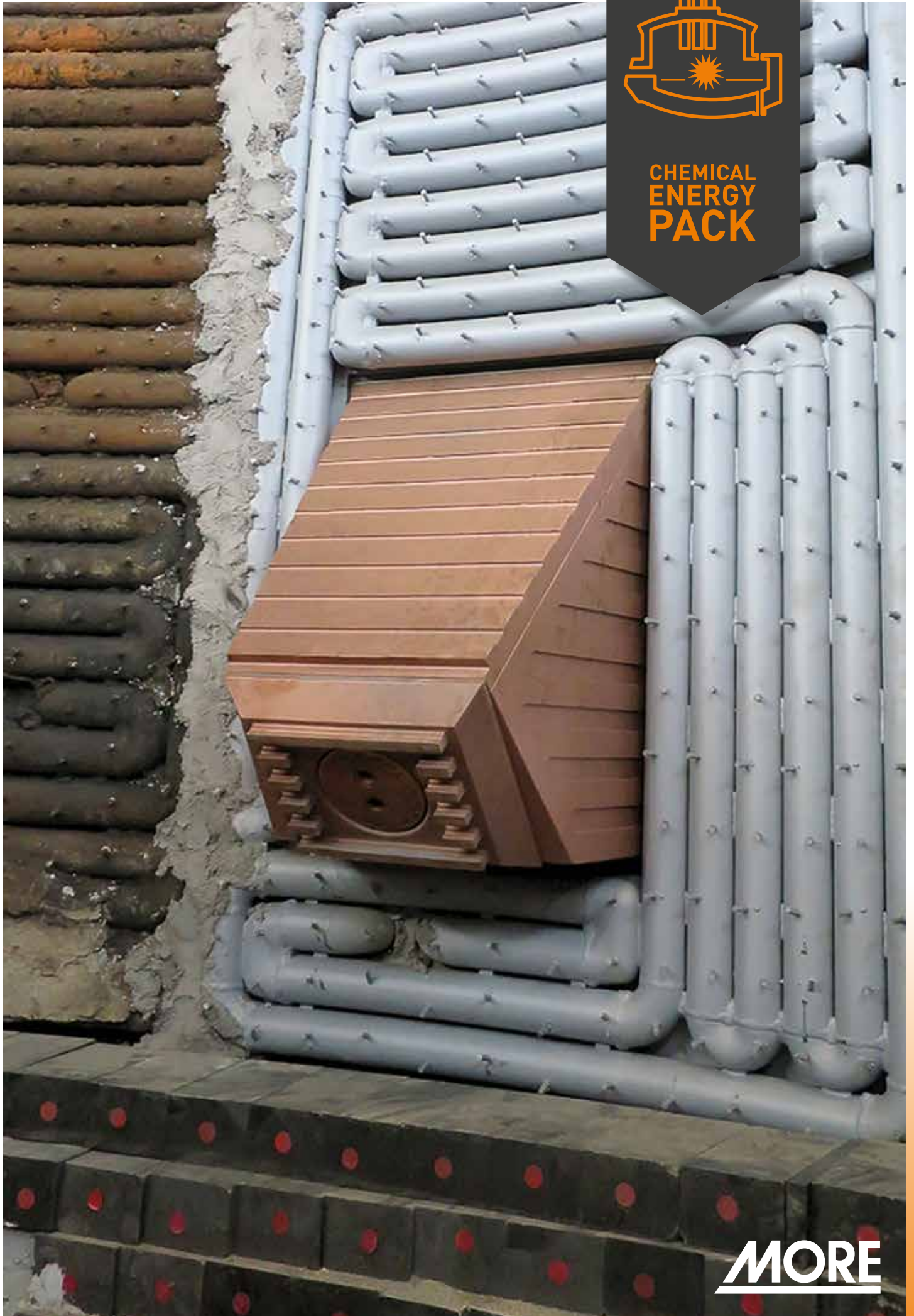
Welding



Final product



**CHEMICAL
ENERGY
PACK**



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MOCA

PNEUMATIC CARBON INJECTION SYSTEM

The **MOCA** pneumatic injection system has been conceived to satisfy the carbon metallurgical demand for steelmaking processes with precise flow control and transport air optimization. A precise and efficient carbon injection in the EAF is the cornerstone for improvement of metallurgical processes and reduction of conversion costs.

The integration of the pneumatic carbon injection system into the **Q-MELT** automation, allows a dynamic foaming slag control that monitors slag conditions and adjust automatically the carbon injection set-points.

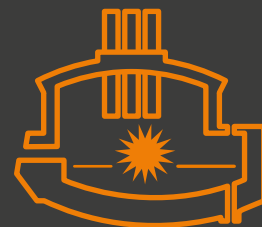
- Dispenser encased in a self-standing steel frame for easy handling.
- Automatic anti-clogging system.
- Independent pneumatic cabinet for transported air requirements.
- Optimized consumption of transported air.
- Low operating and maintenance costs.
- Accurate tolerance of set point ($\pm 5\%$).
- Fast carbon flow rate stabilization ($\lt 30$ sec).

MANUFACTURING STANDARDS

- PED 2014/68/UE pressure equipment directive.
- ATEX 2014/34/UE.
- ASME code rules, section VIII, division I.

Other standards are available upon request.





**CHEMICAL
ENERGY
PACK**



MORE

MOLI

PNEUMATIC LIME/DOLOLIME INJECTION SYSTEM

The **MOLI** pneumatic injection system has been conceived to satisfy the flux metallurgical demand for steelmaking processes with precise flow control and transport air optimization.

Lime injection is a valid well-proven improvement compared to lime charged through the roof or into the scrap bucket. Additionally, injection of powdered reactants generates a much cleaner shop environment. Therefore, dusty and maintenance demanding belt conveyor systems can be abandoned.

Thanks to the **Q-MELT** automation, the dynamic regulation of the correct feeding rate of lime and dololime enables a complete control of slag conditions throughout the process. Proper slag management improves slag foamability and dramatically changes the heat input efficiency and the refractory lifetime.

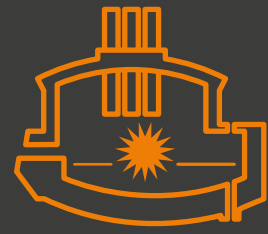
- Dispenser encased in a self-standing steel frame for easy handling.
- Automatic anti-clogging system.
- Independent pneumatic cabinet for transported air requirements.
- Optimized consumption of transported air.
- Low operating and maintenance costs.

MANUFACTURING STANDARDS

- PED 2014/68/UE pressure equipment directive.
- ASME code rules, section VIII, division I.

Other standards are available upon request.





CHEMICAL
ENERGY
PACK



MORE

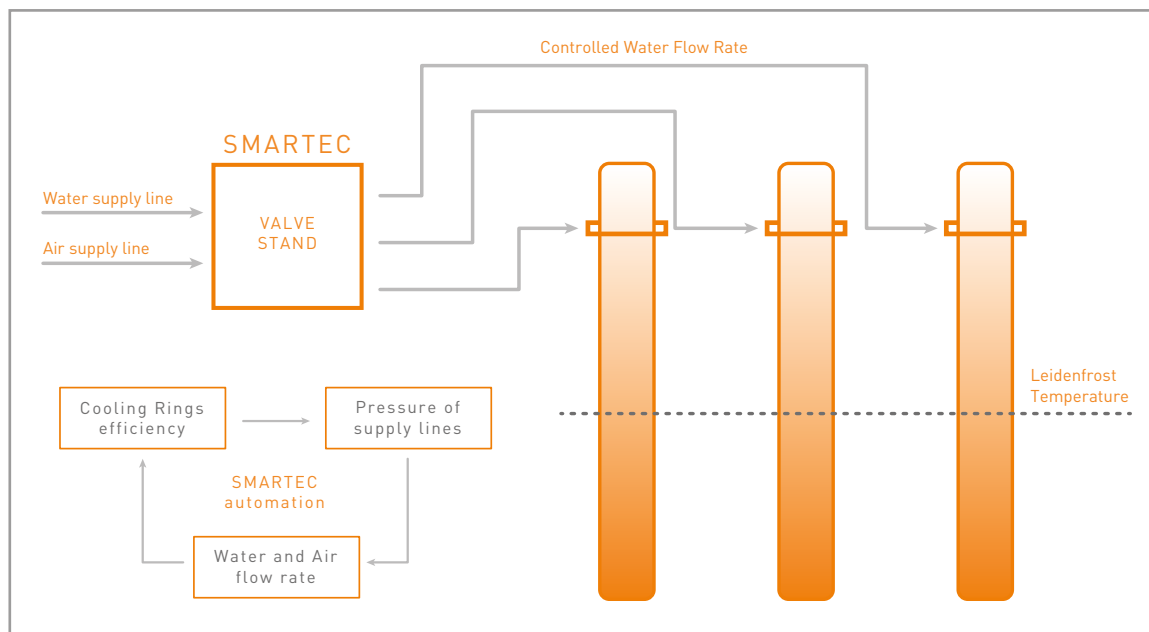
SMARTEC

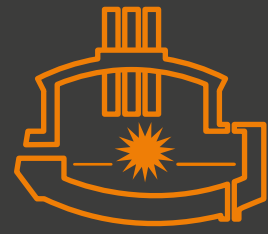
SMART COOLING ELECTRODE SYSTEM

The **SMARTEC** is an advanced cooling electrode system to regulate air/water flow through the electrode cooling rings dynamically. It consists of a valve stand and a set of optimized electrode cooling rings controlled by a dedicated proprietary automation software.

This dynamic control during every melting phase, significantly increases the efficiency and effectiveness of electrode cooling compared to the standard practice to use a fixed amount of cooling water; therefore, reduction of electrode and electrical energy consumption, without affecting the arc stability, can be achieved.

- Dynamic adjustment of the water cooling flow according to the requirements of the melting profile.
- Increased availability of the cooling rings due to a design that prevents clogging and deformation.
- Electrode-consumption reduction up to 15%.
- Reduction of OPEX.





**CHEMICAL
ENERGY
PACK**



MORE





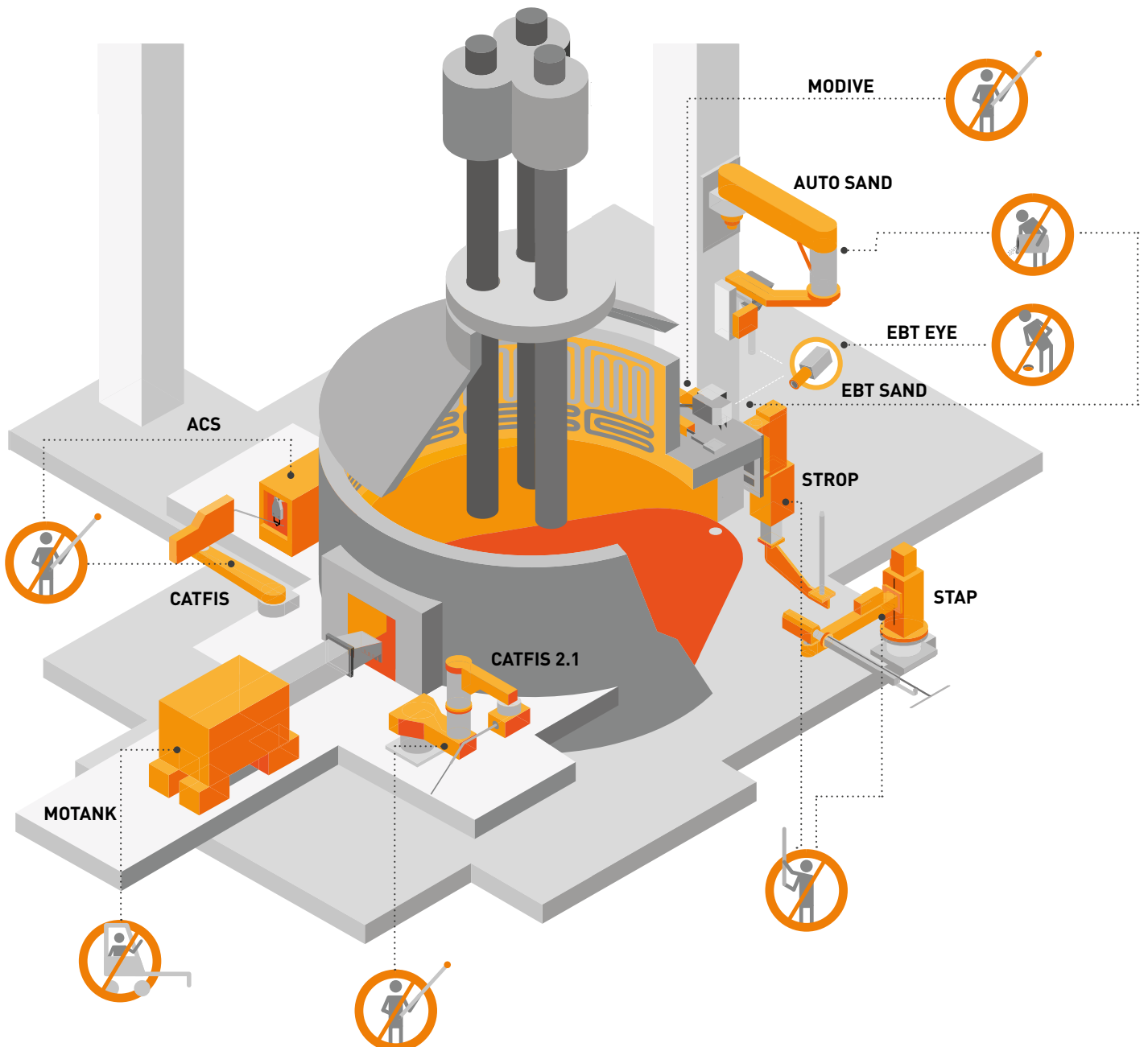
MORE

ZERO MEN AROUND

TECHNOLOGICAL PACKAGES SUITE TO REMOVE HUMAN OPERATION AROUND THE EAF

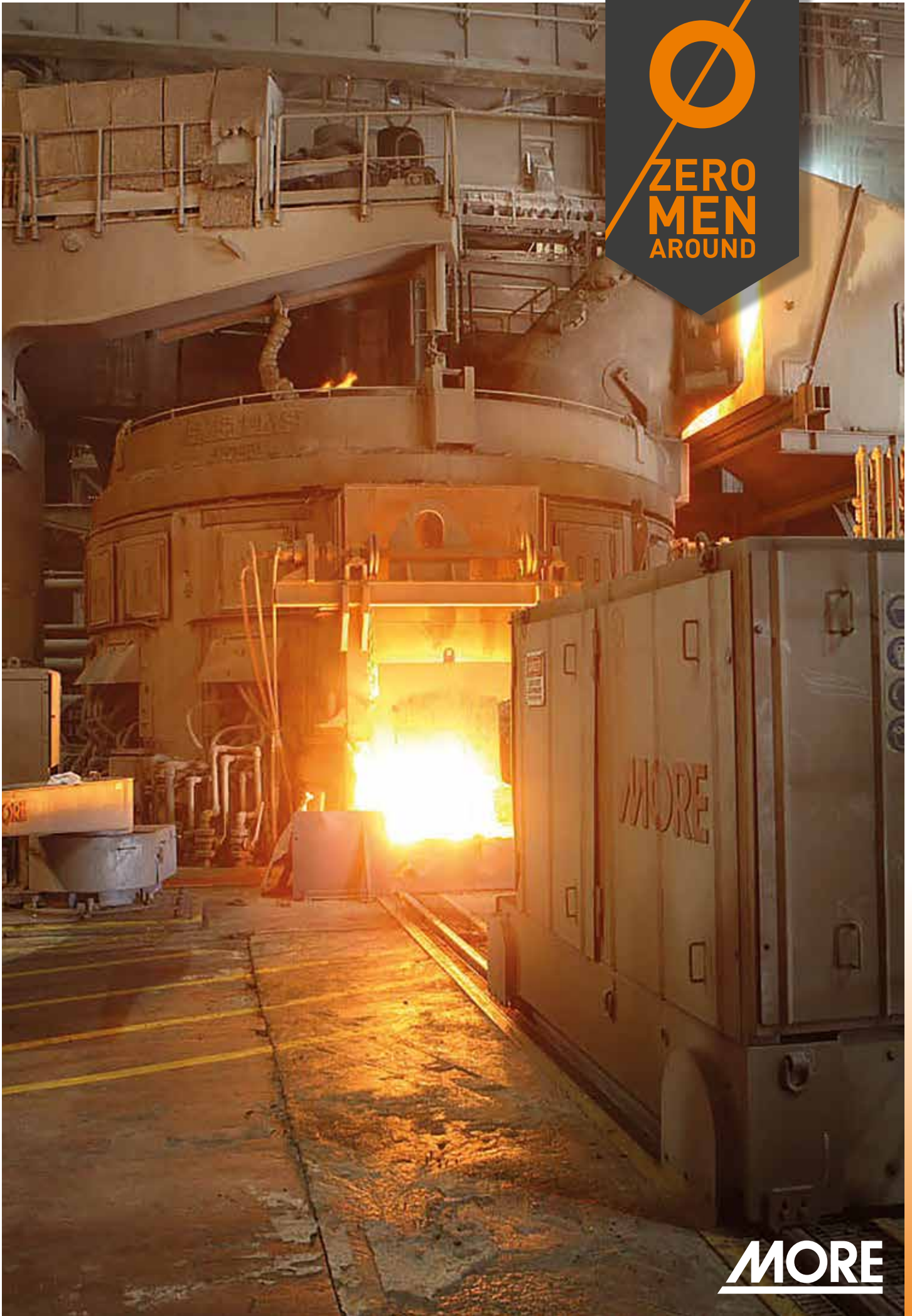
ZERO MEN AROUND technological packages eliminate the manned activities on the melting floor, with the aim to prevent accidents and keep furnace operators safe.

The suite extends the automatic control of the EAF melting process to all the operations from charging phase to tapping. Plus, the integration of the most frequent operations by automated specialized tools effectively minimizes power-off times, enhancing reliability and improving the transformation costs.





**ZERO
MEN
AROUND**



MORE

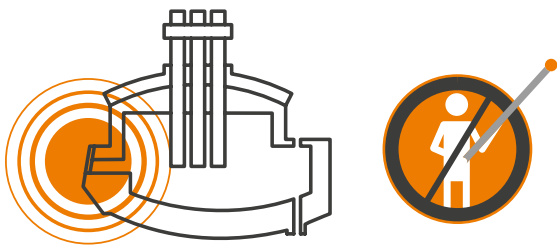
CATFIS

SAMPLING AND MEASURING LANCE MANIPULATOR OPERATED THROUGH THE SLAG DOOR

The manipulator has a swinging movement around two axes of rotation in order to approach from the parking to the measuring position.

The lance is water cooled, in order to guarantee a long life and a proper protection for the cabling and the measuring lance sensor. All the mechanical components are carefully shielded from heat and slag radiation by metallic protections.

In order to perform a reliable measurement, the lance insertion movement is controlled in speed and position. In case of collision detection, the manipulator retracts the lance.



FEATURES



MORE THAN 200 MACHINES AT WORK IN THE WORLD



ANTI COLLISION SYSTEM



EASILY EQUIPMENT INSTALLATION / DISINSTALLATION





**ZERO
MEN
AROUND**

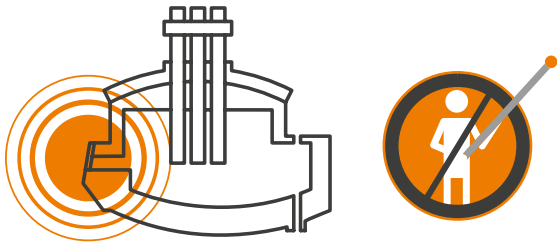


MORE

CATFIS 2.1

SAMPLING AND MEASURING LANCE MANIPULATOR OPERATED THROUGH THE SLAG DOOR

A multiple axis manipulator to achieve flexibility and compactness, it can be fitted in constrained and confined areas, total control of movement and adapting trajectories, easy maintenance, tailored for the steelmaking harsh environment and multitasking operations.



FEATURES



HIGH MOVEMENT
VERSATILITY
WITH 4 AXES



ANTI COLLISION
SYSTEM



EASILY EQUIPMENT
INSTALLATION /
DISINSTALLATION





**ZERO
MEN
AROUND**

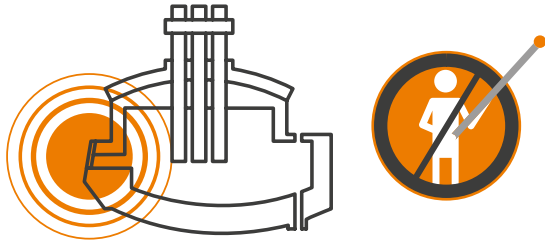
MORE

MORE

ACS

AUTOMATIC CARTRIDGE SYSTEM

ACS equipment is designed to change automatically the probes for **CATFIS** and **CATFIS 2.1** manipulators eliminating manual operations. It is a "stand alone" piece of equipment that can be installed on the fix platform on the same side of the manipulators, with up to three different cartridge types compartments.



FEATURES



USE OF STANDARD SENSORS CARDBOARD

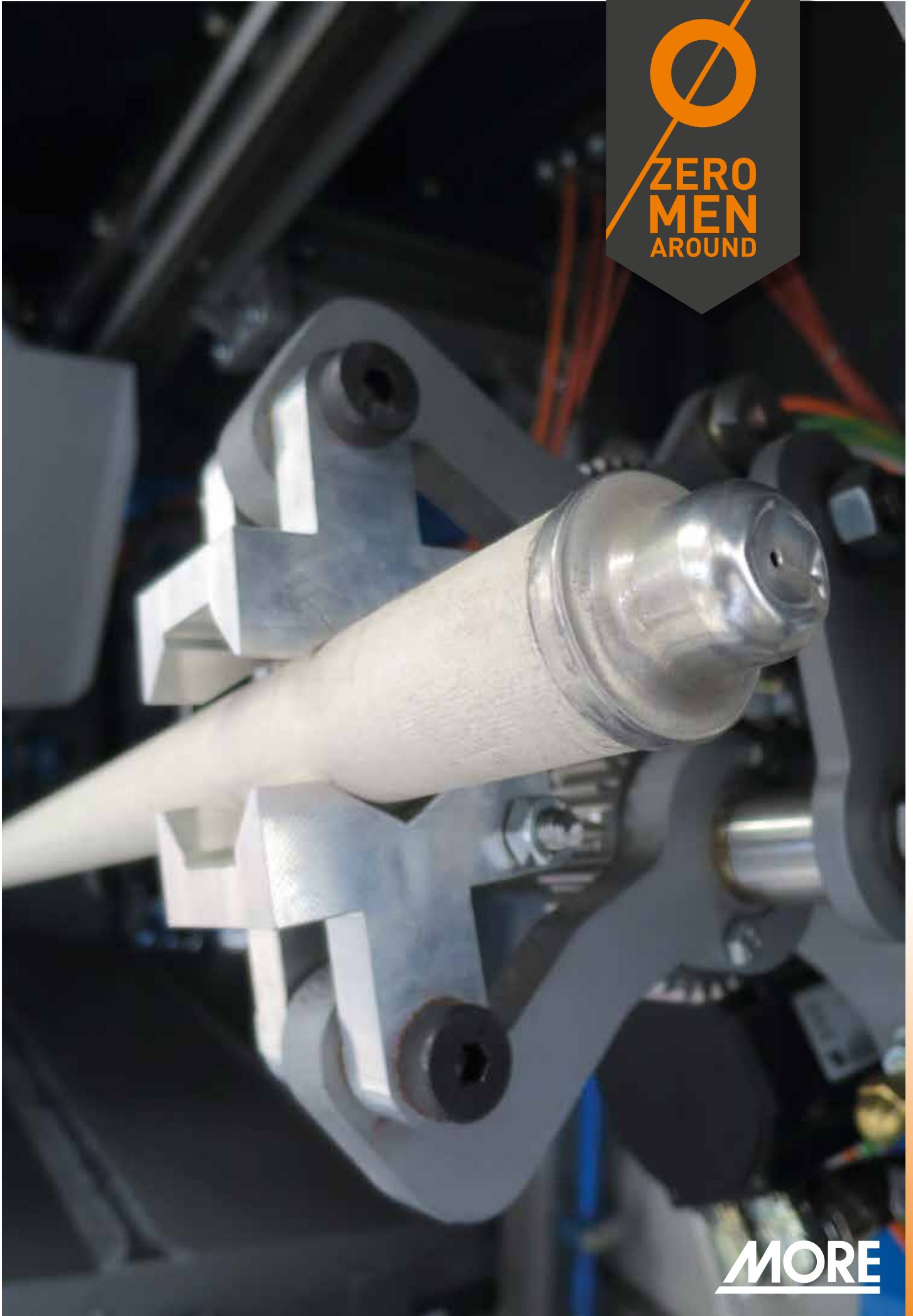


EASILY EQUIPMENT INSTALLATION / DISINSTALLATION





**ZERO
MEN
AROUND**



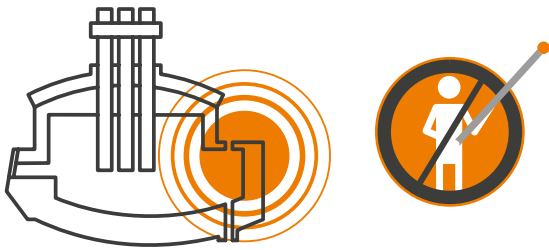
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MODIVE

SAMPLING AND MEASURING LANCE MANIPULATOR OPERATED THROUGH EBT PANEL, LADLE FURNACES, TRIMMING STATIONS AND VACUUM DEGASSING

The **MODIVE** is a multiple axis manipulator designed to measure temperature, carbon/oxygen contents and take samples for steel chemical analysis automatically.

The manipulator is a “stand alone” piece of equipment that can be easily installed nearby the electric arc furnace EBT area or in the ladle furnace, trimming stations and vacuum degassing.



FEATURES



HIGH MOVEMENT
VERSATILITY
WITH 4 AXES



ANTI COLLISION
SYSTEM



EAF CAN OPERATE
WITH THE SLAG DOOR
CLOSED





**ZERO
MEN
AROUND**

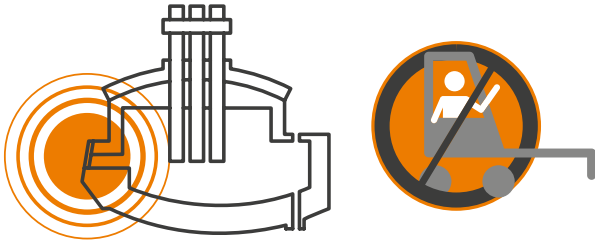


MORE

MOTANK

REMOTE CONTROLLED RAM FOR SLAG DOOR CLEANING

MOTANK is a remote controlled ram, specifically designed to operate at the slag door. The cart moves independently on rails, that can be laying in axis with the door or eventually sideways to best fit in almost all the layouts, even in case of EAFs encapsulated in a doghouse. The ram is actuated by a hydraulic cylinder equipped on-board. The pulling force is designed to easily clear the scrap and skulls in all the situations. It can be also tilted downwards to better fulfil the clearing action.



FEATURES



**MORE THAN 40 MACHINES
AT WORK IN THE WORLD**



**HEAVY DUTY
DESIGN**



**10 TONS
PUSHING FORCE**





**ZERO
MEN
AROUND**

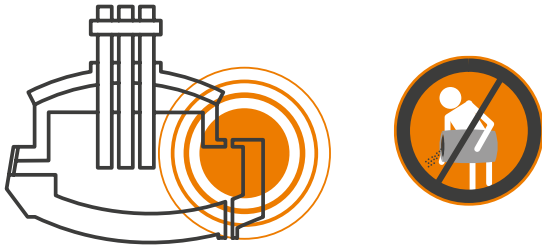


MORE

EBT SAND

TAP HOLE INSPECTION AND SAND FILLING

The on-board solution to inspect and fill sand is a compact all-in-one design equipment assembled on a sliding guide. A local small bin is charged with the proper amount of sand by a small stationary dispenser, located close to the furnace. The inspection camera is mounted parallel to the feeding chute in order to check in real time the correct feeding of the material and tap hole status.



FEATURES



**MULTIFUNCTION SYSTEM:
SAND FILLING, SLAG BREAKING
AND REMOTE VISUAL
INSPECTION**



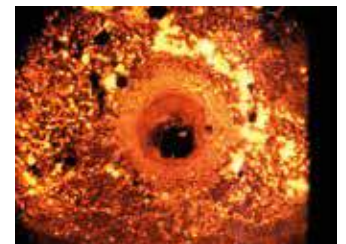
**PRECISE CONTROL
OF SAND FILLING**



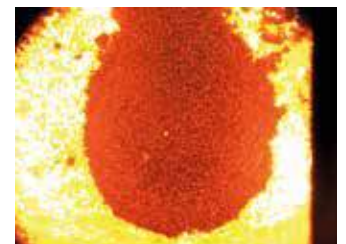
**HEAVY DUTY
DESIGN**



**AUTOMATIC CONTROL
OF IMAGE**



EBT AFTER
TAPPING



EBT POST
SANDING



**ZERO
MEN
AROUND**

MORE

AUTOSAND

TAP HOLE INSPECTION AND SAND FILLING

Specifically developed for off-board installation in case of reduced space availability on sump area or frequent shell change practice to inspect and sand fill.

The inspection camera is mounted parallel to the feeding pipe in order to check in real time the correct feeding of the material and tap hole status.



FEATURES



**MULTIFUNCTION SYSTEM:
SAND FILLING, SLAG BREAKING
AND REMOTE VISUAL
INSPECTION**



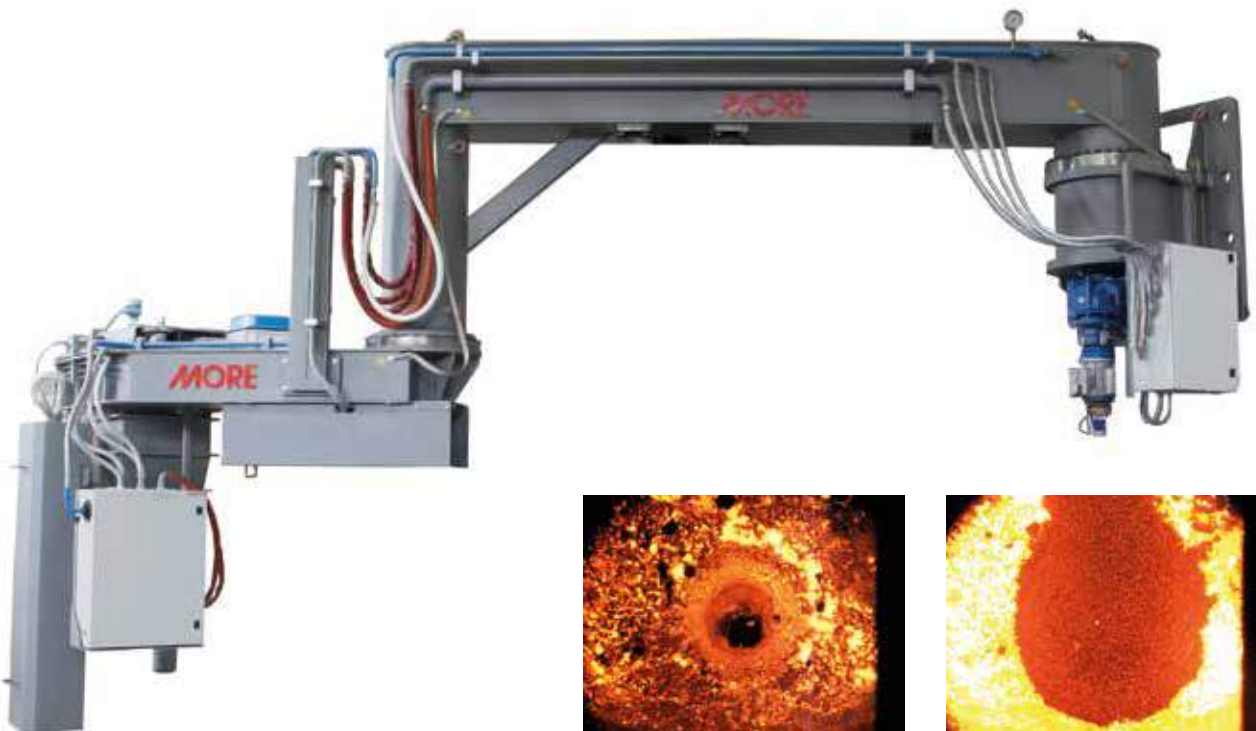
**SYSTEM INSTALLED
OUTSIDE THE EBT**



**PRECISE CONTROL
OF SAND FILLING**



**AUTOMATIC CONTROL
OF IMAGE**



EBT AFTER
TAPPING

EBT POST
SANDING



**ZERO
MEN
AROUND**



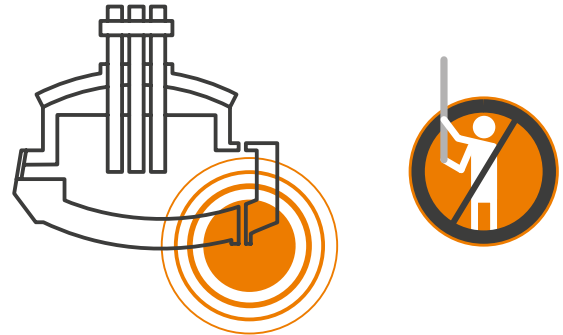
MORE

STROP

EBT TAP HOLE CLEANING

Unmelted scrap, skulls or heavy residuals may obstruct the tap hole after tapping. Sometimes obstructions are drilled by the operators by oxy-cutting. Moreover, lancing is non effective in case of slag skulls, concrete or graphite blocks. These tasks, although not very frequent, normally generate long delays, sometimes hours. Production loss and cost associated, plus hazard injuries risk for the operator represent a very serious issues.

The **STROP** is a hydraulically actuated equipment that inserts a sturdy rod into the tap hole that is able to lift heavy loads and free the tap hole from any kind of obstruction.



FEATURES



EAF ON BOARD
INSTALLATION



HEAVY DUTY
DESIGN



5 TONS
PUSHING FORCE





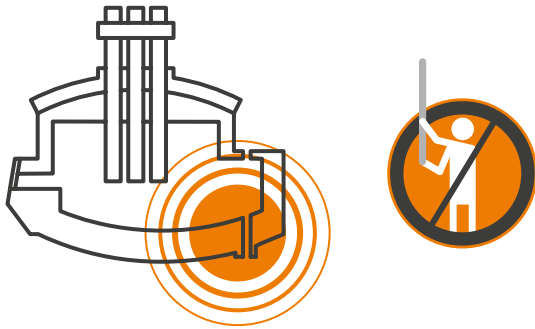
**ZERO
MEN
AROUND**

MORE

STAP

TAP HOLE EMERGENCY OPENING

The **STAP** manipulator is a multi-axis equipment dedicated to open the tap hole in case of clogging by an oxygen lance. The **STAP** device is not used regularly at each cycle but only when required. It saves on long delays that usually are accumulating in several meltshops due to the time required for the operators to get repaired at the occurrence of the non-free opening.



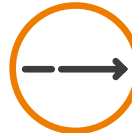
FEATURES



HIGH MOVEMENT VERSATILITY WITH 4 AXES



HIGH PRECISION REMOTE CONTROL



ARM LENGTH UP TO 6 METERS





**ZERO
MEN
AROUND**



MORE

SANDY

LADLE WELL BLOCK SAND FILLING AND INSPECTION SYSTEM

The **SANDY** equipment has been designed to fill sand and inspect remotely the ladle well block eliminating manual operation, increase the opening rate and reduce filler sand consumption. A hopper on board of the manipulator is charged with the proper amount of sand by a screw conveyor from a storage hopper designed to prevent moisture pickup in the sand. The inspection camera is installed on board of the system to check in real time the correct feeding of the material and ladle well block status.

FEATURES



MULTIFUNCTION SYSTEM:
SAND FILLING AND
REMOTE VISUAL
INSPECTION



**HIGH RESOLUTION
IMAGE CONTROL, EVENT BASED
VIDEO RECORDING AND IMAGE
STORAGE**



**STORAGE HOPPER
DESIGNED TO PREVENT
MOISTURE PICKUP IN
THE SAND**



**HEAVY DUTY
DESIGN**



**PRECISE
POSITIONING
AND CONTROL OF
SAND FILLING**

BENEFITS



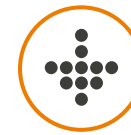
**AUTOMATIC, PRECISE
AND REMOTE SAND
CHARGING OPERATION**



**REDUCED FILLER
SAND CONSUMPTION**



**INCREASED NOZZLE
OPENING RATE >98%**



**IMPROVED OPERATORS'
HEALTH AND SAFETY**





**ZERO
MEN
AROUND**



MORE

QUALITY

We strive at guaranteeing the best operational standards in all the stages of its organization (from designing, to construction, to sales), since 1997 the company has been certified to satisfy quality assurance requirements of ISO 9001.

MORE products meet our rigorous internal standards as well as the internationally recognized certifications you've come to expect from the line of products we build such as ASME, PED, ATEX and others. All welding processes in **MORE** are made by certified welders from IIS (Italian Institute of Welding) and according to UNI EN ISO 3834-2 in order to keep track of all welding processes used during MORE manufacturing stages.

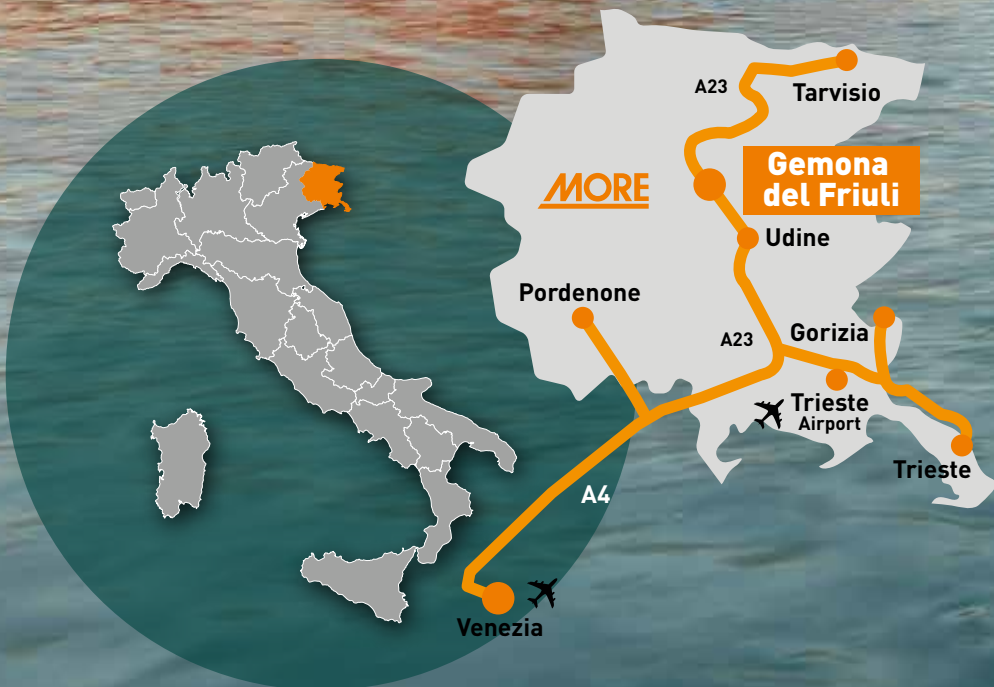
All equipment is designed, manufactured and tested in-house prior to delivery to check the working sequences and functionality.





MORE

WHERE WE ARE





INNOVATION IN STEELMAKING

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