SIMETAL EAF – solutions for electric arc furnaces

Technology, mechanical engineering, automation, and electrical engineering from a single source – top values in productivity, consumption, and availability

www.siemens-vai.com
The market for steel from electric steel plants continues to grow. And so do your expectations from us, your systems supplier. Fine-tuning your EAF technology for an optimal balance of charge materials, process control, cycle times, logistics, productivity, and many other parameters requires both in-depth experience – and especially a precise analysis of your requirements.

You expect:

- Cost-efficient production and maximized productivity
- Low consumption levels and efficient energy use
- Short delivery times and consistently high availability
- Flexibility in the use of charge materials and in the grades of steel produced
- Solid production quality and highly expert solutions
- Preparation for future environmental and market requirements
Your challenge: Balancing consumption, performance, and quality

Reducing operating costs – increasing performance
A key requirement is to optimize the consumption parameters, thereby permanently reducing operating costs. Achieving this goal requires an optimized balance between the charge materials and the technology used.

Extensive experience is likewise needed to increase plant availability while also decreasing the interval between batches. This is the key to precisely optimizing the furnace logistics with the upstream and downstream plants.

Reaching these goals also requires a maximum degree of automation and continuously improved process models, plus flawless interaction between the mechanical, hydraulic, and electrical components.

High plant equipment quality is necessary for product quality
One of the most basic prerequisites for high availability and product quality is engineering that meets best-in-class requirements and ensures superior production quality on the foundation of a state-of-the-art steel plant design. Many investors and plant operators demand “German quality standards” as the hallmark of engineering excellence, production expertise, and dependable short delivery times.

You expect the same reliability when it comes to service and training. Customer support has to be managed, in addition to process analyses and guaranteed availability of replacement parts.

And last but not least, a steel plant must be designed to meet future market requirements today – whether they involve stricter emission limits or more challenging customer needs concerning the quality and flexibility of your steel products.
The right approach: Our EAF solutions for your steel plant

Targeting the entire process
The key to low operating costs and high performance is to optimize furnace technology to suit your production parameters while incorporating the upstream and downstream processes and plants in the solution. That’s how we make it possible for your plant to:
- Stay within agreed-upon consumption values
- Efficiently use electrical and chemical energy, and thereby reduce conversion costs
- Optimize cycle time and minimize idle time
- Configure the gas cleaning systems to precisely match furnace waste gas parameters and process sequences — to ensure your ability to comply with present and future environmental requirements
- Increase productivity as the result of these capabilities — thereby converting some of your fixed costs into working capital.

Process reliability from a single source
Siemens VAI stands for integrated capabilities in process technology, electrics, and automation from a single supplier. This combination of expertise and resources enables us to adapt the furnace configuration to local conditions with respect to batch materials, local constraints, and the often related energy supply situation. But above all, it allows you to maximize your degree of automation as a basis for reproducible, reliable, and flawless processes.

Optimizing the lifecycle
Your goal is to ensure high plant performance throughout the entire lifecycle. SIMETAL EAF includes analyzing your current situation, supplying the EAF plus all required auxiliary systems, training, and coaching of your employees by our own experts, as well as in-house production of replacement parts. These services ensure fast start-up curves, consistently high plant availability, and an ongoing supply of your plant with new technologies — our so-called mechatronical performance packages, such as our tuning kits, electrode control systems with slag manager, oxygen process management with comprehensive offgas model, or high roof package.

Dependability counts
A variety of measures ensure the availability and quality of the mechanical components, from certified quality assurance processes to our own manufacturing facility in Germany for the production of performance-critical components. Your benefits include assured delivery times and high plant availability, resulting in reduced costs for maintenance and replacement parts.
SIMETAL EAF has a distinguished 40-year history with more than 350 reference plants in the EAF and LF fields. Backed by this extensive expertise, we use our modular building-block system to design the solution that precisely fits your production requirements – for technology, electrics, and automation.

Advantages of SIMETAL EAF:

- High reliability of your plant – assured fulfillment of the contractual agreements
- At the leading edge of innovation – Siemens VAI is the front-runner: see, for example, our SIMETAL EAF Ultimate for maximum productivity, flexible process control, and high availability, and our SIMETAL EAF Quantum for the most efficient and environment-friendly steelmaking
- Short start-up periods – thanks to the user-friendliness of the system, combined with the process expertise of our specialists
- High quality and minimized downtime risk – because of the high level of standardization of the system components
- Short amortization time of your investment – thanks to low consumption levels, high availability, and dependable productivity
SIMETAL EAF AC
Proven technology – high productivity

Based on decades of experience in designing electric arc furnaces, Siemens VAI offers steel producers a broad range of powerful options for high-performance electric steelmaking.

This includes EAFs of all sizes and types, twin-shell furnaces, and shaft furnaces in addition to all related processes, automation, and environmental systems. The AC EAF from Siemens VAI is the ideal melting unit for the production of all types of steel, from standard carbon grades to high-alloyed and stainless steel grades. Its overall furnace performance can be further enhanced with the latest oxygen and carbon injection technologies.

Twin-shell EAFs are a highly attractive solution for increasing a plant’s productivity, especially when the lifting and loading capacities of existing cranes and other infrastructural limitations do not allow an increase in the tapping weight. Power-off times can be reduced to less than three minutes.

Features:
- Gantry design for self-supporting furnace roof
- Prismatic roller guide system for electrode masts
- High-current conducting electrode arms in copper-clad box design
- State-of-the-art electrode control system
- Split-shell design
- Copper or combi-panels with high-speed cooling water flow
- Oxygen and carbon injection
- All bottom tapping systems (EBT, EO-EBT, RBT, OBT)
- Special hot-metal charging facilities
- Continuous DRI/HBI feeding systems
- DRI fines and dust injection

Main benefits:
- Increased productivity due to shortest melting and idle times
- High power input (up to 1 MVA/t)
- High-impedance furnace
- Arc voltage up to 1,500 V
- Low tapping temperatures and minimum slag carryover
- Proven low consumption values (including energy and electrodes)
- Minimum maintenance using heavy mill-type components
- Highest flexibility with charge materials

For twin-shell EAFs:
- High productivity levels resulting from reduced power-off times
- Parallel operational activities on separate EAF vessels

Selected references:
Hadeed – Saudi Iron and Steel Company, Saudi Arabia
NSIF – National Steel Iron Factory Company Limited, Saudi Arabia
North Star Steel, USA
MMK – Magnitogorsk Iron and Steel Works, Russia
ReFDA – Maxi Group, Russia
Dofasco Inc., Canada
Chengdu – Iron and Steel Company Limited, China
EVRAZ Rocky Mountain Steel, USA
VISCO – Vian Steel Melting and Casting Company, Iran
Siemens DC EAFs with our patented SIMETAL FinType anode systems have proven their reliability, even in areas with weak and unstable power grids.

Thin steel plates embedded within a rammed magnesia mass are vertically welded to horizontal plates in an annular arrangement at the base of the furnace hearth.

The favorable thickness-to-surface ratio of the sheets eliminates the need for bottom water cooling, contributing to increased furnace safety and availability. The unique design of the anode promotes a smooth and uniform transfer of the electric current through the melt, fins, steel plates, and the high-current transition elements.

Furnace types include UHP DC EAFs with one or two electrodes, twin-shell arrangements, and shaft furnaces.

Features:
- SIMETAL FinType anode system with low current density
- No water-cooled anode necessary
- Current up to 160 kA
- Twin-electrode design in ultrahigh-powered EAFs for fast melting of 100% DRI charges

Main benefits:
- Ideal melting unit for areas with weak power grids
- Highly suitable for 100% DRI feedstock (single- or double-electrode design)
- Reduced flicker effect (up to 50%)
- Reduced arc deflection
- Anode lifetime of more than 2,000 heats
- No repair work necessary during anode lifetime
- Safe and reliable operation
- Fast and easy anode exchange

Selected references:
Hangzhou Iron & Steel, Hanggang, China
Natsteel, Dynamic EXIM PTE Ltd., Singapore
Grupo Alfonso Gallardo Stahlwerk Thüringen GmbH, Germany
Gerdau Ameristeel, St. Paul, USA
SIMETAL EAF Quantum
Innovation in steelmaking – future furnace technology

Based on an optimized preheating and melting concept, the SIMETAL EAF Quantum delivers minimum conversion costs, maximized output, and environmental compliance.

Scrap charging via elevator
The new charging concept – an elevator system with a chute for scrap transfer from a subsurface dumping station into the furnace – results in flexible charging logistics. A crane or basket for scrap charging is not required. In addition, based on a precise duty cycle and charging time, a full-fledged automation solution can be implemented.

Redesigned preheating and off-gas processing
Thanks to 100% scrap preheating, the efficient recovery of energy results in energy consumption of less than 280 kWh/t. This is made possible by a trapezoidal shaft design in combination with a redesigned retaining system, which results in an optimal allocation of scrap and improved off-gas routing for efficient heat transfer.

This new approach is rounded out by an off-gas processing system with automated off-gas stream modification, maximized leak control, and a special hood to manage dust and off-gas emissions.

Pure flat-bath operation
Melting scrap in large liquid heels results in pure flat-bath operation with the lowest possible flicker, and also supports preheating efficiency. In combination with the Furnace Advanced Slag-free Tapping system (FAST – siphon design), this new furnace concept allows charging, tapping, and taphole refilling under power-on conditions.

The result: the highest productivity with the lowest tap-to-tap time and virtually no power-off time.

Minimized furnace movement
A specially designed shell transfer and moving concept utilizing a closed roof reduces furnace movements, improves system tightness and energy processing, and simplifies maintenance through quick shell exchange.

Main benefits:
- Increased productivity
- Energy consumption of ≤ 280 kWh/t
- Tap-to-tap time of 33 minutes
- Increased productivity of 1.35 million t/a with an 100-t EAF arrangement and a three-batch process
- Charging, tapping, and taphole refilling under power-on conditions
- Direct energy recovery due to 100% scrap preheating
- Smaller transformer installation
- Optimized environmental compliance due to revolutionary off-gas processing
- Highest output even with weak power grids – thanks to pure flat-bath operation and lowest possible flicker
- Up to 30% reduction in electrode consumption
- Safety improvements
- Full automation concept is feasible
- No crane movement in furnace area reduces danger from moving loads
- Profitable investment
- No scrap baskets necessary
- Short ROI
Shaft furnace technology was pioneered by our company in the late 1980s in response to the market challenge for minimum conversion costs, maximized output, and environmental compliance.

Through the utilization of the furnace off-gas during the heat cycle, scrap can be preheated to approximately 600 °C, on average, prior to final melting in the furnace vessel. This means considerable energy and cost savings with a substantial reduction in tap-to-tap times.

Furnaces are available as either single-shaft or double-shaft types. The most efficient design is the so-called fingershaft furnace, which employs a unique scrap retaining system with fingers to preheat 100% of the charge.

Thanks to SIMETAL EAF Shaft and SIMETAL EAF Fingershaft, any existing EAF with a heat size of over 60 tons can be upgraded to a high-performance shaft furnace with only minor modifications to the existing equipment.

Features:
- Up to 100% scrap preheating
- Ideal conditions for maximum energy recovery and application of postcombustion
- Flexible charging of DRI, HBI, hot metal, and pig iron
- Highest output, even with weak power grids
- Efficient off-gas treatment that satisfies all regulations
- Shaft moves laterally for easy maintenance

Main benefits:
- Low EAF conversion costs
- Tap-to-tap time of only about 35 minutes
- Up to 100 kWh/t electrical energy savings
- Approximately 40% reduction in flicker factor
- Up to 30% lower electrode consumption
- Up to 1% increase in metallic yield
- Up to 25% less dust emissions
- Up to 40% increase in productivity
- Short ROI

Selected references:
Severstal AG, Russia
Diler Iron & Steel Co., Turkey
Stahl Gerlafingen – Beltrame Group, Switzerland
Fushun Special Steel, China
Nervacerco S.A. – Celsa Group, Spain
NatSteel – Tata Group, Singapore
Zhangjiagang Steel – Shagang Group, China
SIMETAL EAF Ultimate

Welcome to the new generation

The combination and integration of the latest Siemens VAI EAF technologies and design features has led to the development of a new generation of electric arc furnaces – the SIMETAL EAF Ultimate.

This high-tech power package is characterized by super-high power input, high shell and roof design, high-efficiency automation, high-speed furnace equipment movement, performance-enhancing oxygen and carbon injection technology, short tap-to-tap times, and reliable operation. Its modular design, quick-change components, and easy access for simplified maintenance maximize furnace availability and steel output.

Process and operational features:
- Superhigh power input (up to 1.5 MVA/t)
- Latest oxygen and carbon injection technology with RCBs (Refining Combined Burners)
- Furnace design for one-bucket scrap charging
- Automatic prepositioning of scrap bucket
- Continuous-feed systems for HBI and DRI (hot or cold)
- DRI fines and dust injection
- Hot-metal charging facilities
- Contact-free steel temperature measurements
- Automatic tap control with video camera
- Automatic slag detection system during tapping with IRIS (InfraRed Identification System for Slag)
- Taphole- and door-cleaning robots

Design and equipment features:
- Robust and reliable equipment
- Gantry with single-point roof-lifting device
- Prismatic roller guide system for electrode masts
- High-capacity current-conducting electrode arms in copper-clad box design
- State-of-the-art electrode control system
- Copper or combi-panels with high-speed cooling water flow
- High furnace shell and roof for improved postcombustion
- All bottom tapping systems (EO-EBT, EBT, RBT, OBT)
- Crane with two auxiliary hooks for quick electrode exchange
- Split-shell design for fast exchange of shell sections
- Automatic taphole filling device
Main benefits:

- High degree of flexibility with charge materials
- High reliability and availability
- Proven and profitable technology for any steel route (flat and long)
- Highest productivity resulting in dilution of fixed costs
- High-impedance furnace
- Arc voltage up to 1,650 V
- Proven low consumption values for energy, electrodes, refractories, etc.
- Minimum maintenance with the use of heavy mill-type components
- Safe operation and maintenance
- Optimized power utilization

Typical performance and consumption values:

**Design parameters**
- Tap weight: 120 t
- Scrap charge: 1 bucket
- Melting power: 125–130 MW

**Performance values**
- Power-on time: 22 min
- Power-off time: 8 min
- Tap-to-tap time: 30 min
- Heats per day: 48
- Productivity: 240 t/h

**Consumption values**
- Electricity: 340 kWh/t
- Electrodes: 1.2 kg/t
- Oxygen: 45 Nm³/t
- Carbon charged: 10 kg/t
- Carbon injected: 7 kg/t

**Selected references:**
- Çolakoğlu Metalurji A.S., Gebze, Turkey
- Revda – Maxi Group, Russia
- MMK – Magnitogorsk Iron and Steel Works, Russia
- Kaluga – NLMK Group, Russia
The ever-increasing global demand for stainless steel can be met by installing melting units with the latest technologies and design features.

SIMETAL EAF Stainless combines all of the advantages and benefits of the new SIMETAL EAF Ultimate concept with the special requirements of stainless steel production. Maximized power input and high productivity are the distinctive features of this furnace type.

Siemens VAI is the world’s leading supplier of EAFs for the production of stainless steel.

**Features:**
- All features and design elements as outlined for AC and DC EAFs
- Power input up to 120 MW
- Large furnace volume, with consideration given to low density of stainless steel scrap (200 m³ and greater)
- Tight furnace with minimal shell and roof openings
- Exclusive spout design to enable fast tapping
- Special furnace design to allow tilting angle up to 40°
- Equipped with RCBs for stainless steel with N₂ injection

**Main benefits:**
- All benefits as outlined for AC and DC EAFs
- Additional productivity improvements thanks to minimized power-off times

**Selected references:**
- Outokumpu Polarit Oy, Finland
- Carinox – Ugine & ALZ, Belgium
- ZPSS – Zhangjiagang Posco Stainless Steel, China
- Tisco, Shanxi Taigang Stainless Steel Corporation Ltd., China
- Lisco, Lianzhong Stainless Steel Corporation, China
The SIMETAL EAF Micro is an efficient solution for small foundries or micromills with a yearly productivity of 50,000 to 200,000 tons.

Besides the mass production market, there is an increasing market for smaller tonnage ranges and treatment weights. To fill this niche, Siemens VAI has developed the EAF Micro for tapping weights of up to 35 tons. The EAF Micro is based on the conventional SIMETAL EAF design concept, but with custom configurations to fulfill specific process and metallurgical requirements as well as accommodate any given investment budget.

**Advanced metallurgy**

In contrast to other melting processes in this range of tapping weights, the implementation of an oxygen system enables even complex metallurgical process steps – such as deoxidation and decarburization – to be performed. Even the installation of an appropriate material handling system with roof feeding is possible. This is essential for the production of a wide range of special steels. With the EAF Micro, it is possible to have only one furnace solution that handles major metallurgy process steps and the input of raw materials of widely varying qualities.

**Mechanical design**

The SIMETAL EAF Micro is engineered using standard, state-of-the-art components that have been proven over many years, as well as improvements like the following:

- Tilt platform with improved kinematics
- Water-cooled roof and upper shell
- Refractory-lined lower shell with spout tapping
- Current-conducting electrode arms

**Modularity**

SIMETAL EAF Micro has a tilting frame with enhanced dynamic characteristics and is installed on a base frame. This design permits a high degree of preassembly in the manufacturing phase and minimizes the time required for installation in the melt shop.

Thanks to its modular design, SIMETAL EAF Micro can be quickly adapted to handle the complete range of tapping weights.

**Main benefits:**

- Complex metallurgical processes can be performed
- Chemical energy input is feasible
- Wide range of input materials
- High availability due to low maintenance requirements

**Selected references:**

Tikhvin Rail Car Building Plant, Russia
Innovative injection process management
Enhances EAF performance

Injection process management
Siemens VAI has developed an innovative injection process management system designed to boost the power input and performance of electric arc furnaces.

Based on Refining Combined Burner (RCB) technology, this high-power performance package operates completely automatically in accordance with the EAF process.

The system includes oxy-gas burners and postcombustion oxygen injectors. It allows the injection not only of carbon but also of any fine material such as FeSi, FeCr, and dust.

The injection process enables flexible and profitable solutions for any production route, ranging from 100% scrap to DRI/HBI or hot metal for carbon and stainless steel production.

The SIMETAL RCB technology
The latest development is the SIMETAL RCB system, which is especially designed to optimize the injection of oxygen and carbon into the EAF.

It ideally complements the electric arc energy input with additional exothermic energy created by chemical reactions of fuel or gas, oxygen, and carbon injected into the furnace. For stainless steel production, nitrogen is additionally injected to improve bath agitation, especially when charging heavy materials like pig iron bars and FeCr.

The complete RCB unit includes a modular-designed injection panel in which the RCB and the carbon injection lance are installed.

The unique design of the modular approach provides a number of advantages in comparison with other systems:

- The distance between oxygen/carbon streams and refractories minimizes refractory wear
- Ideal placement of the lance tip with respect to the steel bath to enable a supersonic, laminar oxygen stream to a distance up to 1.8 meters; the nose panel positions allow a multipoint injection for a strong stirring of the bath
- Fully modular, easy-to-maintain design reduces the need to procure new equipment, saves time, and reduces material consumption and costs
- It is possible to replace the front plate quickly and easily with a crane without cooling the furnace
- Optimized water flow in the individual modules enables optimal heat removal

Main benefits:
With up to 100 successfully operating RCB installations worldwide, the benefits can be summarized as follows:

- Ideal for all furnace types with varying raw-material inputs and produced steel qualities
- Highly effective O₂ input into steel bath at high penetration speeds in support of scrap melting
- High degree of bath agitation and heat generation for elimination of cold spots
- Efficient carbon/oxygen injection for faster and more consistent buildup of foamy slag
- Shorter power-on time and considerably lower conversion costs
- Closed-door operation for reduced energy losses and false-air intake
- High degree of personnel safety
- Potential for steel decarburization and recarbonization, if required
- Short ROI

**Selected references:**

MMK – Magnitogorsk Iron and Steel Works, Russia
Revda – Maxi Group, Russia
SISCO – Millennium Steel, Thailand
Brandenburg – Riva Group, Germany
SAM – Riva Group, France
Tokyo Steel MFG Co. Ltd., Japan
Suez Steel Co., Egypt
Baoshan Iron & Steel Co. Ltd., China
SIMETAL RCB Temp brings you one step closer to fully automatic steelmaking under safe and reliable operating conditions. And it completely eliminates the need for more cost-intensive cartridges for temperature measurement.

SIMETAL RCB Temp uses a supersonic injection technology combined with analyzing and control units for contact-free temperature measurement. These units allow the temperature of liquid steel to be measured inside the furnace with closed slag door and offer major advantages over existing technologies. The results are far more accurate, with fewer unstable measurements, and permit monitoring of the steel temperature until the target temperature is reached.

**RCB Temp operation**
SIMETAL RCB Temp consists of a burner with an integrated oxygen lance. The lance injects oxygen at a special angle with a supersonic laminar jet. To protect the central laminar oxygen stream, the burner shrouding function is maintained during the refining process. Switching SIMETAL RCB Temp from lance to temperature mode allows contact-free temperature measurement.

**Temperature measurement process with SIMETAL RCB Temp**
The temperature signal is processed and intensified within the analyzing unit. The control unit filters the signal and evaluates it based on an algorithm specially developed by Siemens VAL. SIMETAL RCB Temp improves process efficiency by measuring the temperature of the liquid steel more frequently until the tapping temperature is reached. Temperature measurements can be started manually by operator or in automatic sequences.

**Cost reduction**
SIMETAL RCB Temp is a highly economical solution thanks to the elimination of temperature cartridge costs, the reduction of personnel overhead, and significant energy savings.

**Main benefits:**
**Safety improvements**
- SIMETAL RCB Temp eliminates risks for operators during temperature measuring, because the slag door is closed.
- No additional space-consuming devices in front of the EAF are needed.

**Increased productivity**
- The right time for tapping can be determined more precisely
- Faster temperature measurement results are achieved

**Profitable investment**
- Short ROI
- Low installation costs
- Short implementation time
- Can be installed during regular maintenance shutdown

**Selected references:**
Stahlwerk Bous GmbH, Germany
SIMETAL LiquiRob for EAFs
Safe operation in hazardous environments

With SIMETAL LiquiRob, Siemens VAI provides a highly flexible robot-aided measuring and sampling solution that gives you the flexibility and reliability needed to ensure uninterrupted, fail-safe, and controlled EAF steel production.

SIMETAL LiquiRob will replace mechanical manipulators, delivering higher availability, simple upgrades, and easy training in new operations. In many cases, it will eliminate the need for operators to make temperature or celox measurements and take samples.

Thanks to the SIMETAL LiquiRob, work in hazardous areas is largely eliminated.

Maximum flexibility
With its six-axis movements, the SIMETAL LiquiRob may be implemented even under extremely tight space conditions. Consequently, very short cycle times can be achieved. In addition, the SIMETAL LiquiRob is a perfect upgrade solution for existing plants.

Due to its high degree of flexibility, SIMETAL LiquiRob can be used for handling various kinds of cartridges without any major modifications.

Low maintenance costs
The SIMETAL LiquiRob is a proven, mature system. The maintenance cycles are considerably longer compared to those of conventional manipulators. To protect it from dust and heat, the robot is covered with a special fabric.

Ease of use
During most operating cycles, SIMETAL LiquiRob requires no operator interaction because the system is controlled by a state-of-the-art automation system. A Siemens HMI guarantees easy handling and short training time.

Additional features
SIMETAL LiquiRob recognizes defective cartridges and sorts them out before performing any measurements, thus avoiding time-consuming measurement errors. In addition, it is also possible to check the contact rod position, so the availability of the system is guaranteed.

Main benefits:
- Significant improvement in health and safety conditions by keeping the workers away from dangerous areas during operations
- Higher reproducibility of the measurements
- Handling of diverse types of cartridges (T, S, celox), with potential for cartridge cost reduction
- Shorter process cycles – flexible and fast exchange of the cartridges

Selected references:
RIVA Neuves-Maisons, France
The combination of process technology, electro-technology, and automation is a crucial aspect of Siemens VAI solutions.

Leading basic automation, process control engineering, and process optimization created by our company all play a key role in stable processes and greater system reliability – because we develop the system to meet your specific requirements beginning right in the design phase.

Features:
- Modular design, expandable, upgradable, and user-friendly
- Optimized and customized process models
- Reporting and statistics
- Remote monitoring and diagnostic options

Main benefits:
- Stable production, systematic monitoring, and quality improvement
- Advanced solutions for new and existing plants
- User-friendly operation, full transparency, and flexibility as a result of integrated diagnosis and fault clearance
- Highest performance and increased productivity, thanks to shortest possible tap-to-tap time
- Reduced costs through optimized handling of additive alloying material
- Highest reliability from the most proven automation solutions worldwide – SIMATIC S7, WinCC, and SIMATIC PCS 7

Process optimization
SIMETAL EAF Optimization enables process guidance for the production of a wide range of steel grades, including carbon, stainless, and special steels. It also accommodates variable charging ratios of scrap, DRI, and hot metal.

The main feature of the automation system is Steel Expert, a group of process models that perfectly image and optimize the process of EAF steelmaking.

The prediction model provides a forecast of the progress and final condition of the heat, predicts all required actions, and acts to optimize the production process. While the supervision models are monitoring the metallurgical and thermal process, calculating online the actual condition of steel and slag, the set point models determine the energy supply and all material additions.

SIMELT Foaming Slag Manager
This package manages the measurement of structure-borne noise at the furnace shell. The signals picked up at several measuring points permit the spatial mapping of the foaming slag around the electrode and panel.
SIMELT FSM detects foaming slag in all sections of the furnace and optimizes carbon injection – in such a way that baring of the arcs will largely be avoided. This reduces power-on time and carbon consumption, improves the power intake in the arc furnace, and increases productivity.

Selected references:
Lech-Stahlwerke GmbH, Germany
BMZ Zhlobin, Belarus
SIMETAL SIMELT provides a fully automatic, end-to-end solution for electrode control in three-phase electric arc and ladle furnaces.

Fully automatic electrode control with artificial intelligence
The solution relies on artificial intelligence to optimize the melting process. It also includes optional melting programs to ensure accurate reproduction of the melting process – for highest furnace productivity. The electrode control and its add-on units are based on our proven SIMATIC S7 technology, and they can be integrated into any system environment and architecture. The technology has been successfully applied in more than 300 cases worldwide.

Main benefits:
- Dynamic control parameters and reduced energy consumption for melting performance and more efficient use of resources
- Higher productivity and reduced power-off times through fast electrode movements and automatic melting programs
- Graphical display and input of all control parameters
- Extended furnace life by preventing furnace hot spots
- Amortization within less than six months

SIMETAL SIVAC-X switchgear
Our furnace switchgear are perfectly adapted to extreme requirements. At voltages of up to 40.5 kV and load currents up to 4,000 A, they ensure reliable energy supply and reliable plant operation with up to 120,000 operating cycles. Long maintenance intervals of 10,000 operating cycles ensure very low operating costs.

Main benefits:
- Higher productivity and minimized production risk, thanks to a secure power supply
- Control over large power consumers like electric arc furnaces and ladle furnaces at all times
- Reduction of network disturbances
- Minimization of network fluctuations
- Reduction of power costs
Continuous development in technology, equipment, and systems means that with relatively small investments, major improvements can be achieved in plant performance and production efficiency.

Siemens VAI offers a comprehensive range of customized upgrade solutions for the harsh operating conditions of electric steelmaking. All components and systems supplied are designed for endurance, easy access, and low maintenance, and offer superb value for the money.

**Features:**
- Multidimensional problem solving expertise and capabilities for turnkey system supply
- Individual, customer-oriented solution approach
- Minimum interruption of ongoing plant operations
- Proven short solution implementation times within scheduled plant shutdowns
- Fast response and short delivery times
- "Rapid action" response teams in emergency situations
- Continuous technology and service improvements through partner feedback
- Worldwide service network
- Company-owned workshop for highest-quality materials and workmanship
- Proven short ROI

**Main benefits:**
- Continuous improvement in plant performance
- Higher plant availability
- Technological solutions for boosting productivity
- Improved and consistent product quality
- Lower conversion costs
- Long-term relationship and partnership

Siemens VAI provides steelmakers with tailor-made solutions for the highest plant efficiency and performance.

**Selected references:**
- Arcelor Schifflange, Luxembourg
- Gerdau Piratini, Brazil
- Hangzhou Hanggang, China
- Hadeed Saudi Iron and Steel Company, Saudi Arabia
- Rocky Mountain Steel Mill, USA
- Severstal AG, Russia
- Outokumpu Stainless, Finland
Siemens VAI lifecycle services
As a plant operator, you have conflicting needs. On the one hand, your performance is measured each quarter against short-term profitability expectations. On the other hand, you have to think on a totally different timescale compared with the capital market. Depending on the lifetime of your plant, you have to take 15 years or more into account. At the very least, that’s 60 full quarters.

But thanks to our comprehensive expertise and integrated approach to solutions, you benefit both short-term and long-term from our lifecycle services.

In the short term: Backed by our extensive experience with many reference plants, we will provide you with the certainty of fast, dependable production start-up and shorter amortization periods.

In the long term: Our master plan guarantees competitive performance for your plant in every phase of its lifecycle. Whether we’re providing 24/7 technical support, optimizing maintenance, or making permanent plant improvements, we’re always working to ensure the cost-effective operation of your plant.

Siemens VAI stands for a successful long-term relationship and partnership

<table>
<thead>
<tr>
<th>Electric steelmaking: our soft-skill services</th>
<th>Electric steelmaking: our hardware supply services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigation, inspections &amp; feasibility study</td>
<td>Consulting &amp; training</td>
</tr>
<tr>
<td>Evaluation and diagnosis – equipment conditions – standard operation – plant performance</td>
<td></td>
</tr>
<tr>
<td>Identification of problems – on-site inspections – bottlenecks – operating practices</td>
<td></td>
</tr>
<tr>
<td>Proposal of solutions to achieve – new milestones – new targets – higher efficiency</td>
<td></td>
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<td>Fact-finding missions</td>
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<td>On-site support: “show-how” – maintenance – operation</td>
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<td>Assistance during start-ups</td>
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<td>Installation and commissioning services during: – weekly maintenance shifts – yearly shutdown – provision of operational and maintenance training and technical assistance, including know-how and show-how services</td>
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<td>Supply of spare parts – components – equipment – systems</td>
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<td>Reengineering of components</td>
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<td>Consignment stock services</td>
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<td>Repair and remanufacturing</td>
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<th>Services for steelmakers</th>
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<td>Experience, competence, and expertise are available as soft skills, in addition to hardware supplies and technological upgrades.</td>
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Ultimate charging

Customer: Revda – Maxi Group, Russia
Plant type: 120-t SIMETAL EAF Ultimate
Our solution: Replace the traditional Siemens-Martin furnace with a totally optimized production line for steel billets. We supported the customer during the complete integration of the system; in addition, together with the customer we developed a structured financing package.
The result: The project was carried out very quickly in view of the available materials. The design capacity was accomplished after only six months, which meant an extremely short start-up curve. The system has proven how SIMETAL EAF Ultimate technology increases productivity in practice. This was just one of the many reasons that Siemens VAI was awarded two more orders for the same equipment, this time for the entire production line.

Going all out

Plant type: 80-t EAF
Our solution: Develop the entire system configuration for a highly productive SIMETAL EAF AC; train the operating personnel
The result: In addition to a short start-up curve, the system is notable for its stable productivity across the entire line.
SIMETAL EAF epitomizes the 40 years of experience in plant construction. The success stories presented below offer just a brief impression of our comprehensive experience.

**The world’s most productive furnace utilizing scrap**

**Customer:** Çolakoğlu Metalurji A.S., Gebze, Turkey  
**Plant type:** 320-t EAF  
**Our solution:** SIMETAL EAF Ultimate, the world’s largest and most productive electric arc furnace utilizing scrap; the development of this furnace has enabled us to implement an economical minimill concept for the production of flat steel products as well.  
**The result:** Minimized investment and optimized consumption charges

**Production up – costs and emissions down**

**Customer:** MMK – Magnitogorsk Iron and Steel Works, Russia  
**Plant type:** 2 x 180-t EAF  
**Our solution:** Convert steel production from the open-hearth process to electric steel production  
**The result:** Along with a 25% boost in steel production, production costs were reduced for the long term. Moreover, emissions were cut significantly, providing the basis for compliance with required standards.

**20% production boost**

**Customer:** Severstal, Russia  
**Plant type:** 120-t FSF  
**Our solution:** Integrated shaft preheating with SIMETAL EAF Fingershaft furnace  
**The result:** Productivity was maximized, with the simultaneous minimization of electrical energy consumption. Production is expected to be 20% above the design capacity.