Competence in LD (BOF) steelmaking

Driving steelmaking to perfection: Technology, mechanical engineering, automation and electrical engineering from a single source
Your challenge:
To increase productivity and reduce operating costs in a growing market

Continuous growth
According to current forecasts, worldwide demand for steel is set to grow 3.5% per year until 2020. This increased demand must be met with expanded capacity, a reduction in tap-to-tap times and a general increase of plant productivity. China, India, Brazil and the CIS are currently the primary drivers of the global market.
Continuous growth requires continuous optimization of processes in order to remain globally competitive.

Local specializations
In addition to large consolidations, there are many local alliances between iron and steel mills. However, the value-added chain is shifting as the availability of the necessary raw materials continues to diminish. Many investors and plant operators are locating their plants close to raw materials or sources of energy, such as in South America and the Middle East.

Growing environmental awareness
More stringent environmental regulations ultimately require increased investments in LD (BOF) plants, especially in offgas systems. These investments must pay off in the long term and be sustainable while meeting both present and future environmental standards.

Increasing productivity and consistent plant availability
Future plant operators will have to continue optimizing consumption parameters in order to achieve capacity increases and quality improvements with decreasing operating costs. This is the only way for them to strengthen their market performance in the long term. Requirements for product quality are continuously growing. Especially in the automotive branch, increasingly higher steel quality – both physical and chemical – is in demand. If producers are to succeed in these markets, they will have to continuously update their technology.

Increased modernization
Extensive saving potentials can be tapped in the area of operating costs, especially through the installation of technological components such as bottom purging, slag stoppers and sublances. In the future, a maximum degree of automation will be required to ensure process reliability and maintenance-free operation. This will optimize the interface between mechanical and electronic process components.

Flexibility in the market
In general, the more comprehensive your process expertise, the better you are able to meet your customer’s specific requirements with know-how and products, and the more you are able to boost your performance in the market – a market that is continuously becoming more complex and dynamic. We invite you to work together with us in meeting these new challenges.

You expect...
• Higher plant availability with regards to increasing steel consumption
• Increased modernization for higher plant performance
• Flexible technological updates in response to growing quality requirements
• Flexibility of charge materials as a reaction to price fluctuations of raw materials
• Optimized plant processes as a response to more stringent environmental standards
• Decreasing operating and maintenance costs to offset growing cost pressures
Our solution:
Tailored technologies for process optimization

Advantages of Siemens Metals Technologies LD (BOF) steelmaking solutions:
- Remaining at the leading edge of technical advances through continuous innovation and perfection
- Optimization of your processes thanks to proven technology packages
- Increased plant performance through competitive modernization packages
- Shortened tap-to-tap times and proven automation solutions
- Fast return on investment through reduced operating and maintenance costs
- Tailored and individual services for the entire life-cycle of your plant
- Profit from our experience and knowledge through numerous references in all metallurgical processes – a significant percentage of the world’s steel production comes from Siemens Metals Technologies plants
- Boost your competitive edge – thanks to full-line, unique and worldwide solutions from the market leader
- Higher plant performance through an intense partnership for the entire lifecycle of your plant

Quality from the leader in technology
Benefit from the experience and expertise that has made us the world leader in LD (BOF). In every one of our projects, we have excelled by achieving flexibility, top performance as well as short exchange and run-up times. We have the process knowledge to shorten your tap-to-tap times and to lower your plant operating costs through optimized material consumption, individual performance packages, dynamic process control and customized automation packages.

Customized package
You might be looking for a complete solution or a stand-alone package, modernization or construction of a new plant. No matter what your needs, we offer you the complete range of all current LD (BOF) technologies. From individual converter design to single performance packages (bottom purging, slag stopper, sublance) and converter offgas plants, our technology meets with your requirements. But that’s not all: Continuous technology updates, immediate spare parts delivery and coaching of your employees round off our services.

Innovative technologies
As a member of the VOEST conglomerate, we developed the LD process in 1949, but we don’t let it end there. Since then we have continually expanded and improved the process. Now integrated into the Siemens Group, we can strengthen our leadership in innovation, not least because our headquarters are located very near to an iron and steel works. We look forward to applying our innovative expertise to optimize your LD (BOF) process throughout the entire lifecycle of your plant.

Automated solutions
Our automation packages allow you to react quickly to your customer’s requirements and achieve market-driven production. In conjunction with an integrated control system, they ensure that your plant runs smoothly. If there are breakdowns, emergency programs prevent possible downtimes, while logical, simple process screens make it easy to maintain an overview and full control of the process.

Plant modernization
When your plant has reached its final stage of the lifecycle or you need an upgrade to update older equipment, we offer a huge spectrum of solutions for modernization. From the integration of additional equipment to increase performance and safety to complete replacement of the entire production unit, we will find the solution meeting best your requirements. Our references show that our exchange solutions take account of reusable equipment such as foundations or drives, if required, as well as minimize impact on running production.

As the only global full-line provider with its roots in the invention of the LD (BOF) process, we possess unique expertise. In everything we do, starting with individual converter designs, including tried-and-tested lance technologies, sophisticated automation packages, sustainable solutions for offgas utilization, and efficient modernization packages, we have one goal in mind: To increase the performance of your plant.
When engineers at the end of 1940s were looking for alternatives to the Siemens-Martin and the Thomas process, they never imagined that they would set off a revolution in steel manufacturing with the invention of the Linz-Donawitz (LD) process. Today more than 70% of global steel production takes place using the LD route, of which more than 30% (more than 195 plants, including 18 turnkey projects) were planned, built and commissioned by Siemens Metals Technologies.

Time has not stood still since the LD technology was developed and implemented. Siemens Metals Technologies engineers have continually further developed the system and complemented it with automation expertise. The lead now held by the merged companies in the area of steel production is a good basis for the future.

In the meantime, Siemens Metals Technologies has extended its market and technology leadership to include the entire range of converter methods, upstream and downstream process steps and the electric steel production line.

Our specialists continue their fine-tuning efforts, building on the feedback from a multitude of international projects. Changes in customer requirements and standards over the years are reflected in plant layout, equipment and operational procedures.

Siemens Metals Technologies supplies the entire range of products, systems, processes, innovative packages and tailored lifecycle services for efficient and reliable steel production. From the expansion or modernization of individual parts of a system to completely new construction of a turnkey project, Siemens Metals Technologies opens up new horizons in the field of steel manufacturing. The members of the Siemens Metals Technologies LD steelmaking team are ready to integrate their company’s 50 years of experience into customer service.

Milestones in converter technology
1952: 1st LD steelmaking plant (Linz, Austria)
1956: 1st LD steelmaking plant abroad (Rourkela, India), founding of VAI
1962: 1st exchangeable converter in the world (Arbed, Luxembourg)
1965: 1st 300 t converter (Taranto, Italy)
1975: 1st QBM steelmaking plant (Thy Marcinelle, Belgium)
1980: LD perfection package
1985: 1st steelmaking plant with dry dedusting (ArcelorMittal Eisenhüttenstadt, Germany)
1990: 1st LD steelmaking plant with dust recycling (Kwangyang, Rep. of Korea)
1995-1997: VAI becomes leading supplier of stainless steelmaking plants
1996: SIMETAL Vaicon Link converter suspension system
1998: SIMETAL Dynacon (dynamic process control)
1999: Continuous temperature measurement
2004: First electrostatic precipitator in VAI design (Kosice, Slovakia)
2005: Sublance compact design
2006: Advanced De-P converter
2007: Innovative upgrade of process models
2008: Competence for devanadization
2009: Sampling and measuring with SIMETAL Horizontal Measuring Manipulator
2010: Application of SIMETAL LiquiRob for probe manipulation at sublance
2011: SIMETAL AutoTap to tap steel into the ladle with increased safety and reproducibility

Know-how and performance
Success in LD steelmaking requires state-of-the-art know-how, an understanding of the overall process and the ability to focus on customer-driven solutions. Clients can profit from the strength of Siemens Metals Technologies, one of the world’s leading engineering and plant-building companies:
• A dedicated staff of nearly 4000 engineers, specialists and support personnel
• A complete spectrum of all related iron and steelmaking technologies, from raw materials to the finished product
• Engineering and completion of more than 1000 major industrial projects in over 80 countries
• In addition to the mainstream LD vessels, Siemens Metals Technologies offers its experience in bottom blowing converters and process routes with De-P and De-V converters

Siemens Metals Technologies full-line spectrum of steelmaking solutions:
• Converters
• Offgas cleaning systems
• Secondary metallurgical facilities
• Integrated automation systems
• Slag-handling systems
• Ladle handling and preparation
• Additive handling
• All auxiliary facilities
• Utility supply
• Power supply
• Civil works
• Steel structure
• Hot-metal handling
• Hot-metal pretreatment
• Scrap handling

Our traditional perfection and innovation for your plant
Converter solutions
Optimizing the primary process – increasing plant performance

We create the best possible converter in terms of size and design for every customer and tailor it to specific requirements.

Application of expert systems
In order to optimize process routes, equipment selection and design, Siemens Metals Technologies has developed a unique expert system. This tool identifies all process parameters, from hot metal pretreatment to continuous casting, necessary to achieve the most cost-effective plant configuration, whether for new plants or for plant expansions.

Taking into account the entire production route, the following features are calculated for each process step:
- Ideal temperature and analysis
- Quantity and cost of input materials
- Quantity and composition of by-products

Simulation tools for ideal plant layout
The best possible arrangement and configuration of all production units and transport systems within a steel works are a prerequisite for maximized plant productivity. Since it is impossible to manually assess and analyze all of the transport events within a steel works, particularly over longer production periods, Siemens Metals Technologies utilizes a four-dimensional (3D + time) simulation tool.

The logistic optimization and routing algorithm (OSIRIS) is an in-house development used to analyze process and transport logistics. OSIRIS is capable of optimizing and simulating any steel plant configuration and also makes it possible to be efficiently check different plant layouts and process options.

Our process and logistics expertise is the basis for our successful plant design. Worldwide experience makes it possible for us to guarantee optimum converter productivity, even in complex conditions, whether integrated in a steel plant or compact mill.

Main benefits:
- Ideal equipment selection and dimensioning
- Totally optimized plant layout and logistics for highest plant productivity
- Minimum investment costs for meeting product mix targets
- Lowest achievable plant operating costs
- Prediction of equipment utilization
- Analysis of existing plants regarding improvement potentials
- Detection of bottle necks

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Individual packages for optimized operations

The suspension system must be viewed in close combination with an optimized vessel. The SIMETAL Vaicon Link suspension is a statically determined system for all converter operating and deformation conditions. Pendulum-type links are mounted vertically and horizontally below the trunnion ring in the cooler zone of the converter. With an optimized shape and maintenance-free bearings, the system contributes towards maximum converter availability.

Special designs such as the SIMETAL Compact Link with vertical lamella links allow minimized distances between the vessel and trunnion ring to achieve the maximum possible vessel size at a given distance between trunnion pins.

Main benefits:
- Statically determined converter suspension system
  - for unobstructed shell deformation
  - for reducing restraint forces
- No converter rocking motions or shock loads during tilting
- No post-adjustment of suspension elements
- Proven and maintenance-free components
- Ideal for all existing and new converters
- Maximized space for the vessel at a given distance of trunnion pins
- All types of media supply

Our converter drives offer excellent reliability and precision. Depending on the converter size, up to four motors are used that act through gears on the converter trunnions. Interaction with the individual brakes enable secure fixation in any desired position. High speeds enable fast tip-back after tapping to reduce escaping slag. The ample dimensions of the drive are designed for all imaginable operating conditions; full function is still provided with 3 motors even though a four-motor drive is used.

In an emergency, our drive has 2 integrated pneumatic emergency motors to set the converter down or to tip it, independently of the power supply.

Main benefits:
- High reliability thanks to proven components and long-time experience
- Overload-safe, maintenance-free and easy-to-disassemble shrink fit connection
- Torque support offers distortion-free support of the drive
- Condition monitoring of the main parts
- 100% availability ensured by emergency drives

The latest generation of suspension systems for converters

Converter drives with excellent reliability and precision

Products and technologies for converters

Suspension systems

SIMETAL Drive

Suspension systems SIMETAL Drive

The latest generation of suspension systems for converters

Converter drives with excellent reliability and precision

Products and technologies for converters

Individual packages for optimized operations
SIMETAL BOF Stirring

The main process equipment of LD (BOF) converters is the blowing lance. The copper tip is designed for a constant oxygen jet over a long lifetime; the sliding seal and slide connections for the inner lance pipes compensate for thermal expansion. Two lance cars equipped with the latest technology in drive, control and safety equipment ensure flexibility and maximum availability of the system.

The automatic coupling systems use the weight of the lance to fix the lance on the lance car in order to bring the lance exchange time down to 15 minutes. Self-centering of the lance and compensation of lance deviations in male coupling parts on the car ensure easy utility connection. Manual activities are limited to checking the seals and tightening two swing bolts.

Main benefits:
- Maximum availability
- Precise accuracy of position
- Short exchange times
- Highest safety as a result of flow, temperature and pressure monitoring

SIMETAL Sublance 2.0

Siemens Metals Technologies offers sublance technology for every type of converter, including updated information on temperature, [C] content, oxygen activity and bath level. The physical steel samples from the measurement can be analyzed in a chemical lab in order to determine the full analysis, including trace elements for quality control. A sample manipulation system and a slag remover support the robust and low maintenance equipment. The most up-to-date technologies for measurement techniques, drives, double rope engineering, mechanical free-fall brakes and emergency drives all ensure the maximum positional precision. The sublance as a central part of dynamic process control ensures a short return on investment.

Main benefits:
- Shortened process times
- Reduced rate of overblows and reblows
- Avoidance of converter tilting
- Automated measuring and sampling with maximum safety

SIMETAL Sublance 2.0

Simetals, a central part of dynamic process control

Bottom injection of inert gas for best performance and long service life

Increased safety and reproducibility at sampling and measuring
SIMETAL Vaicon Stopper

The robust slag stopper provides steelmakers with the means to tightly control slag carry-over at the end of tapping. Consisting of a cylinder and cast iron nozzle mounted on a support structure installed adjacent to the taphole, the nozzle is slewed in front of the taphole, actuated either manually or by slag detection system. For optimum differentiation between the slag and the steel we offer you a contact-free measurement based on infrared technology. Advantages include precise resolution, robustness and data archiving.

Main benefits:
- Reduced slag carry-over from 8-16 down to 2-5 kg/t steel
- Lower ladle refractory consumption
- Reduced rephosphorization of the steel
- Reduced consumption of deoxidiation and alloying materials
- Increased cost savings

SIMETAL Lomas and SIMETAL Dynacon

SIMETAL Lomas, the proven offgas analysis system, is characterized by its very short response time and minimum maintenance time. Continuous gas analysis is carried out at high temperatures and dust loads in corrosive and reducing environments. Based on offgas analysis, the SIMETAL Dynacon process model dynamically calculates the actual carbon content of the melt and thus determines the optimum moment for blow end.

Main benefits:
- Accurate determination of the blowing endpoint
- Avoidance of overblowing for higher steel yields and lower deoxidation agent costs
- Increased converter refractory lifetime
- Continuous oxygen blowing for higher CO recovery rates
- Significantly lower investment and operating costs as compared to a sublance
- ROI typically within 11 months

Converter auxiliary equipment

We offer all auxiliary equipment related to the converter. Throughout the entire production chain, we offer processes for hot-metal mixing, desulfurization and deslagging. Our storage and charging systems for converter additions and tapping alloys form the basis for flexible and fast cycle times. Ladles, slag pots and transfer cars are built for reliable transport of the liquid converter products. Additional equipment such as doghouses, cranes and buildings complete our scope as a complete turnkey provider.

Main benefits:
- All converter auxiliary equipment from a single turnkey provider
- Cost savings resulting from synergies
- Upgrade possibilities (weighing, calibrating, condition monitoring, …)
Primary dedusting and energy recovery systems

Siemens Metals Technologies solutions for converter offgas cleaning and energy recovery focus on highly efficient gas cleaning, high energy efficiency and maximum availability. For gas cleaning, Siemens Metals Technologies has developed dry-type and wet-type waste gas cleaning systems which ensure compliance with the most stringent environmental regulations.

Energy recovery and CO₂ emission reduction have become key issues in steelmaking. Siemens Metals Technologies offers advanced solutions for energy recovery such as conversion of the thermal energy of the hot converter waste gas to saturated steam in a boiler-type cooling stack, or the recovery of cleaned, carbon-rich converter gas as a substitute for natural gas.

Gas cooling system

The primary hot gas leaving the converter is cooled in a cooling stack based on evaporation cooling. In order to maintain the maximum chemical energy content in the gas for further gas recovery, the system is designed for suppressed combustion, thereby limiting the ingress of ambient air and consequently minimizing gas volume and size of downstream equipment.

Main benefits:
- Suppressed combustion design for LD (BOF) gas recovery
- Generation of steam for further use in steelmaking plant

Dry-type waste gas cleaning system

The waste gas is cooled in an evaporation cooler through the injection of a water/steam mixture. Fine cleaning of the waste gas takes place in the cylindrically shaped electrostatic precipitator (ESP), which features particular design solutions such as special electrodes, a dust extraction system, pressure relief devices, etc.

Main benefits:
- Highest dedusting efficiency (BAT)
- Low operating costs based on low power consumption
- No water treatment plant and sludge handling required

Wet-type waste gas cleaning system

Siemens Metals Technologies provides two different, well-proven wet-type waste gas cleaning systems. In addition to the high efficient dust separation, the main focus is on water droplet separation, and ID-fan performance. Siemens Metals Technologies wet dedusting technology is characterized by low maintenance requirements coupled with safe and reliable process operation.

Main benefits:
- High dedusting efficiency
- Low investment costs
- Highly reliable and robust design, special solutions for reduced maintenance requirements

Secondary dedusting system

The main task of secondary dedusting systems is to efficiently capture dust emissions that occur during the handling and processing of hot metal and liquid steel (e.g. charging, tapping, reladling, desulfurization, deslagging). The proper design and location of hoods is essential to achieve highest dust collection and ensure clean ambient conditions inside and outside the steel shop.

A major process improvement is the patented Siemens Metals Technologies static cooler technology. Static coolers absorb temperature peaks during hot metal charging and reduce the need for additional cooling air. This reduces investment and operating costs. Operational safety is increased and higher productivity is achieved due to a higher possible charging speed.

Advanced Siemens Metals Technologies pulse jet filter technology ensures highly efficient dedusting and increased lifetime of the filter bags.

Main benefits:
- Optimized design for suction hoods and required suction rates through CFD modeling
- Efficient reduction of dust emission levels in the steelmaking plant
- Pulse jet filter technology with improved filter bag service life and efficient gas cleaning
- Increased productivity and safety with static coolers

Secondary dedusting system for high efficient emission control and clean ambient conditions

Wet-type gas cleaning systems for high efficient gas cleaning and reliable operation

Cylindrically shaped electrostatic precipitator for high efficient gas cleaning

Gas cooling system
Following new investments, the steel boom of recent years and the interim economic crisis, companies in the steel industry have had to develop strategies to adapt their products to match global developments and meet the environmental challenges of the twenty-first century. In meeting these demands, Siemens Metals Technologies provides modernization solutions for the entire metallurgical process chain from raw materials to finished rolled products. Our automation and plant and process engineering meet the market requirements of the metals industry. Designed to improve your plant performance and effectiveness, these solutions will highly increase your market competitiveness. Our modernization packages help increase your productivity, enhance your flexibility and improve your overall plant efficiency for maximum added value. In short, modernization packages from Siemens Metals Technologies help you remain competitive and react quickly to market changes.

The extensive modernization portfolio for oxygen steelmaking plants is tailored to individual requirements with state-of-the-art technology. We offer you a wide range of modernization packages that will satisfy different kinds of needs, such as:

- Reduction of production and energy costs
- Extension of your production mix with increased production flexibility
- Improved production quality
- Adherence to environmental regulations and requirements

Our modernization portfolio for LD (BOF) steelmaking includes:

- SIMETAL BOF Stirring
- SIMETAL Horizontal Measuring Manipulator
- SIMETAL Vaicon Stopper
- SIMETAL Drive
- LD (BOF) converter replacement
- SIMETAL Dymacon and SIMETAL Lomas
- SIMETAL Sublance 2.0 and SIMETAL LiquiRob
- Slag splashing

LD (BOF) converter replacement

One modernization package of this wide portfolio is the LD (BOF) converter replacement package. This package stands for optimized processes and plant performance and is characterized by a variety of advantages. The converter vessel is designed to customer requirements, and the vessel suspension systems (SIMETAL Vaicon Link and SIMETAL Vaicon Compact Link) are used for both unobstructed shell deformation and reduced restraint forces. The statically determined converter suspension system in combination with our tilting drive system also prevents rocking motion or shock load during tilting. Different types of cooling systems can also be included.

**Latest modernizations:**

**Customer:** NTMK, Nizhni Tagil/Russia
**Type of system:** 1 x 160 t LD (BOF) converter and 3 x 160 t De-V converter

**Customer:** Cia. Siderurgica Nacional, Volta Redonda/Brazil
**Type of system:** 2 x 240 t LD (BOF) converter

**Customer:** voestalpine, Linz/Austria
**Type of system:** 3 x 180 t LD (BOF) converter

Low investment modernization packages to improve and grow your business

![Extensions at steel constructions](image1)

![Reuse of existing foundations](image2)

![First turn of new vessel with tilting drive](image3)

![LD (BOF) modernization](image4)

![The modernized meltshop at NTMK](image5)

![Worn out vessel and old drive](image6)

![Extensions at steel constructions](image7)
Siemens Metals Technologies steelmaking automation supplies state-of-the-art solutions for maximum performance and product quality in the entire converter steel plant. The unique advantage of the integrated approach is that it covers all aspects of process stability, product quality and operational flexibility, while ensuring efficiency and profitability throughout the entire lifecycle of the plant.

Features:
- Advanced solutions for new and existing plants
- Modular, expandable and upgradeable automation packages
- Both integrated and stand-alone solutions for all automation levels
- Proven dynamic process models
- Comprehensive reporting and statistical evaluation
- Remote monitoring and diagnostic options

SIMETAL BOF Control
Siemens Metals Technologies automation solutions for process control (level 1) include all relevant technological control functions, such as the following:
- Oxygen lance control system
- Oxygen ignition detection system
- Converter tilting drive
- Sublance measuring system
- Bottom stirring, single-line control
- Gas recovery and analysis
- Automatic tapping system
- Intuitive human machine interface
- Interlocking and alarm system

SIMETAL BOF Optimization
The SIMETAL BOF Optimization (level 2) is based on advanced algorithmic equations that accurately model the complex thermodynamic-metallurgical reactions. Process optimization solutions are particularly suited to a wide range of operating conditions such as variable scrap-to-hot-metal ratios, minimum slag practice and varying phosphorus content.

Main benefits:
- Flexible and modular automation packages in response to a dynamic market situation
- Reduced scrap material expenses based on cost-optimizing charge calculation
- Increased productivity and yield
- Improved hot rate for temperature and carbon content
- User-friendly operation, full transparency and flexibility

Service is lifecycle partnership
Siemens Metals Technologies Metallurgical Services is a highly experienced international partner for all metallurgical service requirements, one who is dedicated to a long-term and lifecycle partnership with plant operators. Services from Siemens Metals Technologies ensure trouble-free operation and optimum functionality throughout the entire lifecycle of a plant. Substantial improvements are achieved in system efficiency, extended component lifetimes, minimized plant downtimes, and a lower spare parts inventory. These advantages add up to major cost reductions. We offer our know-how, technical expertise and global network of service locations in the fields of
- Supply of original manufacturer components, spare and wear parts
- Online and offline maintenance of plants, equipment and components
- Consulting, technical assistance and training
- Plant modernizations and installation of mechatronic solutions
- Repair of original manufacturer components

Customers of Siemens Metals Technologies rely on a dependable unique global service network without comparison in the metals industry. More than 2,500 service specialists located at more than 25 service locations are at the disposal of metal producers to provide the support and assistance required for metallurgical plants.

Main benefits:
- Increase of plant availability and productivity
- Cost reduction
- High quality and short delivery times
- Single point of contact for all metallurgical requirements
- Local workshops

Lifecycle service along the entire value processing chain
Expertise from experience:
Selected success stories in LD (BOF) steelmaking technology

In the field of LD (BOF) steelmaking, where increased productivity, higher capacity, reduced operating costs and low emission levels count more than anything, facts and figures are of utmost importance. Our customers use these data to measure their success – and ours as well. Take a closer look at our successfully completed projects and decide for yourself.

<table>
<thead>
<tr>
<th>Customer</th>
<th>Type of system</th>
<th>Our solution</th>
<th>The result</th>
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</thead>
<tbody>
<tr>
<td>One step ahead</td>
<td>3 x 180 t LD converter, modernization</td>
<td>Increased vessel volume with newly developed SIMETAL Compact Link system</td>
<td>Increased production with best equipment</td>
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<tr>
<td>Customer: voestalpine, Linz, Austria</td>
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<tr>
<td>South America’s largest vessels</td>
<td>2 x 330 t LD converter, turnkey plant</td>
<td>Complete steel plant with state-of-the-art technology</td>
<td>Capacity to export 5 million tons of slabs per year to USA and Germany</td>
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<tr>
<td>Customer: ThyssenKrupp CSA, Rio de Janeiro, Brazil,</td>
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<tr>
<td>The giant De-P converter</td>
<td>300 t De-P converter</td>
<td>High-intensity bottom stirring system</td>
<td>Duplex steelmaking with higher overall throughput</td>
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<tr>
<td>Customer: POSCO, Gwangyang, Korea</td>
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<tr>
<td>Additional value through vanadium</td>
<td>4 x 160 t LD and duplex converters</td>
<td>Steel plant modernization with De-V converters and LD converters</td>
<td>Increased productivity (3.5 mtpy up to 4.2 mtpy), flexibility in steel production and high-value vanadium slag for sale</td>
</tr>
<tr>
<td>Customer: NTMK, Nizhni Tagil, Russia</td>
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<tr>
<td>Modern environmentally-friendly LD</td>
<td>2 x 180 t LD converter</td>
<td>Replace 3 old vessels with 2 modern converters + dry dedusting systems</td>
<td>Increased production with lower emissions</td>
</tr>
<tr>
<td>Customer: US Steel Kosiče, Slovakia</td>
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<tr>
<td>Slag stopper at its best</td>
<td>130 t LD converter</td>
<td>Upgrade with pneumatic slag stoppers</td>
<td>Return heats nearly eliminated completely, ROI in less than 6 months</td>
</tr>
<tr>
<td>Customer: SSAB, Luleå, Sweden</td>
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**Expertise from experience**

Selected success stories in LD (BOF) steelmaking technology

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