CONVERTER STEELWORKS in action.
New plants, conversions and revamps
Converter steelworks

SHAPING THE FUTURE

Creating added value
NEW BUSINESS PROSPECTS WORLDWIDE
Everywhere around the world, people are working to increase their wealth and wellbeing. There is a world of opportunities because a global economy quickly opens up its markets for goods and services, setting the stage for rising steel demand.

BENEFITS FOR YOU
Efficient converter steel production requires the latest technology – machines, plants and services from SMS Siemag. That gives you a profitability edge as you fully exploit your existing potential.

AROUND THE GLOBE
We speak your language, whatever country or region you call home. Needless to say, we also know the small – yet often crucial – differences. Opting for new plants and tailor-made revamps from SMS Siemag means you seek reliable, successful solutions that enhance your competitive power in a global business environment.
Meeting tomorrow’s REQUIREMENTS today

RELIABLE, SUSTAINED OPERABILITY OF YOUR CONVERTER STEELWORKS
To produce high-quality steel, your converter steelworks consistently has to achieve top performance – hour after hour, day after day. Due to your solid routine, you make sure of that, even when high production cycles keep pushing your plant beyond its limits.

Yet constant top performance takes its toll:

- You can never rule out partial material fatigue after very long operation time.
- The system also has to meet growing demands, e.g. for higher output.

That’s what makes replacement, revamps and the creation of extra capacity so important to preserve the value of your converter steelworks.

THINKING AHEAD: SO YOU CONTINUOUSLY INCREASE YOUR CAPACITY
There is a clear trend on the global markets towards growing demand. This goes to show that additional capacity geared to the profitable segments makes good business sense.

So, because SMS Siemag converter steelworks are specially designed for more demanding grades, investments here will generate an especially effective return on investment.
MOBILIZING EFFICIENCY RESERVES
Your converter steelworks operates at its highest possible capacity at all times. Usually, there is scope to significantly boost its profitability using major advances in technology.

Tap into your hidden efficiency reserves by continually replacing key components and modernizing your plants at regular intervals. The results will soon be evident on a market that makes investment pay off in no time.

CREATING NEW CAPACITY
Now, if you finally decide to create new capacity, you will take advantage of the opportunities available and pool your strengths. Quality and quantity should be carefully balanced so you will be able to supply your customers exactly what they want, when they want it.

All this will be particularly worthwhile for you if you have already determined the further specifications downstream. Why? Because you can design your new converter steelworks from the start to match the applications you require – with the maximum versatility.

What also speaks for choosing new plants from SMS Siemag is our world-leading range of metallurgical plant and rolling mill technology for further processing. You benefit from our know-how in this field that enables you to plan ahead and meet tomorrow’s demands.
VALUE ENGINEERING
A broad range of solutions

MAXIMUM EFFICIENCY FOR YOU
Solutions for converter steelworks are highly customized developments. Ideally, they achieve the right balance between four targets:

- Problem solving,
- Innovation,
- Cost cutting,
- Productivity growth.

How to find the optimum mix is an issue we address in each concrete project. However, the components and procedures we develop using this framework always guarantee you the maximum added value.

That’s why a structured, customer-specific analysis examining all economic and technical aspects is crucial. This gives us the scope to weigh up various alternatives, looking at how far to revamp or to reuse existing components.

Next, we design our solution based on this analysis. It takes into account eight aspects, from the ideal rate of utilization to fine-tuning your existing environment.

POWERFUL ORGANIZATION
Our experience from countless projects ensures we perfectly customize our solutions to your processes and specifications. You also benefit from our internationally versed project managers, engineers and technicians, because they are so familiar with the various environments that you can rely on a minimum of disruption. Simply put, most of your existing production processes can continue to run uninterrupted.

Instrumental here are these factors:

- Maximum observance of your time plan,
- Process simulation that allows for your works’ layout and requirements,
- Integration of automation packages using tried-and-tested routines.

FROM DRAFT DESIGN TO CUSTOM SOLUTION
SMS Siemag converter steelworks and components come from a single source, responsible for everything from the initial design to the fully operational plant. This is your guarantee of achieving seamless quality. Wherever useful and desired, we integrate interfaces that allow you to implement individual stages yourself. Our mission is to apply the optimum solutions so you raise your added value to the maximum level. That is within your reach with the packages described in this brochure.
The eight aspects for increased added value in your converter steelworks.

OPTIMIZATION WITH SIMULATION
We always use state-of-the-art simulation techniques to design components and systems – from the draft design phase to compiling the manufacturing plans. That’s how we develop optimized components to ensure your plants constantly meet the high demands of your production process. Simulation leads to products perfectly matched to their specific tasks.
BOOSTING YOUR UTILIZATION RATE
More performance for the future

RESULTS OF REVAMPS
All replacements and revamps in your converter steelworks aim at a central goal: giving you the capacity to produce more steel in the same time and in your existing factory. That means your steelworks can supply the market with higher capacities – and at lower cost.

This creates clear competitive advantages, especially in times of high demand. Yet, even when demand stagnates or falls, the cost benefit per t gives you more flexibility and therefore more security that you can always supply the right market segments.

HIGHER TAP WEIGHTS AND PRODUCTION QUANTITIES
You can achieve significant productivity growth with your existing plants by taking intelligent replacement and modernization action on and around your converter. The main increases are based on these factors:
- Greater tap weights
- Use of bottom flushing systems
- Use of sub-lances

OPTIMALLY ADJUSTING THE SPECIFIC VOLUME
Any revamp can re-adjust the specific volume. That offers you special advantages:
- Much longer service life of the refractory material, i.e. lower re-lining costs per year
- Lower slopping, therefore increased output and reduced maintenance costs
- Better achievement of metallurgical target values at the end of the blasting process

Not only does this improve the steel quality you can produce, it also helps you tap into lucrative market segments.

CREATING ADDITIONAL CAPACITIES
New plants create additional capacities where you need them. You can rely on SMS Siemag know-how for all your periphery equipment – upstream and downstream. Just one current example of this is the 917,000 t per year plant at Neelachal Ispat Nigam Ltd, which we are upgrading with a 6-strand ingot plant from SMS Concast and a new ladle treatment stand.

Or take Companhia Siderurgica Tubaro, where we installed a third converter adjacent to the two existing units in order to supply the company’s own hot rolling mill as well as the slab market. The new converter is designed for a tap weight of 315 t. This is a revamp that has increased the company’s total capacity by 5.2 million t per year to 7.5 million t per year.

Examples of increased tap weights

<table>
<thead>
<tr>
<th>Old</th>
<th>New</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>265 t</td>
<td>290 t</td>
<td>ThyssenKrupp Steel Beeckerwerth</td>
</tr>
<tr>
<td>210 t</td>
<td>240 t</td>
<td>Salzgitter</td>
</tr>
<tr>
<td>125 t</td>
<td>200 t</td>
<td>Isdemir</td>
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<tr>
<td>130 t</td>
<td>170 t</td>
<td>Tisco</td>
</tr>
<tr>
<td>150 t</td>
<td>160 t</td>
<td>VA Stahl Linz</td>
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</tbody>
</table>
3D model of vessel optimization

Assembly of one of the three new converter vessels at ThyssenKrupp Steel in Beeckerwerth
Focus on: Converter Technology

Tried and Tested Solutions, Combined to Order

The heart of steel production beats inside the converter. That’s why sustained reliable functioning is crucial here. Achieving this depends on the precise interaction of all the sub-systems. Therefore, due constant technical progress in the field of steelworks, it is both necessary and advisable to update and adjust your components regularly.

SMS Siemag ranks among the pioneers of converter technology. So you can expect us to be experts in all technologies and development phases. Whatever your plant-specific problem, you get intelligent, customized solutions that produce results right where you want them: in your facility.

NEW COMPONENTS – DIRECTLY ON THE CONVERTER

To boost your converter steelworks’ performance, you first need to replace the converter vessel. Included here is the immediate periphery, consisting of
- the trunnion ring and
- the fixing system.

Based on experience and learning curves over decades, there are some clear preferences for the ideal designs. However, we take your specific circumstances into account to choose the right option for you. That’s why discussions on this subject are a core part of our cooperation with you. It is one way we underline the fact that your particular requirements form the crucial basis for our converter technology.

We configure the revamp components for the immediate periphery depending on your blasting process and building-related situation. Equally important is matching the equipment for steel production itself to these conditions.
- Blasting lances,
- Sub-lances,
- Slag retaining devices,
- Bottom rinsing systems,
- Slag splashing devices.

There is practically no limit to the specific increase in quality and quantity you can achieve. The design and limits are set by the technical features and commercial approach of your steelworks. They largely determine the shape of SMS Siemag solutions.

EXAMPLE OF COMPANHIA SIDERURGICA TUBARAO (CST)

The increased production achieved here was based on:
- Installation of a new, more powerful converter,
- Selection of lamella-type fixing instead of the suspension system used in the other converters in the works,
- Upgrading the converter with bottom rinsing system, sub-lances and slag retaining device,
- Re-use of existing components wherever economically viable.

The result: efficient capacity expansion in a short time, so that the steelworks now reliably supplies an additional new rolling mill.
3D engineering in the project phase
INTelligent RE-Use
of central components

REtaining functioning units
Whenever we thoroughly modernize converter steel plants and replace their technology with more efficient units, there tends to be plenty of scope for savings in the area around the converter. You probably know that revamping does not mean all the components have to be replaced. On the contrary: at SMS Siemag we have the experience necessary to team up with you and identify substantial savings potentials. That’s because, in most cases, retaining fully operative units saves costs in the long term and therefore increases your income.

Systematic check finds your saving potentials
Yet first there is a key question we have to ask you – what if we could show you that the time gained by carrying out a total renewal would make this option economically more viable? Often, we have to strike a balance between the two extremes – but how exactly?

That’s where our SMS Siemag systematic check comes in. It examines the re-usability of the immediate and more remote converter periphery, providing clear, reliable answers even to your complex questions. The resulting recommendations are based on calculations and projections supported by databases and verified together with you on site.

You can see for yourself that retaining existing components can be worthwhile for technical reasons, as exemplified by a lamella package from SMS Siemag. Surprisingly, even after 23 years of use in the Salzgitter works in the immediate and extremely unforgiving vicinity of the converter, there was no wear beginning to show in the lamella package. The component was only replaced together with the converter in order to save time, so we were able to expertly dismantle it to prove this fact.

Fundamental yield potentials
Another way to save costs during revamps is to keep the old foundations as far as possible. This means, first, avoiding the costs for replacements altogether, and second, no foregone profits.

It takes intelligent flexibility on the part of our designers to achieve this feat with a substantially higher converter volume. The engineering experience at SMS Siemag is up to this task.

Involved for instance in a blast steelworks revamp for Isdemir, SMS Siemag upgraded the converter while retaining the old foundations, despite larger bearing spacings. Furthermore, the job was carried out under ongoing production. That was possible due to expertly planned design and organization. Similarly, we succeeded in keeping the same foundations despite larger bearing spacings at Thyssen Beeckerwerth. The new bearing stands are designed so that the original anchor screws and platforms could be retained. Here again, significant increases in capacity and technological progress were achieved while still using the existing foundations.
FURTHER IMPRESSIVE EXAMPLES

There are many areas where you can retain and re-use converter-related components. Here is a brief selection:

- Re-use of bearings, bearing stands and bearing housings
- Partial or complete retention of lamella packages
- Retention of trunnion ring neck areas
- Retention of bottom rinsing systems
- Re-use of bottom insert and lining devices
- Re-use of removable bottom units

We take these steps in close consultation with you, producing measurable results for the cost-effectiveness of your renewal programs.
Renewing your CONVERTER PERIPHERY, increasing your output

INTELLIGENTLY INTEGRATING COMPONENTS
The extent to which periphery components have to be renewed depends on the overall job. You will especially appreciate working in partnership with SMS Siemag because of our broad range of solutions, extending far beyond steel production. It is a pool of know-how that ensures we devise holistic solutions, sure to meet your requirements for today and the future.

There is a close link between converter technology and its periphery. Inevitably, new or additional converters have an impact on their surroundings. Therefore it is vital to see them as an economic and technical unit when planning your revamp.

CONVERTER DRIVES
Frequency-controlled drive motors control SMS Siemag converter drives. We manufacture these high-precision special transmissions in our main works in Hilchenbach, Germany.

Drives exactly geared to the converter form a particularly powerful unit. You will find our customized solutions in steelworks all over the world.

ELECTRICS AND AUTOMATION WITH X-PACT®
Available under the X-Pact® brand, electrics and automation from SMS Siemag are exclusively designed for metallurgical plants and rolling mill technology. Especially important for steel converter revamps, Level 1 and Level 2 systems use models to visualize and optimize your processes.

Yet also included in our supply scope is integration into superior process control and planning programs. That means our work on and around your converter is always directly related to upstream stages and further processing. So you can adjust the overall system to achieve the maximum efficiency and economy of resources.

Converter gas recovery plant
DUST COLLECTING AND WATER SUPPLY SYSTEMS
National and international environment protection regulations have created financial incentives for keeping air and water clean. There are more and more revamps of converter steelworks aimed at tapping into these economic reserves. SMS Siemag offers you a range of products and services exactly geared to this market demand.

Now that resources taken from the environment and circulated or consumed in the steelworks represent growing cost factors, components designed for maximum re-usability make good sense.

ALONG THE PROCESS CHAIN
We use supplementary equipment to efficiently link upstream and downstream processes with the converter technology components. Here is a selection:
- Pig iron desulfurizing plants
- Slag removal devices
- Ladle rinsing stands
- Ladle furnaces

Our extensive check of your plants makes it easy for you to decide between new systems or re-use.
PERIPHERY COMPONENTS
geared to your situation

SHIFTING THE ROTATION AXIS, RETAINING THE DRIVES
You save money by re-using your existing converter drives when you revamp. Therefore an exact examination of the scope for this and other savings is a fixed part of our modernization strategy.

If you decide on re-use, technical and design steps will be necessary to enable you to operate the new, usually higher-volume converter with the existing drive components.

Shifting the rotation axis has proven a useful way of adjusting the torques, making it easier to re-use drives. Consequently, we have achieved these specific improvements for various customers:
- Converter volume increased from 140 m³ to 154 m³
- New converter vessels with a tap weight of 290 t compared to the previous 265 t. The rotation axis here was shifted exactly 100 mm.

FINE-TUNING THE ENTIRE MATERIALS MANAGEMENT
As the converter and steelworks capacity increases, the demands on your material management processes also rise. So it is usually necessary to adjust the existing configuration.

The extent of this re-organization is closely related to the capacity growth you anticipate. To boost production from 3.2 to some 5.2 million t per year, we took, for instance, these steps:
- Replace feed systems for the storage bunkers
- Replace charge materials supply system for the converters
- Replace charge materials supply system for the ladles

Integrating materials management into the automation system is a great way to optimize your cost-benefit ratio.

EXTRA POWER FOR YOUR CRANES
It is vital to ensure your greater converter tap weights are safely transported throughout the production shop. That’s why upgrading the internal logistics forms an integral part of the SMS Siemag revamp program for periphery components.

Take for instance a recent case, where the increase in the crane bearing load was a direct result of raising the converter capacity from 125 t to 200 t. Many revamps lead to similar changes.
OTHER TAILOR-MADE CAPACITY ADJUSTMENTS

Increased output should be matched by the same high level of process quality. So, unless you renew everything, you need to make further adjustments.

Here is what integrated solutions from SMS Siemag comprise:

- Tundish transport
- Water supply system
- Dust collecting systems
- Lab equipment
- Workshops

Dust collection, ventilation and waste gas recovery have been adjusted.
EXACT MANEUVERING
to install ultra-heavy equipment

PRECISION IN EXTREME ENVIRONMENT
Carrying out replacements and revamps in converter steelworks demands special know-how and experienced personnel. Why? Because only if each individual component is placed exactly where the modernization plan indicates can the puzzle fit together. Rest assured, the job is in good hands with the specialists from SMS Siemag.

SIMULATING WORKFLOWS IN ADVANCE
You know that the structural features in the steelworks have a significant impact on the installation processes. That’s why SMS Siemag uses special software to weigh up the various alternatives before erecting the equipment. The electronic simulation of complex workflows ensures we can meticulously plan the modernization and extension processes.

This is how we find ways of performing the conversion during ongoing production. Moreover, we develop existing and newly installed capacities simultaneously, while keeping unavoidable disruptions to a minimum. Plus we calculate how long the job will take by considering organizational aspects as well as the early realization of extra potentials.

LIFTING AND SHIFTING - EXPERIENCE PAYS OFF
Every steelworks is built differently, with its own structural features around the converter. That applies especially after decades of operation, when it is time for a conversion or revamp. As a result, SMS Siemag has developed special shifting tracks for those installations that require new converters to be fitted into the blast stands. They make it possible to position the extremely heavy parts accurately to the last millimeter. Even complex projects involving the replacement of several converters in series present no problem for us.

It is often a challenge for the installation team to retain functioning components on converters that are being replaced. Included here is, for instance, welding work in very tight spaces when some lamella packages are replaced as part of a converter upgrade. During the adjustment and welding work on the new lamella packages, we use a specially developed lifting technique to support the other components.
ON REQUEST: TAILOR-MADE ASSEMBLY SUPERVISION

Sometimes it makes economic sense for your own staff to carry out assembly work, e.g. when time is not so tight. SMS Siemag project engineers know the ropes when it comes to successful assembly and commissioning, so in these cases we can offer you made-to-measure assembly supervision services. That gives you the assurance that you are putting a fully functioning system into operation.
### FULL SERVICE and perfect timing

**WHAT COUNTS IS THE RESULT**
The sooner your supplier of technology and services finishes his job, the earlier you can start on your own mission: top-level converter steel production.

That’s why the time slots available for erection, conversion and modernization are always extremely tight. Rapid commissioning helps you turn your investment into returns as early as possible. This is the goal behind the SMS Siemag logistics strategy. So you can expect corresponding results from us – high process compatibility.

**BY ROAD, BY WATER AND BY AIR**
Manufacturing precision components for converter steel production takes account of a multitude of specifications. There are only a few places worldwide where this degree of accuracy is possible. Then, after completion, the components are dispatched to you without delay – by road, by water and by air, usually in a complex combination.

The gigantic dimensions of the components demand enormous logistics skills. Whether converter, trunnion ring or drive, they all require special transport. Our logistics experts at SMS Siemag select the right options of waterway, rail or road transport. This is how we have mastered numerous logistical challenges over the decades. And it always means unique, tailor-made solutions for you.

**PARALLEL ACTIVITIES PREFERRED**
Our highly developed project management enables us to perform activities in multiple-level, parallel sequences. Let’s assume, for instance, we are revamping an existing plant and simultaneously installing new components such as a converter and periphery equipment. We then coordinate the work so that the necessary products will be available at the earliest possible point in time. The existing plant continues to run at the maximum degree of efficiency during the conversion phase.

<table>
<thead>
<tr>
<th>Start: planning</th>
<th>Dismounting: 5 days</th>
<th>Assembly: 18 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start: implementation</td>
<td>Dismounting: 5 days</td>
<td>Assembly: 15 days</td>
</tr>
</tbody>
</table>
NEW PLANTS AND REVAMPS

The fine-tuning and linking of work stages we practice in revamp projects also benefit you in your new equipment projects.

This means plants with extensive additions in the upstream or downstream areas also start up in good time. We can offer you exceptional solutions especially for the integration of plants from SMS metallurgy companies.

EARLY TRANSFER, EXTRA PROFITS

Evidently, despite a huge number of logistical and assembly challenges, SMS Siemag has succeeded again and again in accomplishing the transfer ahead of schedule. This has strengthened existing customer relations.

Our customers gained a great deal because they were able to go into production earlier, serve the markets more quickly and therefore utilize the available production capacity for an extra boost to their profits.

<table>
<thead>
<tr>
<th>Refractory brick lining and heating: 8 days</th>
<th>Actual transfer</th>
<th>Target transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractory brick lining and heating: 7 days</td>
<td>Extra return:</td>
<td>4 days</td>
</tr>
</tbody>
</table>
A CONVINCING BUSINESS MODEL for converter steelworks

LEAN, TRANSPARENT STRUCTURES
An efficient organization helps you define and implement your requirements as swiftly as possible. Experience, clear structures and tight routines ensure reliable coordination from the initial contact to commissioning.

INNOVATION AND STRENGTH
Improvements in the production of converter steel have been linked for decades with the powerful solutions from SMS Siemag. They help you systematically upgrade your steelworks to top performance – again and again.

INTEGRATED SOLUTIONS
X-Pact® gives you extensive metallurgical electrical and automation modules that can be integrated into the entire control system of your converter steelworks.

COMPREHENSIVE PROCESS ORIENTATION
Continually adjusting your converter steel production to the further processing stages is an effective way of boosting your competitiveness. Optimizations across the process chain are based on the expertise and experience provided by SMS metallurgy. That’s how converter technology helps shape the final product at an early stage.

CONTINUOUS IMPROVEMENT
SMS Siemag maintains links to the leading scientific and technical research institutes as well as being familiar with your production routines. This forms the basis for our systematic development of new solutions in converter steel technology.

So, by applying this business strategy, SMS Siemag systematically supports your added value processes.
"The information provided in this brochure contains a general description of the performance characteristics of the products concerned. The actual products may not always have these characteristics as described and, in particular, these may change as a result of further developments of the products. The provision of this information is not intended to have and will not have legal effect. An obligation to deliver products having particular characteristics shall only exist if expressly agreed in the terms of the contract."