TECHNOLOGIES AND APPLICATIONS
Product program for efficient secondary metallurgy
SECONDARY METALLURGY – ADDING VALUE TO YOUR STEEL

Content

ADVANCED STEEL QUALITY ...............................................................................................................................4
Preferred technologies ........................................................................................................................................4

ATMOSPHERIC PROCESS TECHNOLOGIES .......................................................................................6
HMP Hot metal pretreatment stations ........................................................................................................7
LTS Ladle treatment stations .........................................................................................................................7
CHS Chemical heating stations .....................................................................................................................8
LF Ladle furnaces ..........................................................................................................................................8

VACUUM PROCESS TECHNOLOGIES ........................................................................................................10
RH and RH-TOP Recirculation degassers ....................................................................................................11
RH-TOP Lances ...........................................................................................................................................11
RH-RockerType® ........................................................................................................................................12
VD and VD-OB Tank degassers, VOD Vacuum oxygen decarburization units ........................................14
Vacuum pumps ...........................................................................................................................................16

AUTOMATION SYSTEMS ........................................................................................................................................18
Plant and process control systems ........................................................................................................19

SERVICE SPECTRUM ....................................................................................................................................................20
Lifecycle maintenance .................................................................................................................................21

ADVANCED STEEL QUALITY ...............................................................................................................................22
Process routes ................................................................................................................................................23

FIVE DIMENSIONS OF EXPERTISE FOR YOUR SUCCESS
SMS Mevac’s product program covers the entire range of technologies and services for effective solutions in secondary metallurgy. We combine five dimensions of expertise in an holistic approach. In each performance area we deliver outstanding results:

- Advanced steel quality
- Performance and productivity
- Lifecycle maintenance
- Safety, health, and environment
- ROI and TCO-driven perspectives

Xeed is the brand name of the overall SMS Mevac portfolio, expressing our continuous striving for development of enhanced technologies for the benefit of our worldwide customers.

ADDING VALUE TO YOUR STEEL
Our secondary metallurgy program adds value to your steel. It meets the requirements of all steel producers worldwide. We are pleased to support you in creating the most efficient processes and process routes – tailored to your plant’s needs.
**Advanced steel quality**

**PREFERRED TECHNOLOGIES**

**A PACKAGE OF SUPERIOR SOLUTIONS**

SMS Mevac’s program covers the complete range of technologies and services for advanced steel quality. This package of secondary metallurgy solutions is an important factor in helping to continuously deliver products with superior benefits to the final customer.

These true assets in the value chain give you maximum flexibility in constantly supporting leading industries with the most appropriate advanced steel quality. Seize the many opportunities to satisfy growing demand for quality steels in future-oriented markets.

**ENGINEERING SUPREMACY**

We individually tune and adjust each component of your secondary metallurgy plant. Our total commitment to technologies and services helps to create extraordinarily efficient performance, giving unique competitiveness in economy and ecology.

### INDUSTRIES

<table>
<thead>
<tr>
<th>INDUSTRIES</th>
<th>SELECTED FINAL PRODUCTS</th>
<th>TECHNOLOGIES</th>
<th>ADVANCED STEEL QUALITIES</th>
<th>BENEFITS FOR THE FINAL CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appliance Industry</td>
<td>Refrigerators</td>
<td>VOD, LF, LTS</td>
<td>Precise analysis adjustment, precise temperature control</td>
<td>Surface quality, clean edges</td>
</tr>
<tr>
<td>Appliance Industry</td>
<td>Washing machine drums</td>
<td>VOD, LF, LTS</td>
<td>Low carbon content, precise analysis adjustment, high steel purity</td>
<td>High resistance to washing solutions</td>
</tr>
<tr>
<td>Automotive</td>
<td>Antifriction bearings</td>
<td>LF, VD, (RH)</td>
<td>High steel purity, precise temperature control, precise analysis adjustment, slag management</td>
<td>Long service life, low noise</td>
</tr>
<tr>
<td>Automotive</td>
<td>Automotive panels, car bodies</td>
<td>(RH), RH-TOP, CHS</td>
<td>Low carbon content</td>
<td>Perfect surface quality, high formability, low weight</td>
</tr>
<tr>
<td>Automotive</td>
<td>Crankshafts</td>
<td>LF, VD, (RH)</td>
<td>High steel purity, precise analysis adjustment, sulphide inclusion modification</td>
<td>Long service life</td>
</tr>
<tr>
<td>Automotive</td>
<td>Valve springs, valve cones</td>
<td>LF</td>
<td>High steel purity, oxide inclusion modification</td>
<td>Long service life, low material consumption</td>
</tr>
<tr>
<td>Chemical Industry</td>
<td>Tubes</td>
<td>VOD, LF, LTS</td>
<td>Low carbon content, precise analysis adjustment, precise temperature control</td>
<td>High resistance to corrosion</td>
</tr>
<tr>
<td>Building, Architecture</td>
<td>Facades</td>
<td>VOD, LF, LTS</td>
<td>Precise analysis adjustment, precise temperature control</td>
<td>Perfect surface quality</td>
</tr>
<tr>
<td>Building, Architecture</td>
<td>Steel bars</td>
<td>LF, LTS</td>
<td>Slag management, high steel purity, oxide inclusion modification</td>
<td>Long service life, high stability</td>
</tr>
<tr>
<td>Decoration</td>
<td>Cutlery</td>
<td>VOD, LF, LTS</td>
<td>Precise analysis adjustment</td>
<td>High resistance to corrosion</td>
</tr>
<tr>
<td>Electrical Industry</td>
<td>Sheets</td>
<td>(RH), RH-TOP, CHS</td>
<td>Lowest carbon contents, precise analysis adjustment, precise temperature control</td>
<td>Low energy losses</td>
</tr>
<tr>
<td>Energy</td>
<td>Rotor blades for wind turbines</td>
<td>VD, LF, (RH)</td>
<td>High steel purity, precise analysis adjustment</td>
<td>High strength, high wear resistance, long service life</td>
</tr>
<tr>
<td>Energy</td>
<td>Gas pipes</td>
<td>VD, LF, (RH)</td>
<td>Sulphide inclusion modification, low contents of sulphur and hydrogen</td>
<td>Not sensitive to low temperatures</td>
</tr>
<tr>
<td>Mechanical engineering</td>
<td>Punching tools, screw taps, screws</td>
<td>LF, LTS, VD</td>
<td>Precise analysis adjustment</td>
<td>Low wear, high precision</td>
</tr>
<tr>
<td>Mechanical engineering</td>
<td>Tin plates</td>
<td>LF, LTS</td>
<td>High steel purity, precise analysis adjustment</td>
<td>High strength, low weight</td>
</tr>
<tr>
<td>Transportation</td>
<td>Railroad wheels</td>
<td>LF, VD, (RH)</td>
<td>High steel purity, precise analysis adjustment, slag management</td>
<td>High operating reliability, long service life</td>
</tr>
<tr>
<td>Transportation</td>
<td>Rails</td>
<td>LF, VD, (RH)</td>
<td>Oxide inclusion modification, slag management, precise analysis adjustment</td>
<td>High wear resistance</td>
</tr>
</tbody>
</table>
ATMOSPHERIC PROCESS TECHNOLOGIES

HOT METAL PRETREATMENT STATIONS
SMS Mevac’s HMP stations are installed in many steelmaking plants in order to economically remove detrimental elements from hot metal. Heat sizes cover a range up to 350 t. Mono or co-injection units for desulfurization agents are available. Our latest Twinjection® technology allows fast reagent delivery without compromising efficiency.

Metallurgical functions
- Pretreatment of hot metal and adjustment of composition
- Desulfurization by powder injection
- Dephosphorization
- Desiliconization
- Deslagging
- Homogenization of hot metal quality and temperature

KANBARA REACTOR (KR)
As an alternative technology the Kanbara reactor can be applied in HMP stations to thoroughly disperse the desulfurization reagent.

LADLE TREATMENT STATIONS
SMS Mevac’s LTS units are installed in EAF and BOF steelmaking plants between the melting and continuous casting facilities. Ladle treatment stations carry out an important set of secondary metallurgical processes without using large-scale, capital intensive equipment.

Metallurgical functions
- Desulfurization by addition of synthetic slag or by powder blowing
- Deoxidation by addition of aluminum or micro alloys
- Adjustment of the chemical composition by wire feeding and alloy addition
- Homogenization of liquid steel by bottom purging or lance stirring
- Alloying and fine trimming
- Improvement of castability
- Temperature adjustment by addition of cooling agents
- Liquid steel storage buffer prior to casting
Atmospheric process technologies
HMP, LTS, CHS, LF

CHEMICAL HEATING STATIONS
CHS by SMS Mevac are incorporated into EAF and BOF steelmaking routes to attain clean steel with precise chemical composition. A bell or ring is used as the main component, partly immersed into the liquid steel bath. CHS serve heat sizes of up to 400 t.

Metallurgical functions
- Chemical heating by oxidation of aluminum or silicon
- Desulphurization by metal-slag reaction
- Alloying and fine trimming
- Homogenization of steel quality and temperature
- Improvement of castability

LADLE FURNACES
SMS Mevac’s LFs provide electrical heating to adjust accurate steel temperatures to the continuous caster. The LF can also be used to lower the BOF/EAF tapping temperature to compensate for losses due to secondary metallurgical processes like degassing or desulphurization. The power conducting arms are made of copper or aluminum plates. In addition to fixed-roof installations, slewing versions are available in order to serve two treatment positions or two ladle transfer cars for increased productivity. Inert gas roofs for special applications are available. LFs are installed in steelmaking plants with heat sizes of up to 400 t.

Metallurgical functions
- Electrical heating
- Desulphurization by metal-slag reaction
- Alloying and fine trimming
- Slag management
- Improvement of castability
- Homogenization of ladle contents
- Buffer function between melting and continuous casting units to ensure security of sequence casting
Vacuum process technologies
RH, RH-TOP

**RH AND RH-TOP RECIRCULATION DEGASSERS**
RH and RH-TOP units are installed in steelmaking plants with heat sizes of up to 400 t.

Fixed vessel installations use ladle lifting systems, while movable vessel installations employ vessel lifting systems. Fast vessel exchange systems increase the plant’s general performance and duplex vessel installations enable further increased output.

The RH process is characterized by short treatment periods, minimal temperature losses and extremely favorable results for decarburization and degassing. No special slag measures, extra ladle freeboard or porous plugs are required.

**RH-TOP LANCES**
A short lance design is used to blow from a long distance, allowing installations in plants with restricted headroom. Oxygen blowing, powder blowing and gas burner functions may be combined in a single multi-function lance. Video camera installations can also be incorporated to provide constant visual monitoring.

Metallurgical functions
- Decarburization to lowest levels
- Hydrogen removal
- Alloying and fine trimming with high accuracy
- Fast homogenization of the ladle content, even when large quantities of alloys are introduced
- Vacuum carbon deoxidation

With RH-TOP lance
- Forced decarburization
- Adjustment of C:O ratio
- Desulphurization
- Adjustment of steel temperature by chemical heating
- Skull removal
- Heating of vessel by means of integrated gas burner function
Vacuum process technologies

**RH, RH-TOP**

**RH-ROCKERTYPE® – A BOOST FOR SAFETY**

The RH-RockerType® unit has been engineered to significantly increase the performance parameters of RH processes. This well proven yet future-oriented solution gives safe, reliable RH operation.

The origin of RH-RockerType® technology from SMS Mevac goes back to the 1950s. Its main purpose then was to safely lower the vacuum vessel system and immerse the snorkels into the liquid steel in a simple and reliable way. The system stands out because of its user friendly operation and maintenance.

Recently, RH-RockerType® technology has been further improved. It now smoothly lifts and lowers the ladle instead of the vacuum vessel system. Many useful features were added.

**INCREASED EFFICIENCY**

To speed up your intra logistic processes in the RH plant, the ladle lifting RH-RockerType® can use two ladle cars. One of them brings the ladle to the RH station for treatment. After treatment, another car takes it to the caster area whilst the first ladle car brings the next ladle.

This design supports flexible processes, as the first ladle car can be recharged while the ladle is being treated. Depending on the layout of the steel shop, this greatly improves your ladle transportation logistics. The resulting advantages can be implemented both in single treatment stations as well as in our fast vessel exchange units.

As the alloy system and the vacuum pump are fixed directly to the vacuum vessel system, no special conveyors or moving vacuum ductwork are required.

**A KEY TO LASTING RELIABILITY**

Two hydraulic cylinders are installed to operate the lifting and lowering processes of the ladle. For normal operations, they are mechanically synchronized. In the case of an electric power failure, the ladle is lowered safely onto the ladle car in a controlled way by gravity. Maintenance of the complete hydraulic system is simple and straightforward. The RH-RockerType® unit is very well protected against liquid steel splashes and liquid steel from a ladle break-out.

In comparison to vacuum vessel lifting installations, there is much better access to the vacuum vessel platform. Similarly the automatic sampler and other auxiliary equipment are easily accessed.

For safety and efficiency reasons RH-RockerType® technology will play an important role in future RH secondary metallurgical infrastructure.
Vacuum process technologies
VD, VD-OB, VOD

VD AND VD-OB TANK DEGASSERS
SMS Mevac’s tank degassers support EAF and BOF plants, permitting heat sizes of up to 340 t or more. Inert gas is introduced into the bottom of the ladle by means of porous plugs. The process is characterized by slag-free tapping at the melting unit. The plant requires an efficient vacuum pump system to meet the specific requirements of the desired metallurgical process.

Standard tank installations are fixed above or below the shop floor. Movable tank installations or twin tank installations substantially increase performance.

Metallurgical functions
- Hydrogen and nitrogen removal
- Decarburization to lowest levels
- Desulphurization by metal and slag reaction
- Efficient alloying and fine trimming with high accuracy
- Slag management
- Improvement of castability
- Homogenization of ladle contents

Additional applications using VD-OB lance systems:
- Oxygen blowing for forced decarburization from high initial carbon levels, e.g. for the production of ultra-low carbon steel grades
- Oxygen blowing for chemical heating by aluminum oxidation

VACUUM OXYGEN
DECARBURIZATION UNITS
FOR STAINLESS STEEL
SMS Mevac has supplied VOD units with heat sizes of up to 200 t, mainly for the production of stainless steel.

Similar to VD, the VOD units are designed to meet the specific requirements of the plant layout as well as the individual processes of our customers.

Metallurgical functions enhanced by our efficient oxygen lance are:
- Forced decarburization under vacuum for low chromium oxidation
- Chemical heating
- Homogenization of ladle contents
- Alloying and fine trimming

Technologies and Applications
Vacuum process technologies

VACUUM PUMPS

EFFECTIVE VACUUM TREATMENT
High-performance vacuum pumps from SMS Mevac are the heart of secondary metallurgical vacuum processes. For both recirculation or tank degassing processes, our vacuum pump technologies are tuned to your specific steel conditions and to your individual plant and production requirements.

Our vacuum pump systems precisely control the rate of pressure reduction from atmospheric level to low vacuum pressure. During the various treatment steps the vacuum level is accurately controlled to match the system’s metallurgical needs.

In order to deliver optimum results high suction capacity, low energy consumption and optimal reliability are essential elements of our design.

VACUUM PUMP TECHNOLOGY FOR YOUR PROCESS
Three technologies form the cornerstones of SMS Mevac’s vacuum systems:

– steam ejector vacuum pumps
– steam ejectors with water ring pumps
– dry mechanical pump systems.

The selection of a specific technology depends on the respective conditions in the secondary metallurgical plant. Availability of utilities, metallurgical needs and the balance of operational and investment costs are basic considerations for our individual, high performance concepts.

PIONEERING EXPERIENCE
SMS Mevac has decades of pioneering experience in various vacuum pump technologies.

In 1956 SMS Mevac built its first steam ejector vacuum pump for vacuum treatment processing of liquid steel. Since 1960, we also designed plants with mechanical vacuum pumps.

In 1985 our four stage steam ejectors replaced the former five stage version for high cooling water temperatures. For advanced splash control, our RH-SC® with variable steam nozzles was launched in 2000. And in 2006 we introduced our Triple-S-technology for reduced consumption of cooling water.

This set of advanced innovations has a proven record of success in many hundreds of applications all over the globe.
Automation systems

PLANT AND PROCESS CONTROL SYSTEMS

SMS MEVAC’S AUTOMATION SYSTEMS
Advanced electrical systems, automation and instrumentation bring together the balance of product quality, safety, energy and media consumption and reliable operations. SMS Mevac’s Level 1 and Level 2 automation systems link these functions, giving highly efficient plant operation.

MANAGEMENT SUPPORT AND CONTINUOUS IMPROVEMENT
Secondary metallurgy automation is linked to the steelwork’s Level 3 system, giving full information, providing reporting systems and supporting the scheduling of heats.

Metallurgical and thermal models, least cost calculations and process simulation assist your specialists to continuously improve your processes.

OPERATOR SUPPORT
Ergonomic HMIs are supported by state-of-the-art technology. Operators obtain up-to-the-minute information to safely control secondary metallurgical processes.

Maximum safety is provided by interlock indication on HMI, sequence control, equipment and functional interlocks, pin pointing failures and monitoring of critical processes such as media flow and possible leakage.

A WELL PROVEN BRAND
SMS Mevac and SMS Siemag express their great passion for steelmaking by sharing the unmatched automation brand X-Pact for their plant and process control systems.

This gives additional assurance of highest quality to our customers.
SERVICE SPECTRUM

LIFECYCLE MAINTENANCE

LIFECYCLE-ORIENTED CARE
Secondary metallurgical plants from SMS Mevac are highly reliable and maintenance friendly. Care for our customer’s plant starts even before handing over.

Our vast spectrum of consulting services begins with the feasibility study – based on the individual strategy of the customer. We discuss alternative solutions with regard to technologies and economics. By using extended 3D simulation programs we fine-tune the final layout of each component.

TRAINING PROGRAMS
Individual training packages provide sound knowledge and motivation to the prospective teams - from operation routines to automation details and safety measures.

A combination of initial off-site training courses at the SMS Mevac headquarters or at suitable partner plants plus continuous on-site workshops provide advanced know-how for successful long-term operations.

MAINTENANCE AND SPARE-PARTS
Monitoring of the plant’s performance by our specialists and preventive maintenance packages effectively reduce costly down times needed for fault-finding and trouble-shooting activities. Our after sales service supplies the required OEM spare parts for our customer’s plants ensuring continuous high performance of the equipment.

UPGRADING, MODERNIZATION, AND REVAMPING
Depending on your plant’s lifecycle stage, a periodic update of special innovations and improvements provides optimum return on your investment. Our specialists’ recommendations focus on metallurgy, process technology, engineering and automation.

SMS Mevac is very experienced in careful planning to ensure minimum down times for the required activities. Fast return on investment after modernization supports our customer’s economic and market targets.

For these reasons, our broad service spectrum provides efficient lifecycle maintenance to our customer’s secondary metallurgical operations.
A growing number of advanced steel qualities are based on sequential treatment in a series of secondary metallurgy stations. These process routes combine complementary technologies to produce steels at unique quality levels. Finished products with high performance profiles originate from these high quality steels.

Consistent reproducibility makes them preferred qualities for high level industrial applications. The technology of the steelmaking process and the required steel quality determine the most suitable process route. SMS Mevac’s full range of secondary metallurgy technology permits a broad spectrum of combinations. Integrated technologies for atmospheric and vacuum processes determine the choice of the most appropriate routes.

**LINE PIPE STEELS**
Micro-alloyed line-pipe steels with high strength and HIC-resistant profiles can be produced on BOF or EAF routes. Secondary metallurgy equipment consists of SMS Mevac-VD vacuum degassers and LF ladle furnaces for the EAF route, alternatively SMS Mevac LTS ladle treatment stations, RH-TOP recirculation degassers, LF ladle furnaces and an HMP hot metal pretreatment station to serve the BOF route.

**EXTRA DEEP DRAWING STEELS**
The EAF route, for example for automotive applications uses SMS Mevac VD-OB vacuum degassers and LF ladle furnaces. The BOF route combines SMS Mevac HMP desulphurization units, LTS ladle treatment stations and VD-OB tank degassers or RH-TOP recirculation degassers.

**STAINLESS STEELS**
The Duplex process route especially for the production of ferritic grades combines SMS Mevac VOD vacuum oxygen decarburization technology and LF ladle furnaces. The Triplex route is supported by SMS Mevac HMP desulphurization units and VOD vacuum oxygen decarburization technology.

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**STEELMAKING PROCESS ROUTE – BOF**
- **Micro-alloyed high-strength steels** e.g. for line pipes or ship building
  - SMS Mevac LF Ladle furnace
  - SMS Mevac RH-TOP Recirculation degasser
  - SMS Mevac VOD Vacuum oxygen decarburization unit
  - BOF Basic oxygen furnace
  - SMS Mevac HMP Hot metal pretreatment station
  - EAF Electric arc furnace, deslagging unit

**STEELMAKING PROCESS ROUTE – EAF**
- **Extra-deep drawing steels** e.g. for automotive applications
  - SMS Mevac VD-OB Vacuum tank degasser
  - SMS Mevac LF Ladle furnace
  - EAF Electric arc furnace, deslagging unit

**STAINLESS STEEL PROCESS ROUTE**
- **Stainless steels** for ferritic low carbon and low nitrogen grades
  - SMS Mevac LF Ladle furnace
  - SMS Mevac VOD Vacuum oxygen decarburization unit
  - EAF Electric arc furnace, deslagging unit
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.

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