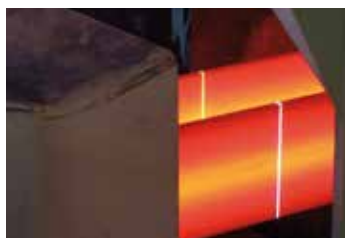


## PERFORMANCE MODULES FOR LONG PRODUCTS PLANTS



# PERFORMANCE MODULES FOR LONG PRODUCTS PLANTS

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SMS has developed performance modules for wire rod and bar mills and section and billet mills that optimizes the efficiency of the plants at reasonable investment costs and short payback periods.

All our technologies – existing and new work hand in hand. The spectrum ranges from process automation and measurement and control technology to new drive concepts and cooling strategies.

Higher precision, minimised downtime, more flexibility, savings of tools, cost reduction through higher output and above all the quality improvements of long products – these are the main objectives of the new technologies.

If used properly, MEERdrive®, MEERgauge®, CCT®, BeamCool®, PGS and the many other technologies help to make the plants more efficient.

**PGS**

The future of  
plant control

**MEERgauge®**

True shape size  
measurement

**MEERdrive®**

The innovative  
drive concept

**MEERguides®**

Optimal guiding  
of the product

**ASC®**

Optimization of  
bar tolerances

**MoVE**

Camera-based  
calibration system

**PROgauge®**

Online measurement  
of sections

**BeamCool®**

**RailCool®**  
Selective cooling

**TCS**

Technological control  
system

**SizeGauge**

Real time cross-  
section measurement

**MEERcon**

Process management  
and planning

**CCT®**

Simulation of rolling  
and cooling process

**Prometheus™**

For reheating furnaces

**High-speed shear**

Profitable cutting

# PROCESS GUIDANCE SYSTEM (PGS)

## The future of SMS plant control

For best quality, variations must be detected early on, even during the production process and necessary steps to adapt the process or the post-processing of long products should be taken at an early stage: Therefore we developed the Process Guidance System (PGS).

PGS unites Level 1 and Level 2 so that the plant operator does not work on the basis of automation levels but is guided by a uniform operator interface as a function of the process.

For this purpose, the software architecture was fundamentally modernized by the SMS automation experts: The interfaces were fully reworked so as to achieve uniform communication via data cloud and database accesses and to avoid redundancies in the automation levels. Moreover, a process optimization system can also be incorporated.

The system is component-oriented and can be extended by adding further modules and applications.

The operator can for example create an order or he can take over the scheduled production data automatically. During operation, the operator receives a display of all relevant data of the automatically executed process steps, which previously had been defined in specified procedures. At the same time, the green signals enable the operator to check that all stipulated parameters are OK, including those for the upstream and downstream processes. The signals would show up in red in case of a fault.

Command buttons lead the operator straight to the details of the fault, without detours. This allows both the operator and the maintenance personnel to make a rapid diagnosis. The process progress is saved and displayed column by column. Simultaneously, all the data gets automatically recorded for quality control.

### BENEFITS

- Operation is process-oriented, ergonomic and simple
- Attractive due to its high transparency and scalability
- Future-proof due to the uniform system platform and universal interfaces
- Process data available at any time





The Process Guidance System sets a new standard for the future automatic control of complex plants in a process-oriented and reliable manner.

# MEERgauge®

## True shape size measurement and online surface defect detection (SurfTec)

Every production line experiences minimal anomalies that are caused by the ingoing material or minute damage to the rolls or guide rollers, among other things. All this has an influence on the product quality and productivity. Bar steel producers therefore face two challenges; firstly, the defects on the hot surface need to be detected and located which are not easily visible to the naked eye in time; secondly, the cause of the defects needs to be identified and eliminated.

### SurfTec: ONLINE SURFACE DEFECT DETECTION

The surface measurement system integrated in the MEERgauge® system helps plant operators to do both; it determines the precise position of the anomalies on the bar surface at the time of rolling, evaluates the data using special algorithms and provides the plant owner with information on the cause by classifying the defects. In this way, it is possible to determine quickly whether a roll is damaged or

defective ingoing material has been supplied. The advantages are twofold; bar steel producers can react quickly in the event of surface defects and increase material output. At the same time, they can improve the productive time of the entire plant as they are able to identify the cause of the anomalies far more quickly.

### TRUE SHAPE MEASUREMENT

The MEERgauge® system operates on the basis of the "laser light cut" technology. Four or more sensors perform synchronous, contact-free measurements over the entire cross-section of the bar. With no moving or oscillating parts, the system is almost maintenance-free. With a scanning rate of 500 scans per second, a true-shape cross-section is created from up to 720 synchronous measuring points in a shared coordination system, and is then displayed with maximum precision. Unlike in conventional systems, the true shape can also be represented.



## BENEFITS

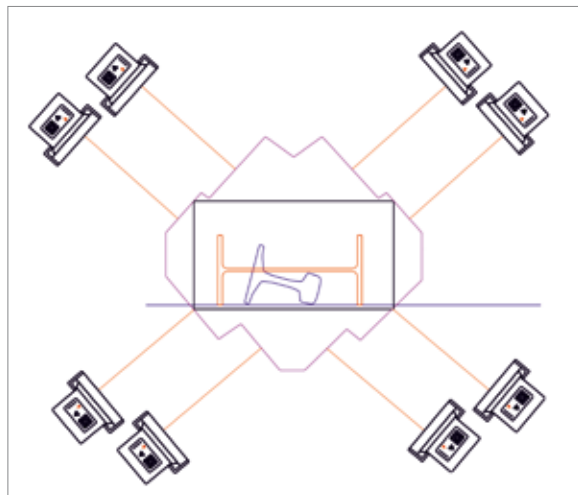
- High measurement data density: up to 2 million measuring points per second
- Short exposure time and absolute synchronization of the measuring probes
- Measuring equipment in the immediate vicinity of the roll stands
- Direct transfer of measured values to the roll stand control system (closed loop control)
- Compatible with 2 and 3-roll systems
- Time and cost benefits from direct production control



# PROgauge®

## Inline measurement of sections and rails

Section measurement using the laser light-section method on a finish-rolled rail in hot state. The same principle is also employed for H beams and other sections. A laser line projected onto the product surface is reflected diffusely and the reflected light is detected by a high-speed, high-resolution image sensor. The distance from the section surface and hence the contour of the object is calculated from the position of the illuminated spots on the image sensor.



### BENEFITS

- Measurement of various contours
- Information about complex key performance values helps operators make appropriate process-related decisions
- Stable measurement results
- Individual tolerance specifications taken into account
- Software and measuring unit are individually tailored to the production conditions
- Profiles can be changed without intervention in the measuring unit; the software is switched over automatically
- Time and cost benefits through optimization of production
- Individually adapted laser power



# MEERdrive®

## The innovative drive concept

Conventional wire rod blocks have limitations. These blocks are only able to roll with fixed reduction ratios which always require the same rolling diameters within the block.

With MEERdrive®, SMS has pioneered an innovative drive concept for wire rod blocks that overcomes these limitations of conventional solutions. The clue: the concept is based on individual drives for each stand position.

MEERdrive® is an innovative SMS development which sets a new benchmark in the wire rod production sector.

The basic idea is to replace the group drive of a rod mill block with its comparatively high energy consumption and maintenance-intensive gear constella-

tion by intelligent single drives for each stand. The advantages are amazing: our customers save a huge amount of energy and gain maximum flexibility – both in the design and operation of the rolling mill.

Thanks to variable speed settings for the individual stands, different rolling ring diameters can be used independently of one another. The number of roll pairs required for annual production can thus be reduced by up to 60 %.

In short: the MEERdrive® concept minimises investment and operating costs, while allowing customers to get maximum performance from their rolling mills.



### BENEFITS

- Highest mill flexibility
- Closer rolling tolerances
- Better metallurgical properties
- Better CO<sub>2</sub> footprint





## MEERdrive<sup>®</sup>PLUS

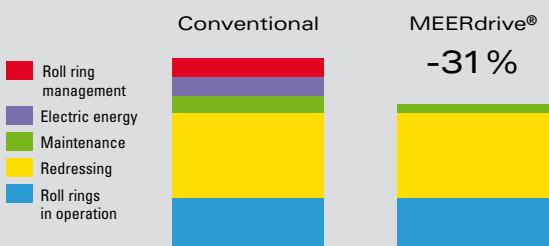
The MEERdrive<sup>®</sup>PLUS is a variant of MEERdrive<sup>®</sup>, which represents a sizing block solution for finished size rolling and allows conventional as well as thermomechanical rolling. Further “one family rolling” is also possible, since all roll / size changes will take place at this block. MEERdrive<sup>®</sup>PLUS blocks finish typical diameter ranges from 5.0 mm up to 26 mm with excellent tolerances at speeds of up to 120 m/s. Because of the large speed range in this block for rolling speeds between 10 m/s and 120 m/s, SMS combines compact individual switch gears with individual motors.

## BENEFITS

- Total flexibility in the roll pass design
- Minimized wear and maintenance of the block
- Reduced roll inventory and simplified logistics
- Significant reduction of energy consumption
- Reduced operation costs: 60 % lower rolling ring requirements
- Energy and operating media: 1,800 MWh p.a. less\*

\* in comparison with the conventional group drive

## A COMPARISON OF OPERATING COSTS ON DIFFERENT BLOCKS



	Conventional		MEERdrive <sup>®</sup>		Savings kWh/t
	No-load power kW	Consumption kWh/t	No-load power kW	Consumption kWh/t	
Distribution gear	300	2.3	–	–	2.3
Change-speed gear	500	5.8	–	–	5.8
Idling	197	2.3	32	0.4	1.9
<b>TOTAL</b>	<b>997</b>	<b>10.4</b>	<b>32</b>	<b>0.4</b>	<b>10</b>

MEERdrive<sup>®</sup> is a revolutionary drive concept for modern wire rod production using individual drives with small low voltage motors for each stand. It offers a wide range of outstanding economical and operational advantages and reduces the required roll inventory to a minimum.

# MEERguides®

## Optimal guiding of the product

The trend to higher rolling speeds requires precise and reliable guiding of long products as well as easy and quick adjustment of the guide equipment. MEERguides® fulfill these high demands and feature a robust design as well as an easy and precise setting. The high performance design ensures that the guides can operate efficiently and effectively as part of the latest rolling mill technology.

### PRECISION FOR BAR MILLS

Growing demands on the tolerances and surface finish of the rolled stock require high standards in the design of the mechanical equipment. In order to guarantee top technical performance, quality and reliability, all SMS guides for bar mills are constantly analyzed and optimized. The stainless steel structure in conjunction with the simple design ensures a reliable production even in demanding production environments.

MEERguides® are available for any type of mill or proceeding: billet mills, section mills, roughing mills, intermediate mills, finishing mills as well as latest SMS cartridge style CL stands and multi-strand slitting.

### BENEFITS

- Compatible with any type of millstand
- Simplicity and rigidity of design
- Robustness and reliability
- Integrated lubrication and roll cooling
- Easy maintenance and setting
- Minimum number of consumable parts
- Symmetrical single point adjustment
- Complete guide portfolio available



# MoVE – Modular Video Equipment

## Camera-based calibration system for MEERguides®

The precise calibration of the MEERguides® is performed by the computer-assisted MoVE video system. It uses a high-resolution camera to record the roll gap and the setting of the guide rollers to an accuracy of a hundredth of a millimeter. The operating software analyzes the video image and uses it to calculate the ideal setting. This makes it possible to precisely align the rollers to the groove horizontally and vertically, position the guide holder exactly to the rolling line, and align the rolling line itself. This allows high positioning accuracy and thus ensures reliable operation and maximum component lifetime. The wireless system can also be used to monitor the alignment of the guide holders and rolls in the plant.

### BENEFITS

- Easy, precise and repeatable setting of roller guides
- High-accuracy setting and alignment by use of a high-definition video camera
- Extended service life of rollers and bearings
- Simple, wireless handling
- Intuitive use of operator software



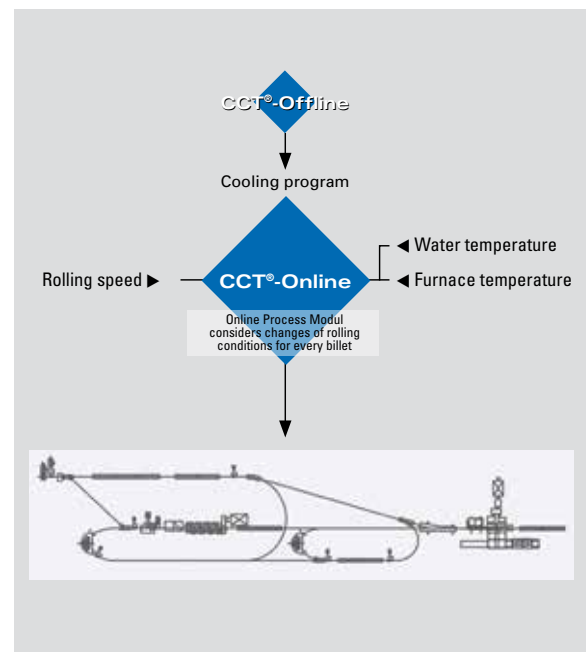
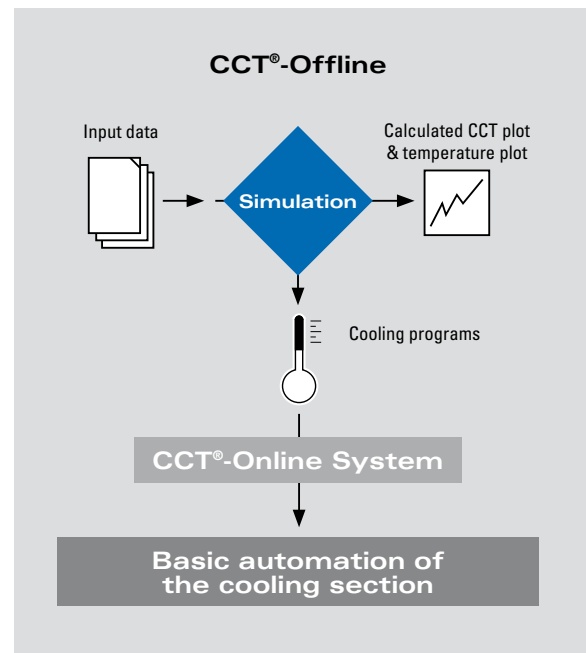
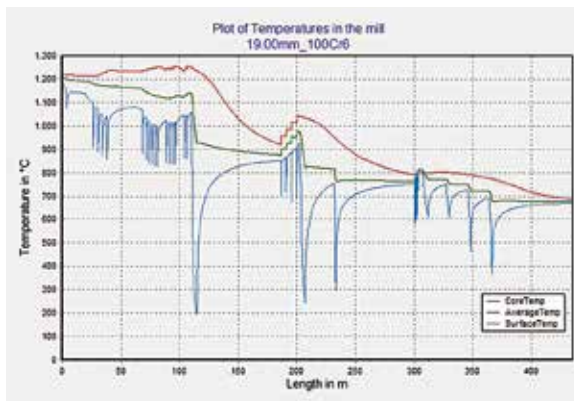
# CONTROLLED COOLING TECHNOLOGY (CCT®)

## Simulation of rolling and cooling process

One example of an open-loop control system from SMS group is the controlled cooling technology (CCT®) already successfully installed numerous times. The system monitors and controls the whole temperature curve in a wire rod or bar mill from the furnace through to the finished product – exactly and reproducibly. Mill owners achieve exactly the material properties the market demands, and increase the productivity of their production line at the same time. CCT® consists of the packages CCT® Offline and the CCT® Online.

### BENEFITS

- Introduction of new steel grades by simulation of cooling process (reduction of rolling trials)
- Development of new cooling programs
- Optimization of existing cooling programs
- Qualitative judgment of the influencing parameters right in the mill
- Determination of cooling line set up
- Representation of cooling process evolution in the form of a CCT® diagram





# BeamCool<sup>®</sup>, RailCool<sup>®</sup>

## Selective cooling

Special cooling lines for Beams (BeamCool<sup>®</sup>) enables the selective cooling of web and flange to obtain residual stress straps and in addition to increase strength in order to save the alloying elements. For Rails (RailCool<sup>®</sup>) the selective cooling for rail heads enables a so-called rail head hardening to reduce wears drastically.

Also this cooling line enables an inline quenching and tempering process (QST).

RailCool<sup>®</sup> and BeamCool<sup>®</sup> enable selective cooling of rails or beams by means of specific cooling strategies.

### BENEFITS

- Minimization of residual stresses
- Increase strengths by reducing alloy elements by inline heat treatment
- Improvement of straightness by homogenization of cross-section temperature distribution
- Heat treatment in rolling line by a "soft" cooling strategy starting with uniform entry temperature along the rail length
- Hardened beams by QST-process
- Rail head hardening



# HYDRAULIC ROLL ADJUSTMENT WITH TECHNOLOGICAL CONTROL SYSTEM (TCS)

Provides plant operators with full process transparency

Existing rolling stands can be equipped with hydraulic roll adjustment systems. All hydraulic roll adjustment systems are controlled by TCS. The advanced closed-loop Technological Control System (TCS) provides plant operators with full process transparency, including pass and roll position measurement and online correction, rolling force measurement and fully automated overload protection.

## BENEFITS

- Automatic compensation of individual mill spring, feeder variations and bar entry impacts
- Optimized products and processes for maximum yield, availability and product quality
- TCS is able to level out temperature variations along the bar
- Reliable and reproducible results across the whole size range can be achieved with the advanced automation level



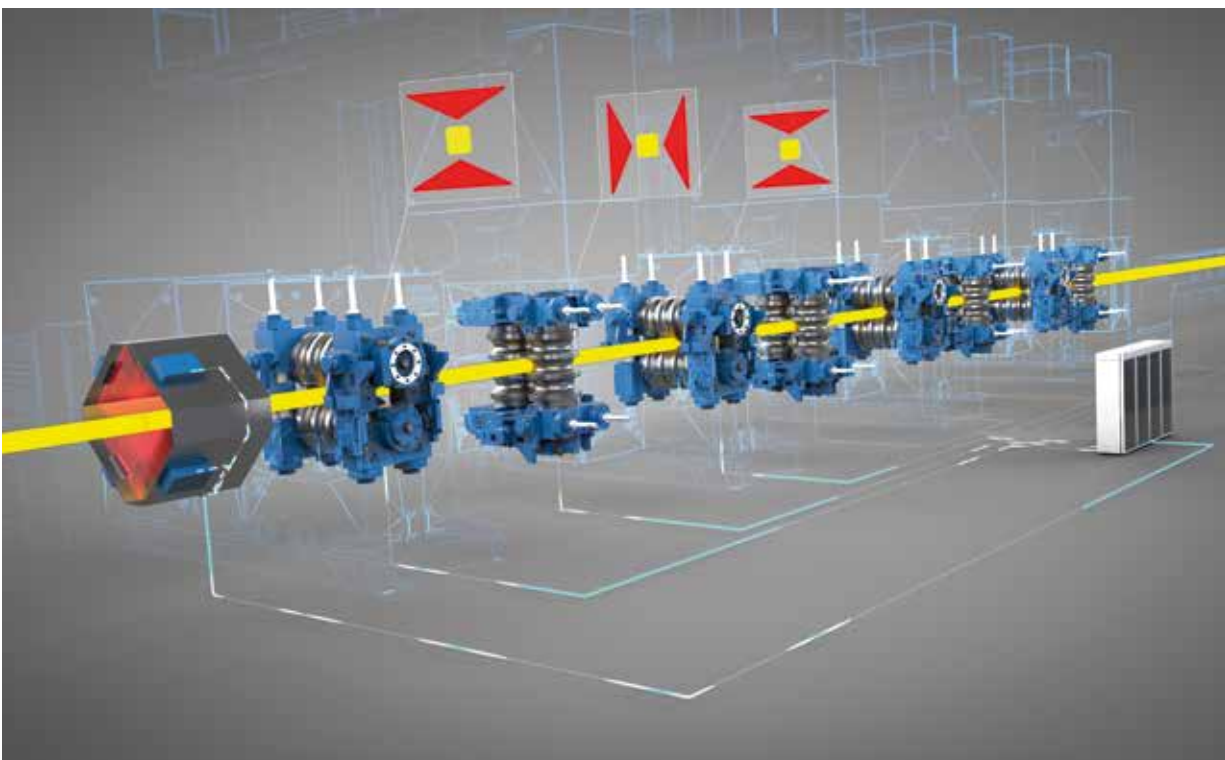
# AUTOMATIC SIZE CONTROL (ASC®)

Finely tuned optimization of bar tolerances

This control system consists of three levels of control systems, namely Hydraulic Position Control (HPC®), Automatic Gap Control (AGC®) and the closed-loop Monitor Control (MON®) between the actually measured dimensional value by a laser-type profile gauge and the hydraulic adjustment system of the last two mill stands. The laser-type profile gauge (MEERgauge®) is arranged directly behind the last finishing mill stand.

## BENEFITS

- Close tolerances for large bars
- Influences the finished dimension during rolling by under load adjustment
- Minimizes maintenance and operating costs
- Increases material yield
- Increases mill efficiency





# MEERCON

## Process management and planning

Whether it's for a wide range of special steel grades or individual requirements, the operator can choose either a standard setting based on an empirical database or can create completely new settings. Moreover, any setting can be flexibly adapted by means of an editor, including the diameter of the initial pass, the design of the actual groove form and the calculation of the corresponding rolling speed.

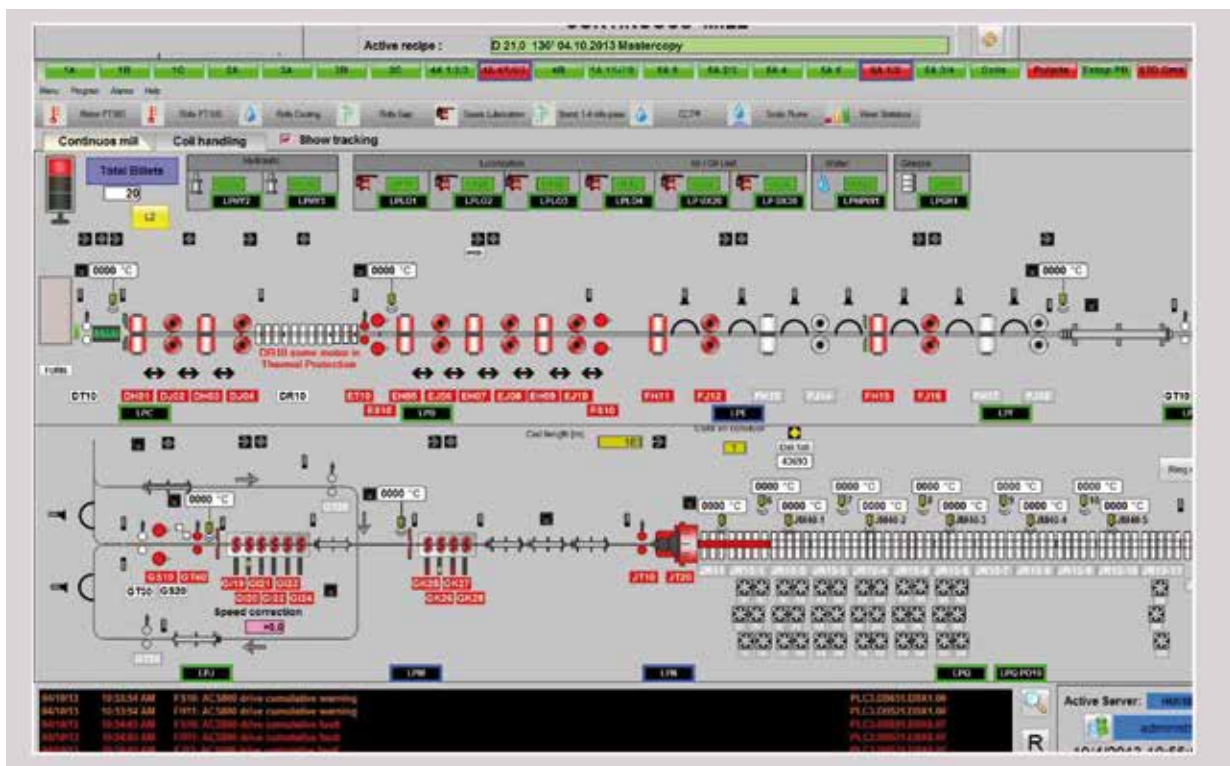
### INTEGRATED PROCESS MANAGEMENT AND PLANNING

The mill setup required to attain the necessary quality of the final product is planned by the MEERcon PSM® system. The technological mill configuration system determines the individual set-points based on requirements and transmits the relevant setup infor-

mation to the PSM® automation system via a data network. It can be linked to an unlimited number of workstations, for example, to the rolling mill managers or technologists.

### BENEFITS

- Automatic roll adjustment system provides all set values
- Optimizes tool and roll ring costs
- Information on roll and roller wear
- Rolls and rollers can be positioned with maximum measurement accuracy





# SizeGauge

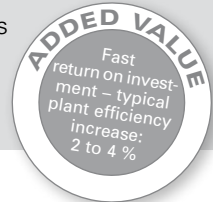
## Real time cross section measurement

Diameter measuring system for surface defect detection on the basis of cross-section measurement. Overfills and seams can be recognized immediately at the hot bar with exact location and size of the defect. The classification of the defect enables an immediate intervention by the operating personnel.

For better monitoring of the cross-section of the rolled material within the rolling mill a cross-sectional measurement is available (SizeGauge). The results of the measurements, the tension relationships are optimally adjusted and thus the product quality can be improved while increasing the availability.

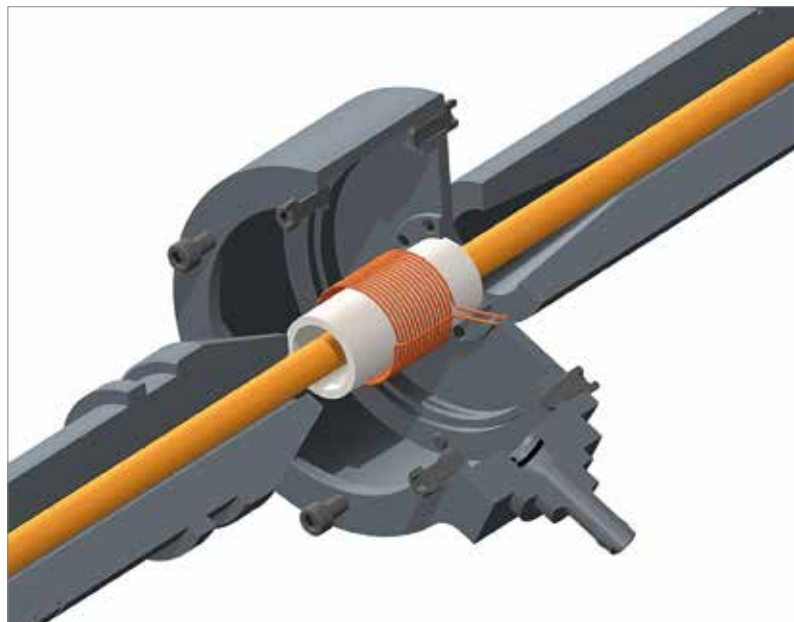
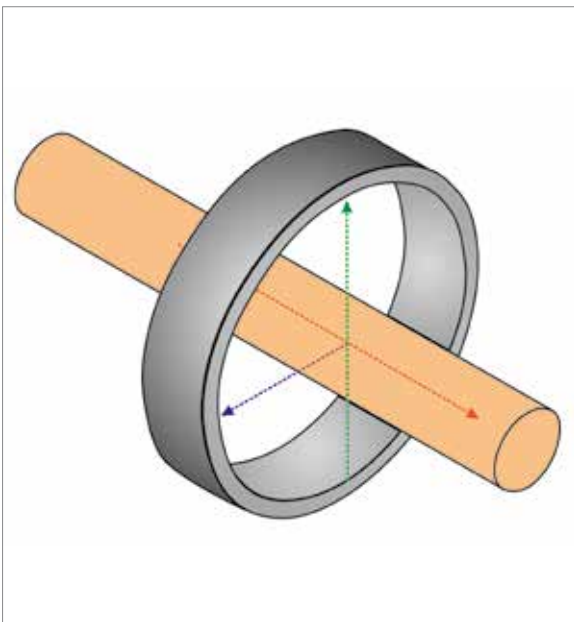
### BENEFITS

- Reduction of wear and failure of roller guides and working rolls
- Improved product tolerances
- Reduction of scrap



### FEATURES

- Real time cross-section measurement of all steel grades
- Bar vibration and transversal movement compensation
- No physical contact with rolled product



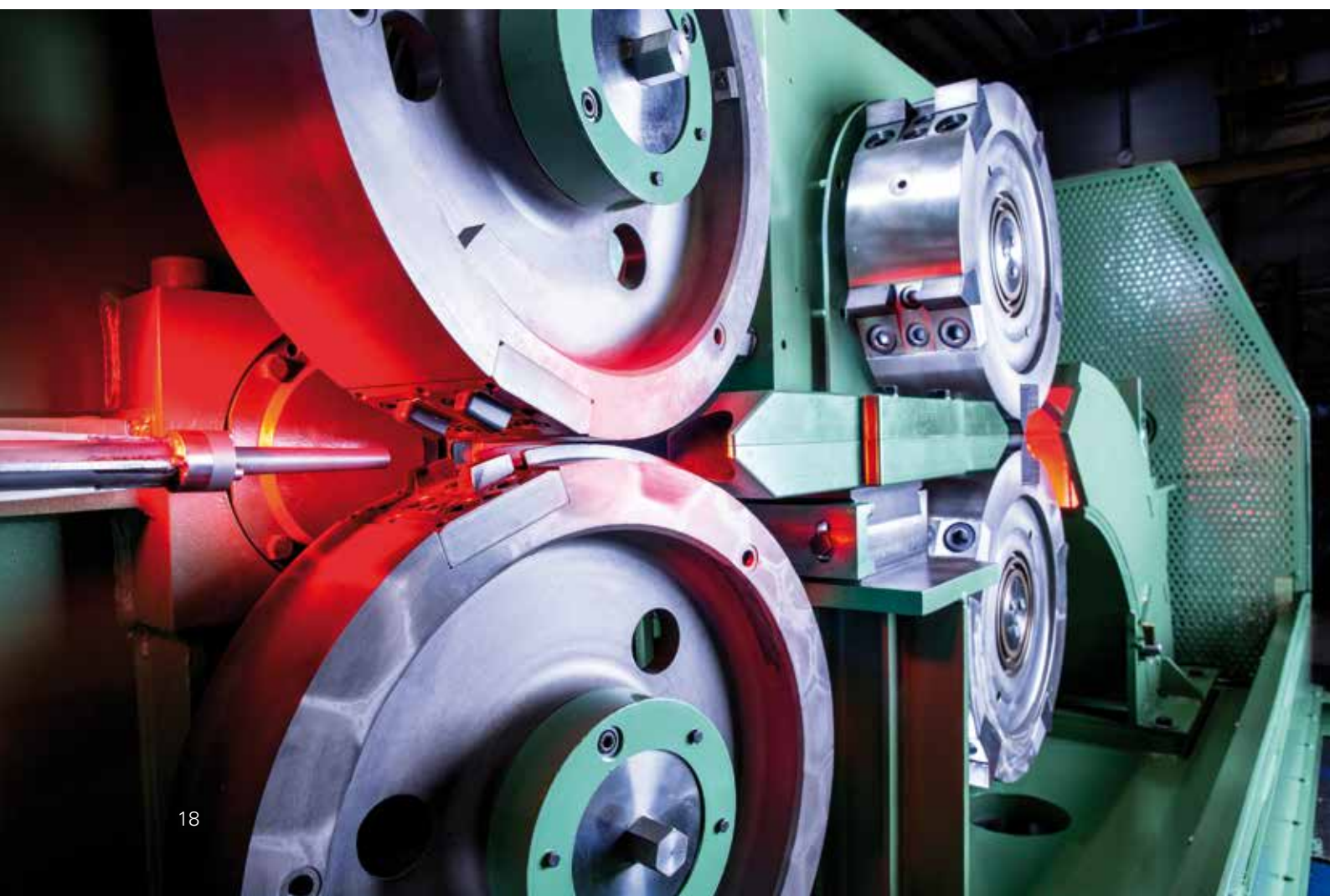
# HIGH-SPEED SHEAR

## Profitable cutting

SMS group's High-speed Shear, located either in front of MEERdrive<sup>®</sup>PLUS block or laying head is performing head and tail cuts for all sizes even on highest speeds up to 120m/s. The result is increased profitability for new mills or for existing ones by modernization.

### BENEFITS

- Increased mill yield up to 2 % due to repeatable head and tail cuts
- Uniform shape and mechanical properties of coil
- No manual trimming necessary
- Improvement of work safety
- Reliable removal of scrap



# PROMETHEUS™ FOR REHEATING FURNACES

Exactly as much fuel as necessary, as few as possible

Prometheus™ boosts the furnace's overall performance. The advanced combustion optimization system improves those parameters that make a difference in the production of special steel qualities. Prometheus™ allows for targeted improvements of the metallurgical properties, for example increased temperature uniformity or minimizes negative effects such as steel decarburization or high scale formation.

## ENERGY SAVINGS – EVEN DURING NONPRODUCTIVE TIME

Prometheus™ is highly efficient in optimising the combustion parameters during events like sudden stoppages, furnace heating-up time or changes to the product campaign. This tool ensures proper heating repeatability, even with inexperienced operators, although even highly experienced staff benefit substantially from the mathematical model guidance during transitory events.

## EFFICIENCY INDEX

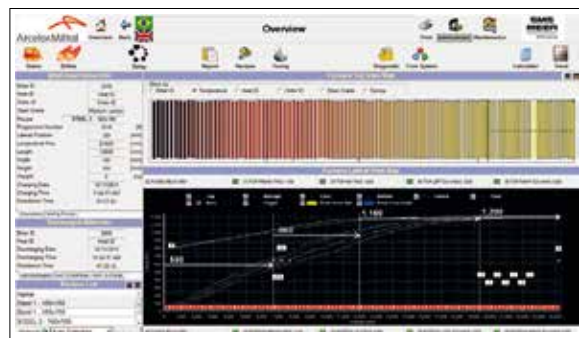
Prometheus™ tracks the consumption and the other efficiency related parameters and compares them to the similar values without optimisation.

## BENEFITS

- Adoption of heating strategies which minimize temperature set points and guarantee the required final stock target temperature
- Simulation of heating curves for each stock load based on a sophisticated mathematical model
- Display of overall furnace efficiency by visualizing heating balance diagrams
- Provision of consumption and emission trends for correlation to actual production data
- Constant monitoring of heating history parameters for each single work piece and prediction of development of the heating path
- Optimization of digital firing pattern when coupled with Digiburn®

## FROM DETAILED INFORMATION TO COMPREHENSIVE OVERVIEW

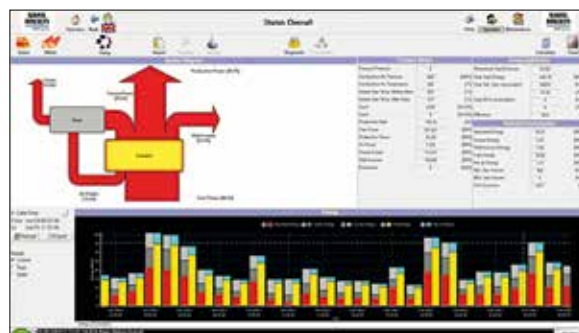
The overview screen shows the furnace loading pattern and provides the main data relevant to the temperature set points of the different heating zones.



By selecting a specific billet, the engineer obtains the real-time heating status of any single workpiece.



Heat flow charts and consumption trend bars help to control furnace efficiency.



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