HIGH-PERFORMANCE HOT ROLLING MILLS
Electrics and Automation
ELECTRICS AND AUTOMATION
for hot rolling mills

HOLISTIC SYSTEM EXPERTISE
Now, more than ever, the market for metallurgical plant automation demands high plant availability and quality of the end products. To meet these requirements, SMS Siemag many years ago launched its policy of supplying not only engineering, technological controls and process models, but also the entire electrics, automation, drive technology as well as energy distribution for its plants. We are therefore an all-inclusive supplier for all aspects of engineering, construction, and commissioning. Acutely aware of our responsibility to you, we ensure all system components mesh perfectly. Short paths, direct communication, and the common interests of everybody involved add up to the best conditions for just that.

EXTENSIVE MODERNIZATION STRATEGIES
As an operator of metallurgical plants, you know how crucial it is to constantly add to and renew your production equipment so you retain your market standing with excellent product quality. This kind of growth comes not only from the latest engineering solutions, but also requires integrated automation to actually improve your end products. SMS Siemag offers you seamless revamps so you benefit from technological improvement of your production across the board.
PROFESSIONAL PARTNER FOR HOT ROLLING MILLS

SMS Siemag supplies hot rolling mills for almost all products and capacities. Included here are:

- Classic high-performance hot strip mills with several roughing stands and if necessary one sizing press
- Compact hot wide strip mills with a roughing stand and, if necessary, a coilbox
- CSP plants
- Steckel mills

Our experts in electrical, automation, technological, and mechanical systems work together to ensure the plants you get are perfectly coordinated in all aspects. That’s how you can rely on intelligent, market-driven solutions with high productivity for top-quality hot strip.
X-PACT®
Electrics and Automation

The entire spectrum of automation technology from SMS Siemens is available to you under the X-Pact® brand name. That applies to all plant types:
- from steelworks to casters
- from hot rolling mills to strip processing lines

Central to X-Pact® for hot rolling mills are high cost-efficiency and transparency of our control technology. X-Pact® encompasses all levels of automation from Level 0 to Level 3.

X-PACT® FOR HOT ROLLING MILLS

X-Pact® for hot rolling mills pools our special process know-how in a system oriented toward the distinct process technology required here. Additionally, because X-Pact® focuses on the hot rolling process and customer requirements, we were able to implement tailor-made application software. That enabled us to fine-tune the application software at a lower outlay. Your advantage is that our solution comes with a leaner system structure, making it much more straightforward to use.

MULTI-STEP STRATEGY

All the systems are based on uniform platforms within a modular structure. We apply the latest hardware and software developments here. Everything is broken down into separate levels (system modules, technological modules, plant-specific modules), so elements only have to be customized where necessary. If the IT environment changes, for instance due to new hardware, only the system modules need to be modified. Similarly, when new technologies come into play, only the technology modules are affected. The plant-specific modules contain project-specific functions and routines. You benefit from this structure because it improves both the effectiveness and lifetime of the technology modules. What you can also count on is the stability of the plant-specific modules, even if you replace your IT infrastructure or change certain equipment.

HOMOGENEOUS SYSTEM ENVIRONMENT

So, in X-pact® for hot rolling mills, all regulation and control functions are implemented on our uniform system platform (X-Pact® ProBAS), and are programmed and parameterized in a common develop-
Plan of the various module levels.

**LEVEL 1**
- Area Master Controller
- Configuration Data
- Sequence Control Module
- Device Library
- I/O-System

**LEVEL 2**
- Communication Manager
- I/O-Configuration
- Technological Function Module
- Communication System

**X-Pact®**
- Plant specific modules
- Technological modules
- Basic modules

**SIMPLE SYSTEM MANAGEMENT**

The open architecture of X-Pact® ProBAS makes it independent of proprietary solutions. That means the automation systems are entirely implemented under logi.CAD on the basis of international standard IEC 61131-3. This is important for international projects and ensures our systems can be updated, maintained, and further developed also by our customers (or: and ensures that either we or you [yourself] can update, maintain, and further develop / improve our systems?). Using logi.CAD is the easiest thing in the

The reflective memory (RFM) architecture supplies all process data to all the sub-systems immediately and simultaneously. This is also how a PDA system can be integrated into the overall array using RFM. It’s one of our principles to react flexibly to customer standards or special requirements, especially for revamps. That's why our solutions easily integrate your existing control systems. Furthermore, other system platforms such as programmable logic control (PLC) can also be included in the X-Pact® system landscape.

**FBD FUNCTION BLOCK DIAGRAM**

The FBD (Function Block Diagram) technology in logi.CAD features the same structure and procedures as the CFC technology (Continuous Flow Chart) used in a PLC programming environment.
MODERN HARDWARE SOLUTIONS

HARDWARE AND SOFTWARE PLATFORM

We use state-of-the-art computer technologies for our Level 1 process regulation in real-time. Equally advanced, ProBAS software takes care of graphic programming and diagnosis. A typical configuration consists of:
- One or more engineering stations (MS Windows)
- An X-Pact® ProBAS development server
- One or more X-Pact® embedded automation PCs

X-PACT® EMBEDDED AUTOMATION PC

X-Pact® Embedded is the SMS Siemag hardware platform for modern, sophisticated control and technological regulation systems in hot rolling. X-Pact® Embedded is based on modern Core™ 2-Duo technology from Intel® and provides maximum computing power to all applications.

It’s an added advantage that X-Pact® Embedded hardware saves space in the control cabinet. A cover on the front of the device protects the drive bays (DVD, HDD) as well as two Compact-Flash ports. Switching between drives is made easy by the modular insertion feature. To make working with this hardware even more convenient, all ports and interfaces are located on the top of the housing. There are no protruding ports at the back which would demand extra installation depth. You can always add modules to the hardware, adjusting it to the complexity of your plant. Whatever the installation situation, you can rely on an array that makes optimal use of the space inside the control cabinet. That’s due to the different capacities of X-Pact® Embedded modules with one, two, or several card ports (for PCI/PCI express cards).

ETHERNET-BASED FIELDBUS SYSTEMS

X-Pact® automation from SMS Siemag supports the latest technology in real-time-capable fieldbus systems. Here are the advantages of an Ethernet-based system over a classic fieldbus solution:
- Much higher performance
- Real-time-capability for fast control
- Extensive diagnosis options
- Wide-scale use with very good acceptance
- Interfaces to classic bus systems

Furthermore, using this technology drastically cuts hardware engineering requirements because for the first time signals for the highly dynamic actors/sensors can be picked up close to the mill by the non-central periphery devices. That eliminates masses of cable as well as the associated adaptation of process signals. The automation systems from SMS Siemag use EtherCAT (from Beckhoff) as a real-time-capable fieldbus. All this goes to show that, with our new technology we harness a modern, powerful and real-time-capable communication medium for our automation systems. Flexible tree structures ensure you can expand the network as you want, when you want.
Typical X-Pact® embedded configuration for a hot strip rolling mill.

**DE-CENTRALIZED SYSTEM ARCHITECTURE:**

- Single CPU-systems (APC: Automation Programmable Controller)
- Only power supply and network connected to the field
- Real-time Ethernet as fast field-bus
- Reduced signal- and HW-engineering
- Highly reduced complexity

An increasing number of suppliers support devices with fast Ethernet interface, e.g. new valve series from MOOG, position transducers by Heidenhain.
ENERGY DISTRIBUTION and DRIVE SYSTEMS

Our Electrics and Automation Division also supplies the equipment for energy distribution and drive technology in hot rolling mills.

SCOPE OF SUPPLY FOR ENERGY DISTRIBUTION

Included in our supply range for energy distribution are high and medium-voltage switchgears, distributor transformers, compensation and filter systems, emergency power generators, USV plants as well as low-voltage main distributors and the associated Emergency Off strategies.

ENERGY DISTRIBUTION FROM ONE SOURCE

We use a single-line scheme to design your energy distribution system. You can also rely on our support in choosing the best method of connection to the integrated network. To determine the necessary filter and compensation plants, we analyze the network. This includes identifying the reactive power requirement and the level of network harmonics. Our in-depth process know-how means we can exactly determine the diversity factors and evaluate pass schedule data. As a result, we can optimally dimension all components, from overhead line feeds to mechanical control elements.

SCOPE OF SUPPLY FOR DRIVE SYSTEMS

Here, we supply all types of drive for hot rolling mills as well as roller table distribution systems. The bottom line for you? Low investment and operating costs due to reduced power dissipation, a smaller footprint, and low maintenance are serious advantages of our energy distribution and drive systems.
Main drives of a rolling mill.

**RELIABLE DRIVE SYSTEMS**

There are a large number of parameters that influence the design of drives, especially in the Megawatt power range. Together with renowned suppliers, we devised and optimized new foundations for these medium-voltage drives. We have also already installed them in several reference plants. Intelligent switching systems are able to reduce the harmonic wave strain on the network side to such an extent that no filters are necessary on this terminal server. These power trains (medium voltage switch, converter transformer, voltage converter, motor) are dimensioned according to the actual process requirements, which can be seen from the pass schedule calculations. Using an optimized transmission of the drives, we ensure you get a plant with maximum flexibility in the design of your production processes.

Included in the X-Pact® electrics and automation package are the technological drive functions. They keep the interface to the drives lean and standardized.
Stability, easy maintenance, no-fuss adaptation to new environments, and top technological performance – that’s what you expect from modern automation systems. This requires a simple yet powerful basis. All X-Pact® automation systems for hot rolling mills are based on our uniform X-Pact® ProBAS system platform. As a result, they readily adapt to different topologies in hot rolling.

What do our automation systems mean for you? To begin with, you can rely on excellent technology and functionality. Other stand-out features of the systems include maximum availability plus a high degree of process automation coupled with effective service functions. There is close coordination between our automation experts and design department to develop and thoroughly test software modules for each mechanical unit.

Furthermore, we have systematically broken down the concept of our automation systems for hot rolling mills into automation product units. Using this modular system, we can put together overall automation system with tried-and-tested sub-units for different system types. The picture on the right shows you the product structure and configuration for the hot rolling mills.

We subdivide our automation systems into these functions:

- Level 1 – Process controls
- Level 2 – Process automation
- Integrated operator HMI system for Level 1 and Level 2 as well as local operating stations
- Safety controls

### Visualisation and operation

#### Level 2 automation

- RM Pass Schedule Call
- Pacing
- Material Tracking

#### Level 1 automation

- X-Pact® ProBAS
- Slab Sizing Press Control
- Roughing Control

### MCC

- Frequency converter
- Local control stations
- Terminal boxes
LEVEL 1 – PROCESS CONTROL

Included in Level 1-automation are rapid-action control loops for the hydraulic control elements, and subordinate process control loops. They are responsible for e.g. width and thickness control, wedge-free and camber-free rolling in the roughing train, cropping optimization, and profile and flatness control. All this ensure smooth operation in the different areas of your rolling mill. You’ll notice that in many improvements, such as stable material flow and efficient functioning of the media systems.

The drive controls include all drive systems that are involved in transporting, rolling and coiling the hot strip.

LEVEL 2 – PROCESS AUTOMATION

Improving the product quality and increasing the productivity and flexibility in production are the main tasks of the X-Pact® Level 2-systems, which are based on mathematical-physical process models. As part of quality assurance, these systems must guarantee the product and production data acquisition of the plant in addition to the process optimization functions. As in the other automation levels, the SMS Siemag Level 2-systems are independent of the hardware structure that is used. Communication with the external systems, such as a cross-plant production planning system or inspection systems, is implemented on a modular basis in order to achieve high flexibility with regard to the different connections.
PRODUCTION DATA CAPTURE AND REPORTING

The production data capture is based on the process events in the Level 1 system. To this end, all products that are located in the system are monitored with their current status in the Level 2 system. This allows plausibility checks to be performed for the production sequence and product-specific values to be specified for the rolling and production process. The relevant production data and product data are saved in a database and can be made available for production evaluations and quality and product reports.

INTEGRATED OPERATOR HMI SYSTEM

Our integrated operator HMI system links the plant and the operator. It maps the rolling process including everything to do with materials and technology. Armed with the information from the process observation, the operator uses the latest graphical methods to manually influence process control or operation of the integrated machine groups such as media plants. In line with our operator-centered approach, our employees work closely with your operating personnel. Involving your team in the Plug & Work tests is another effective way to prepare them for their new tasks.
PROCESS AUTOMATION FOR HOT STRIP ROLLING MILLS

AUTOMATIC WIDTH CONTROL

High accuracy in the strip width saves edge scrap as well as stock and energy. That’s why the purpose of the width control is to obtain a constant strip width over the entire length of the finished strip. Crucial here is that it is as close to the target width as possible. Yet there is no chance of influencing the width in the finishing mill. So you have make sure that the actual width control takes place both in the slab sizing press and in the edger stands of the roughing mill section.

The width control system is a Level 1-function. It is parameterized from the Level 2 PSC® Pass Schedule Calculation pass-by-pass and consists, for example, mainly of these functional modules:

- Edger gap control to adjust the edger roll gap.
- Short stroke control for control for slab tail and slab head ends.
- Compensation of edger stretch.

"material data base’. Also available to you is the set up calculation for the entire roughing mill section. It gives you not only a wealth of data, such as force, torque, speed, thickness, width and slab and transfer bar temperature calculations, but also considers the basic approaches to describe the production condition. The PSC® is adapted pass-by-pass in the roughing mill and feeds width correction information to the pass schedule calculation of the finishing mill. Then the final measured strip width is fed back to the roughing mill section. All this creates a plant-wide control system for high strip width accuracy.

ADVANCED COILBOX CONTROL

As the transfer bars are coiled in the mandrelless coilbox, a heat exchange takes place between the coil windings. As a result, you can count on a more or less constant temperature over the transfer bar length. Our fully automatic coilbox controls ensure optimum coilbox sequencing to maintain the transfer bar temperature. That markedly improves rolling conditions in your finishing mill.

Yet there is even more than an automatic mode. Using our system, you can take over manually at any time if the production situation requires your help. It’s also possible to switch back to automation mode whenever you wish.
CAMBER AND WEDGE-FREE TRANSFER BAR ROLLING

Camberes may form due to thickness wedges in the slab cross-section or asymmetric heating of the slabs. To ensure improved production conditions for the finishing mill, camber and wedge-free rolling plays a vital role in the roughing mill.

![Camber and wedge-free rolling.](image)

Essential for straight transfer bars is an effective interplay between the heavy side guides in front of and behind the roughing mill stand. Just as important here is our hydraulic roll gap adjusting system. The control system for camber and wedge-free rolling (CFR) consists of:

- Roll Alignment Control (RAC) for automatic leveling of the hydraulic roll gap system
- Hydraulic roll Gap Control (HGC)
- Side Guide control
- Interactive control and micro-tracking

THICKNESS AND MASS FLOW CONTROL IN THE FINISHING MILL

We use our Automatic Gauge Control (AGC) in each mill stand to keep the exit thickness constant. That’s because thickness deviations may occur as a result of variations in temperature, incoming thickness, material hardness or width changes. The AGC uses a modern observer control strategy. Using a high-accuracy mill stand stretch model and the measured roll force, we apply the gaugemeter principle to calculate the actual thickness within each mill stand. Then we correct the feed forward from the AGC to the main drives and hydraulic looper to decouple the thickness and tension control. This not only stabilizes the mass flow, which is very important for thin strip rolling. It also avoids thickness fluctuations as a result of roll eccentricities by using special adaptive filtering procedures. The monitor control feeds measured thickness deviations back to the thickness control to finely adjust the final product thickness.

We have also developed a special control technique for Steckel mills. It is applied at the strip head and tail ends to stabilize your products. Unique to this technique is the Steckel looper that optimizes tension control. This increases both the rolling speed and the productivity of your Steckel mill.

ROBUST PRODUCTION CONTROL AND SEQUENCING

What modern hot strip mills need to succeed is not just advanced control technology for prime-quality production, but also the high availability of electrical and automation systems. Equally crucial if you want to boost your productivity is the fault-tolerant handling of unplausible sensor readings.

That’s where our comprehensive monitoring and diagnosis tools come in. They help our maintenance department solve sensor problems like this during ongoing production.
PROCESS AUTOMATION FOR HOT STRIP ROLLING MILLS

STRIP GUIDE CONTROL IN THE FINISHING MILL

RAC Roll Alignment Control

As you know, symmetrical rolling in your finishing mill can be disrupted. That inevitably leads to instability of the rolling process – as a result of:

- Temperature differences on the drive/operator side
- Off-centered strip
- Camber shape of the transfer bar
- Wedge-shaped transfer bar

There is nothing to worry about because our RAC Roll Alignment Control compensates such disturbances. It starts by taking the measured differential rolling force as a basis for calculating the output. The position control then uses this reference value to level the roll gap around the mill center line. Even more: You can also adjust the mill stand leveling setting manually during rolling – at any time.

DTL Differential Tension Looper

Another intelligent solution is our differential tension looper. It responds to the measured average and wedge portion of strip differential tension over the strip width. Here’s how it works: The conventional looper is equipped with load cells integrated in the looper arms. They calculate the average strip tension and the wedge portion (differential tension) from both force signals. These variables then go to the ALC Automatic Leveling Control for roll gap leveling.

ALC Automatic Leveling Control

It’s very important during thin strip rolling that the finishing mill stands level the strip effectively. That stabilizes the strip flow and, in turn, the whole rolling process. Strip flow problems are for example caused by an asymmetrical i.e. unilateral distribution of the strip tension that may lead to unilateral edge waves.

There is only one way at present to avoid these problems. As an operator, you can level your mill stands, i.e. set position corrections with inverse signs for the adjusting system on the drive and/or operator side. But you can only intervene when the strip flow problems become visible, e.g. in the form of unilateral edge waves. The ALC Automatic Leveling Control controls asymmetrical strip tension distribution measured by the DTL Differential Tension Looper.

Tail-end monitoring

The tail-end monitoring function improves rolling stability, especially close to the strip tail end. It gives you recommendations that assist in the pre-leveling of the mill stands – to optimize your strip flow and reduce tail-end cobbles. Then, after the tail end passes through the previous mill stand, the system evaluates this recommendation and visualizes it at the operator HMI for the next strip to be rolled.

PROFILE, CONTOUR AND FLATNESS CONTROL

There has been a huge increase in demands on the profile, thickness, flatness, and surface quality of hot-rolled strip. That’s why we continuously develop our profile, contour, and flatness control technology and improve our mechanical control elements. It features:
CVC-plus work roll grinding with a much larger control range
CVC plus back-up roll grinding to reduce roll wear
Shape-optimized shifting strategies to reduce profile anomalies and extend rolling campaigns
Pass-schedule-free rolling strategies for flexible strip production according to orders in hand

You know how important it is to be able to count on high-performance mechanical control elements. Essential here is the implementation of sophisticated models based on physical and mathematical equations that determine in real time the current strip profile, contour, and flatness according to the operating parameters. What you get with our profile, contour, and flatness control are functions that control work roll shifting and bending for the next strip, as well as solutions that optimize strip profile and flatness along the entire strip length. Considering these advantages, it’s no wonder we have installed our PCFC® automation system more than 100 times to date.

**RUN-OUT TABLE COOLING SECTION CONTROL**

What’s the function of our run-out table laminar strip cooling system? It’s designed to cool down the strip between the last stand of the finishing mill and the down coiler – according to the mechanical strip properties to be produced. Our cooling section technology achieves a very high accuracy in the process control. It is also capable of all the cooling strategies for a wide range of hot rolled products. Finally there is our control system that can be used with many different mechanical designs. Included here is the control of the compact cooling. That’s exactly what you need for adjusting cooling rates to produce e.g. pipe, DQ, high-strength as well as multiphase steel grades.

**COILER CONTROL**

Our process control system for down coilers or up coilers ensures high coiling quality. It helps you for example with new wraps as the first windings are coiled. Right there, directly above the front edge of the strip, you may find that considerable forces occur in the stock and in the mechanical equipment. They lead to severe loads on the mechanical equipment and marks on the strip during initial coiling. Our step control ensures you avoid most of these disadvantages. Here’s how: It all starts before the front strip edge reaches the position of a wrapper roll. Now the roll is raised by slightly more than the strip thickness and placed down again after the front edge has passed through. The other rolls follow the same procedure in sequence. This means that, while one of the rolls is being retracted, the other rolls hold the strip as it is wrapped. This procedure is repeats itself until strip tension has been built up and the rolls have been pivoted to their outer end position.
LEVEL 3 – PRODUCTION PLANNING SYSTEM

Today, there is a constantly growing product variety, while customers expect ever shorter delivery times for top product quality. That demands meticulous planning of your production processes. What’s more, you need close links to the production systems of suppliers and customers so you can react quickly to changes.

Development here focuses on “Real Time Enterprise” (RTE), a method that checks and responds to these changes in real time.

The restrictive factors are the technical and technological limits of the plants, which we have to take into account during program planning. That, in turn, creates a demand for comprehensive production planning systems.

X-PACT® LEVEL 3

X-Pact® Level 3 provides plant operators with all the tools necessary for planning and control of the production process in metallurgical plants and rolling mills. An effective link between the commercial side of the business and the technological process automation systems, Level 3 production planning offers you these advantages:

- Maximization of overall production rate
- Planning and minimization of inventories for interim products
- Uniform, multi-plant product tracking
- Cumulative quality control up to final quality approval
- Increase of delivery date compliance

MANUFACTURING ORDERS

You can rely on our systems to convert customer orders into technically executable manufacturing projects. According to customer specifications, an extensive calculation model generates the manufacturing data for the product ordered.

- Definition of the necessary production steps and possible plant alternatives
- Definition of the dimensions and quality of the initial and intermediate products
- Planning of the output of every production stage to determine the necessary quantities of input material
- Definition of sampling and test regulations
THE FACTORY MODEL

A uniform planning system covering all areas is based on a factory model. The factory model is implemented in the planning system as an electronic planning table.

PRODUCTION PLANNING

It’s vital to determine the doable delivery dates for all manufacturing orders in advance. That’s where our capacity and deadline planning comes in, examining all the plants and plant alternatives available. As a result, you get a sequence plan for the individual plants as well as a plan of the available input materials for each manufacturing order.

QUALITY TRACKING

There is a data exchange between the Level 2 systems of the overall plant and the Level 3 system. That means Level 3 is informed at all times about every production step and the product quality after each step. Inspection and lab data add to the accuracy of the result. This forms the basis for quality approval of the final products before delivery.
SAFETY STRATEGY

Improving machine and plant safety is becoming more and more important – worldwide. Legislation and standards demand the protection of people and the environment.

Essential for safe plant operation is a coordinated approach during planning and design. Together, the engineering and electronic systems form the main elements in our safety strategy:

- Layout of the danger zone
- Risk assessment
- The electro-mechanical function „safety”
- Emergency Stop strategy

The danger zone layout divides the plant into various danger zones. It indicates all the plant-related safety equipment as well as the plant limits.

The risk assessment identifies and evaluates all the possible hazards inherent in a plant, and describes the necessary precautions.

There is also an in-depth Emergency Stop plan drawn up for each plant.

Together with our customers, we worked out a practical solution with the safety control functions operating independently from the machine controls. This strategy also complies with all safety laws and standards. Better still, it reduces the time and cost of testing, documentation, and commissioning. The safety control functions are extensively tested early on, during the Plug & Work process.

(DIN) EN ISO 12100: Safety of machines -
   Type A standard
   - Basic terms, general principles of design;
   - Basic terminology methodology
   - Part 2: Technical principles

(DIN) EN ISO 13849:
   Type B standard
   - Safety-related parts of control systems
   - Part 1: General principles of design
   - Part 2: Validation

(DIN) EN ISO 13850:
   Type B standard
   - Emergency Stop, principles of design

(DIN) EN (IEC*) 60204-1:
   Type B standard
   - Electrical equipment of machines;
   - Part 1: General requirements

Machine safety.
Extract from a danger area layout.

Separation of safety functions and control functions.
Our long-established Plug & Work service is increasingly popular with our customers. Central to Plug & Work are production simulations that mimic reality down to the smallest detail. Today, due to our long-standing experience in engineering and process technology, we know exactly how processes behave and what regulators achieve which product qualities. Our simulation system maps this complex interplay of variables for exhaustive tests of your system.

**MODULE AND INTEGRATION TEST**

Plug & Work starts with module tests that put the individual hardware and software components through isolated function checks. Next, integration tests examine the fault-free interaction of the modules. Unlike other suppliers who usually wrap up the pre-testing and resume only after the entire plant is finished, we use this valuable time to the benefit of our customers. Here’s how: We install the entire automation system in one of our test fields and connect it up to a simulation system. Finally, all that’s left to be done is to set up the customer-specific construction models of the plant including the kinematic and dynamic parameters of the plant behavior and the sensors. This is how we build a computer-aided simulation model to test the operating and process behavior of your plant.

The result: The operator feels he is working on the actual plant – all the operational procedures and processes are visualized in real-time. He can control production virtually, but also learn maintenance routines. Using this hands-on method, we fine-tune the automation system in advance so you benefit from smooth running and perfect operability.

The solution palpably reduces commissioning times, as well as on-site corrections. Your operators appreciate the real-life training opportunity provided during testing because it’s an ideal way for them to prepare for their future work on the plant.

**TRAINING**

Intensive training of your personnel on your new, complex systems is a priority for us.

First comes the theory in the classroom, where our expert employees pass on their know-how to your personnel. Also available for them is detailed training material, so if necessary they can look things up later.
We always organize an extra instruction session for the manufacturer’s experts to explain the operation and maintenance of the measuring systems installed in our automation solutions. After this thorough grounding, we train your operators during the Plug & Work phase.

Only then do we follow up with on-site training at the construction location. It’s standard procedure for us to include your employees in plant commissioning, and as a result they get to know the systems and processes on the ground.

Each training module builds on the last so that by the end of commissioning your staff will be able to operate the plant reliably and independently. If faults occur, they will know how to pinpoint the cause and what to do about it.
MODERNIZATION STRATEGIES

SMS Siemag has developed a strategy that ensures production continues throughout alteration or modernization work. Compared with conventional methods, it gives you a much higher protection against failure, shorter commissioning time, steeper run-up curves, and therefore an early return on investment.

GOOD REASONS FOR REVAMPS

- Improved product properties
- Better production/productivity
- Reduced production costs
- Increased availability
- Replacement of old systems

SMS Siemag revamp strategies utilize all aspects of modern metallurgical automation systems:

- Integration of new process technologies
- Reproducible process sequences
- Improved ergonomics and safety technology
- Replacement of obsolete systems
- Proven quality of product properties using technological values in the entire process

PROCEDURE

These are the main steps in a revamp project:
Current state analysis, adaptation to plant operating procedures, conversion work planning, if necessary a switch-over plan, plant test, re-commissioning, and optimization.

CURRENT-STATE ANALYSIS

The first step to successful modernization is an in-depth assessment of the current state of the automation system. Included here is an examination of the sensory systems installed, to find out whether they can be re-used. This check simultaneously determines how new sensory and measuring systems can be installed. Significant here is that the current state analysis examines all the relevant electrical and automation system components as well as the complete technological process sequence.

The second key stage is considering and selecting interfaces to the automation systems and IT infrastructure that are to stay in place. Essentially, the knowledge gained here goes into a motor and component list, a technological process description, and a documentation of the interfaces for each conversion phase.

ADAPTATION TO THE OPERATIONAL PROCEDURES

It’s quite normal that, over time, all plants develop their own standard operational procedures. These SOP need to be carefully examined during the current-state analysis. They are identified and documented on site in cooperation with the operating and maintenance crew. Taking this as a basis, SMS Siemag and the people who work on the plant develop and agree on the new procedures.

PLANNING THE CONVERSION PHASES

Together with you, we plan the phases for the major conversion stages of mechanical, media, and electrical systems. These plans are mapped out in detail prior to the individual conversion steps.

Here again you benefit because maximization of operations carried out in parallel before, during, and after production standstills minimizes overall stoppage times. Then, according to pre-defined milestones, each standstill is tracked and if necessary re-planned by expert construction managers working hand-in-hand.
SWITCH-OVER PLAN

Simply switching the signals at the interfaces is the easiest way of changing plant operations over from old to new automation systems. That's what we do during the modernization standstill – we shift the field signals from the old to the new automation system. Invaluable here is that, in the course of maintenance standstills before the conversion, individual functions can be tested in advance. However, changeovers during standstills have a certain finality. It's almost impossible to change back to the old plant.

What we usually suggest, especially in the case of complex interfaces and production-critical plant parts, is a switching plan. It allows testing of partial functions of the new automation system over several planned maintenance standstills prior to the conversion standstill itself. Furthermore, the electronic version of the switch-over plan makes monitoring operation possible. This is how the relevant data and signals from the existing automation system are aggregated and evaluated by powerful monitoring systems.

In highly critical cases, the switch-over technology is designed so that the entire plant can be switched over from the old to the new automation system without any major production interruption. This is where our tried-and-tested PIOS system is invaluable.

We cooperate closely with you to choose the switchover plan, taking into account all the economic and technological aspects.

RE-COMMISSIONING

The steps described above reduce many of the risks inherent in conversions. You can rest assured that, due to our long-standing experience in commissioning metallurgical plants, we can get your plant up and running again within a minimum timeframe. The high point of the whole project is the plant run-up after the revamp. Yet, before this happens, we team up with you to carefully plan production of the material quality and dimensions you require. The data recorded during monitoring operation is applied to pre-optimize our process models, clearing the way for immediate production start with saleable product quality.

What's more, you can rely on comprehensive support, starting with continuous assistance during run-up, through to technology support from our development departments. Sometimes, both sides recognize the potential for joint further development and sign a cooperation agreement that might even lead to exciting innovations! Many successful projects confirm the effectiveness of our revamp strategies.
SERVICES

COMMISSIONING

Right from the start of the Plug & Work tests, our experienced engineers are on the spot in the test field. As the final stage of the Plug & Work test, when the scope of supply and functioning has been confirmed, they test the automation to make sure it’s perfectly ready for commissioning.

Essentially, commissioning on site consists of the following stages:

- Cold commissioning
- Hot commissioning
- System optimization during production
- Performance tests

Cold commissioning

Included in cold commissioning are all the activities necessary for rolling the first strip. It concludes with the first strip.

Hot commissioning

This starts with rolling the first strip. It’s the phase when all the mechanical and electrical functions are tested under load to check that the open and closed-loop controls are working properly.

Optimization of the systems during production

This is when the parameters of all the systems are adjusted to ensure the new facility achieves the required performance.

Performance tests

Finally, a test program we run through together with the customer demonstrates that the plant meets the contract specifications.

AFTER SALES SERVICE

Whenever you need us, we are always there to help – and it shows: in the form of our after sales service. This keeps you in touch with our expert know-how.

Specially developed for X-Pact® Electrics and Automation, the ServicePortal SP/1 from SMS Siemag gives you special access to fast fault remedy.

Right from the start of commissioning, we set up a service portal for optimal plant support. It ensures stable, protected communication between your and our own networks. Via this portal, the SMS Siemag experts access your plant’s automation system to give you immediate support in the form of remote diagnosis and maintenance – worldwide and from day 1.

ADVANTAGES OF THE SERVICE PORTAL

Some 70 percent of faults can be corrected immediately. Alternatively, faults are isolated. Take for instance faulty parts. Our experts can usually identify them online, possibly deactivate them, and send a service technician to replace them on site.
We manage the entire order documentation in detailed Excel-based spreadsheet. It comes complete with a table of contents that gives you an easy and immediate overview of the complete documentation. All the necessary documents, such as function descriptions, circuit diagrams, and operating instructions are saved in this list at one central, structured location. Also integrated are all the documents generated throughout the project. That means every documentation transfer gives you the full current status in electronic form.

The spreadsheet itself contains all the necessary information on each document, e.g. file format, print format, language, version, and life cycle. All you have to do is to go straight to the center of the program, and you’ll find the document you want very quickly, then simply click on a link to open it. This is how the operator finds his operating manuals, the maintenance employee the data sheet for a sensor, and the programmer the software details for the automation. Furthermore, once the project is completed, you can continue the documentation yourself and administer new documents or document versions.
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.