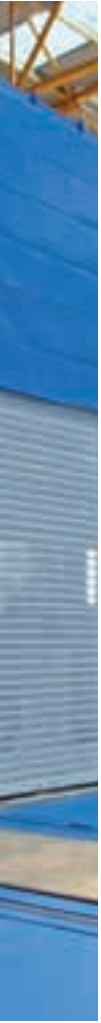


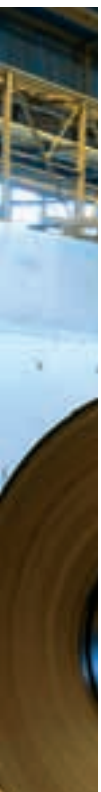
ROLLING & PROCESSING >



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- 1 Tandem cold mill at voestalpine Stahl, Austria
- 2 Roughing mill entry at the Arcelor Mittal Poland hot-strip mill
- 3 Hot rolled coils at the hot-strip mill Hadeed, Saudi Arabia
- 4 Downcoiler pulpit at a hot-strip mill

High performance with new technological packages

Fountain of Youth For Strip Rolling

The slump in sales at iron and steel producers calls more than ever for solutions to modernize facilities or individual production steps with a short payback period of up to two years. Technological packages are perfectly suited for upgrading hot-rolling and cold-rolling mills; they improve the competitive situation of steel producers, which in turn influences their product mix as well as their ability to reduce operation and maintenance costs.

More than ever, the payback period and the long-term positive effect on competitiveness are decisive factors for modernization projects for strip-rolling mills. The evaluation of the most effective measures requires continuous and detailed reporting and data logging in regard to costs, consumption figures, maintenance, process data and product-quality data – and detailed knowledge about the interdependencies of all these aspects. Consolidation steps in companies may even lead during times of big overcapacities to mill extensions, which require debottlenecking studies. If the most effective cost-reduction measures are not obvious, Siemens VAI rolling-mill experts are ready to provide studies when, for example, production planning for smaller order lots, yield improvement or product-mix extension to new grades are under investigation. Examples for such steps are the production of X80 to X100 on a hot-strip mill (HSM), which can call for additional requirements in the coiler area. Or the extension of harder materials in a reversing cold mill or tandem cold mill, which possibly needs higher rolling forces and torques.


Strengthening competitiveness with technology packages

Siemens VAI has developed several technology packages especially dedicated to the modernization of existing mills. Here it is essential to shorten the standstill times of the mill when installing the new equipment. This can be realized by offline assembly and pre-testing of the components in the workshops. The components and line concepts for hot-rolling and cold-rolling mills follow standardized modules that are optimized in terms of delivery time, functionality

and complexity. The packages comprise know-how and expertise in process technology, layout competence, mechanical equipment, electronics, hydraulics, drives and automation systems as well as turnkey competence from Siemens VAI's in-house resources. They have been proven in several modernization projects with specific improvements according to the needs of the customers. Many of these achievements, now combined, were developed or introduced together with leading steel producers around the world. Today, Siroll^{CIS} HM and Siroll^{CIS} CM are the most comprehensive collection of technological and control components for hot rolling, pickling and cold rolling.


- The roll-gap lubrication package is applied to improve the strip surface quality by reduced roll cracks and roll peeling. Roll-gap lubrication also has an impact on the rolling force. The significant reductions of the roll-force level can lead to decreased work-roll wear and reduced energy consumption. Roll-gap lubrication is based on the application of water-oil dispersion to the upper work roll of the finishing mill stands. Wiper modifications ensure that the system works effectively. Process-parameters adjustments and the influence of lubrication are carried out and monitored by a fast data-monitoring system. Typically the roll-gap lubrication system is applied in mill stands No. 2 and 3 and the modular design of the system allows a later extension for other mill stands.
- Cooling package: The successes of new materials are accompanied by an increase in the requirements that are placed on steel. Precise and highly flexible control of the cooling process in the cooling section is therefore extremely important. The Siemens VAI strip-cooling package was developed >>

Siroll^{CM} HM – Modernization packages



Furnace area, roughing mill, transfer table	Finishing mill	Laminar cooling, coiler and transport
Descaling Edger and width control Hydraulically controlled side guides at the roughing mill stand Coilbox Encopanelns	Crop-shear upgrade Hydraulic automatic gauge control (AGC), Booster AGC Shifting & bending (SmartCrown, L-block) Work-roll cooling Work-roll barrel lubrication	Upgrade laminar cooling & microstructure target cooling Hydraulically controlled side guides at the downcoiler Pinch-roll polisher Power Coiler Sample-taking station Coil transport
Automation systems, Mill audits and studies Strengthen drive system (motor, gears, etc.) Plant safety		

Siroll^{CM} CM - Modernization packages



Line entry, pickling, coupling	Mill stand area	Mill exit
Entry package Welding package Entry coupling Scale breaker Side trimmer Pickling-section upgrade	AGC/Booster AGC package Mill conversion with X High Flatness-quality package Active-chatter damping package Strip-cleanliness quality package Roll-change package Drive-train upgrade	Exit-section upgrade
Level 1 and 2 automation systems Mill audits and studies Upgrade to endless rolling Plant safety		

- >> for the production of advanced steel grades such as HSLA, IF, DP, TRIP or pipe grades on hot-strip mills. This package is based on laminar cooling/turbo laminar cooling, quick switch headers, intensive cooling or microstructure target cooling. While the laminar cooling with turbo cooling headers achieves a higher throughput and the quick switch cooling headers take care of higher accuracy in the coiling temperature, the intensive cooling is specially designed for the requirements of advanced steel grades.
- The flatness package includes all required mechanical actuators, control and measurement systems to ensure highest flatness performance. Depending

on mill type and product mix, the mill stands are equipped with work-roll bending and shifting, SmartCrown® work-roll contour and multi-zone cooling. The flatness control system features self-learning parameter optimization for adaptation to the rolling conditions and material properties. To complete the package, Siemens VAI can either use the contactless Siflat system or the Planicim® flatness measurement roll depending on technical and ambient conditions.

- Third octave chatter is a self-excited vibration phenomenon common to practically all tandem cold mills. With the use of the new Siemens VAI anti chatter damping, system no speed reductions are

required, which usually leads to a reduced mill throughput or chatter marks that worsen the strip surface quality. Additionally, overall vibration of mechanical components is reduced, which leads to a longer lifetime for some mill components. If a customer is interested in operating a chatter-free mill, third octave vibrations can actively be damped by a specially designed high-speed servo valve, which has a unique dynamic behavior and was developed in a cooperation involving MOOG and Siemens VAI. This specific high-speed servo valve and acceleration sensors are directly mounted and integrated in the AGC cylinder.

- The drive package comprises all mechanical, electrical and automation components of the whole drive train for mill stands or coilers. It consists of a medium-voltage power supply and harmonic filters, the drive transformer, the drive system (Sinamics) and contactors, motor, sensors and brakes, reducer or pinion gear, couplings, spindles and torque limiters (e.g., shear pins). Siemens VAI can act as a supplier for mechanical, electrical and automation systems for the drive train, putting us in the position to avoid risks in project execution and to reduce project execution time. Depending on the targets of the project, the scope of the package will be adjusted.
- The safety studies and safety package is a standardized methodology to design and implement safety solutions as required according to local regulations. This approach is divided into three steps: The first step is a safety study for which Siemens VAI conducts a risk analysis in cooperation with the customer. A concept study has to be prepared by an expert team consisting of electric and automation, hydraulics, mechanics and safety specialists with the support of an external institute. This concept is then approved by the legal authority in cooperation with the customer and builds the foundation for the second step, which concerns the actual offer for equipment and installation based on the concept study. Step three is implementation and it includes supply and installation of equipment and automation systems according to the contract, validation of control-based safety solution for automation and hydraulic, and the whole documentation including safety instructions.

Typical modernization projects

Although business in recent years was strongly focused on new mills, Siemens VAI has an interesting record of modernization projects. These include a very big extension for a relocated HSM from Europe



New PLTCM linked to an existing pickling line at Corus, Netherlands

to China, new downcoilers in a HSM for high-strength steel grades, the installation of new tandem cold mills behind existing pickling lines as well as smaller packages like the connection of pickling lines and tandem mills, coiler modernizations, and AGC and flatness packages. Recent modernization projects include:

- Major upgrade of a relocated hot-strip mill at Jiangshu Shagang Group Co. Ltd., in China
- Installation of the new Siemens VAI Power Coiler for improved coiling of thick-gauge and high-strength steels at the ArcelorMittal hot-strip mill at Fos-sur-Mer, France
- Major expansion of hot-strip mill capacity and mill features at Hadeed, Saudi Arabia
- New bending blocks and finishing mill upgrade at the Sail Bokaro hot-strip mill, India
- New tandem cold mill for a linked pickling line and tandem cold mill (PLTCM) with existing pickling line for Corus, IJmuiden, Netherlands
- Flatness package for the reversing cold mill at Duferco Coating, Beautor, France
- Coiler packages for ArcelorMittal, Saint Chely, France
- New downcoilers for the HSM at voestalpine Stahl, Austria
- Cooling-section upgrades to microstructure target cooling at several plants, such as TKS Hoesch Hohenlimburg, TKS Beeckerwerth and ArcelorMittal Iscor
- Plant upgrades to Siroll^{CIS} automation solution in TISCO HSM1, Corus IJmuiden and Baosteel HSM1, among others
- Crop shear for voestalpine Stahl, Austria
- Roughing mill and Power Coiler for Severstal, Russia
- Hot-coil transport system for Dunaferr, Hungary ■

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