

Steckel Mills – Creative solutions for the metal industry



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SMS group GmbH draws on a long history as a partner of the iron, steel and nonferrous metal industries. It began as early as 1856 when a predecessor company built the first rolling mill. Since then, we have developed into a global-player group. That's how decades of know-how and experience have merged into a performance and innovation strength that shapes the future, yet builds on corporate tradition.

This has coincided with steady progress in the steel industry and its production processes in recent years. Next in line were more efficient and eco-friendly technologies that have replaced traditional methods. We played our part in this transformation with market-leading innovations.

Today our group holds a leading position in international machinery and plant construction for the steel and non-ferrous industries. We have systematically expanded our product range, so now it covers the entire process chain of metallurgical plant and rolling mill technology – from steelmaking plants and continuous casters through hot and cold rolling mills to strip processing.

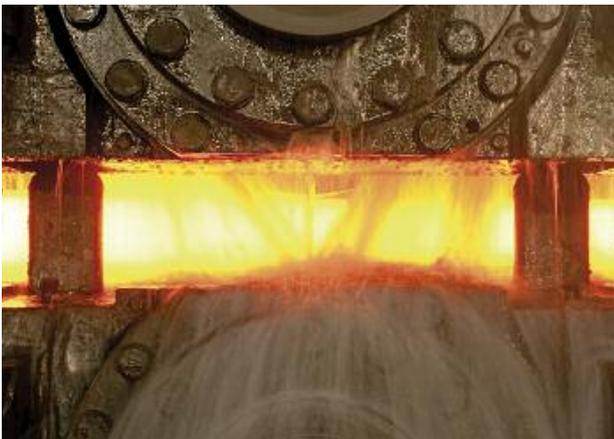
Tippins Technologies was founded in 1923 as Tippins & Springle, Inc. Initially, the company focused on buying and selling as well as modernizing used plants. However, since

the early 1960's, it has specialized in building and revamping Steckel and CoilPlate® mills, and has made a name for itself in this field worldwide.

SMS group specializes in the supply and modernization of Steckel mills for the ferrous and nonferrous industries. Since 2005 it combines the technologies of SMS group and Tippins to provide the world's best Steckel mill technology. Even more, it boasts the longest reference list of Steckel mills around the globe. Included in the product range are literally all steel grades from carbon steels to stainless steels to super alloys in sizes from medium strip to wide coil plate.

As an added extra, you receive a valuable key to the success of your project. Typically, SMS group applies its creativity to solve complex problems – yours too. What you get is an array of solutions that meet your technical requirements as well as your budget.

SMS group offers you mechanical equipment complete with the latest process automation systems, electrical controls and fluid systems designed as units that complement each other. That means you can expect plants that produce first-class products at competitive costs.



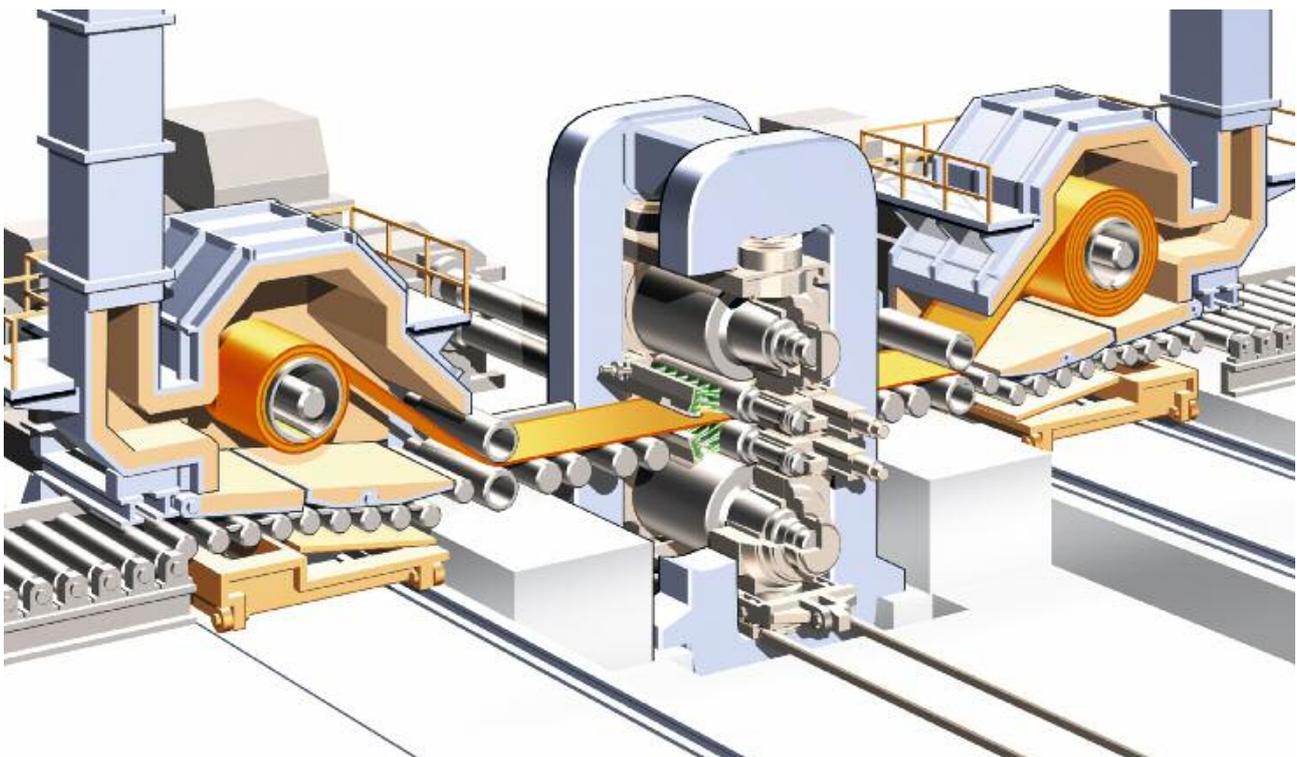
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Whatever your goal – whether improved product quality, enhanced productivity or the capacity to manufacture higher added value products, the experience and know-how of SMS group are vital to your success.

Here is what you will gain:

- Coordinated planning and design of the mechanical equipment, the fluid systems, the foundations and the electrics and automation
- Manufacturing, assembly and tests in our workshops
- Installation, technical assistance for installation and commissioning
- All-inclusive project management from the planning phase to final approval

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Steckel mills

The classic Steckel mill configuration consists of a rougher with an attached edger that jointly roll out slabs to transfer bar thicknesses of 25 – 45 mm. Next, a four-high reversing stand rolls the transfer bar to the desired finished strip thickness in 5 – 9 passes. To keep the material hot during the rolling process, the strip is coiled after each pass and transported into one of the two Steckel furnaces arranged on the entry and exit sides. The heat in the furnaces maintains the strip temperature at a high level.

This plant configuration is ideal for the cost-effective production of hot strip with an annual capacity of 100,000 – 1,000,000 t. Worth noting is that the roughing stand is not necessary if medium-thickness slabs are used.

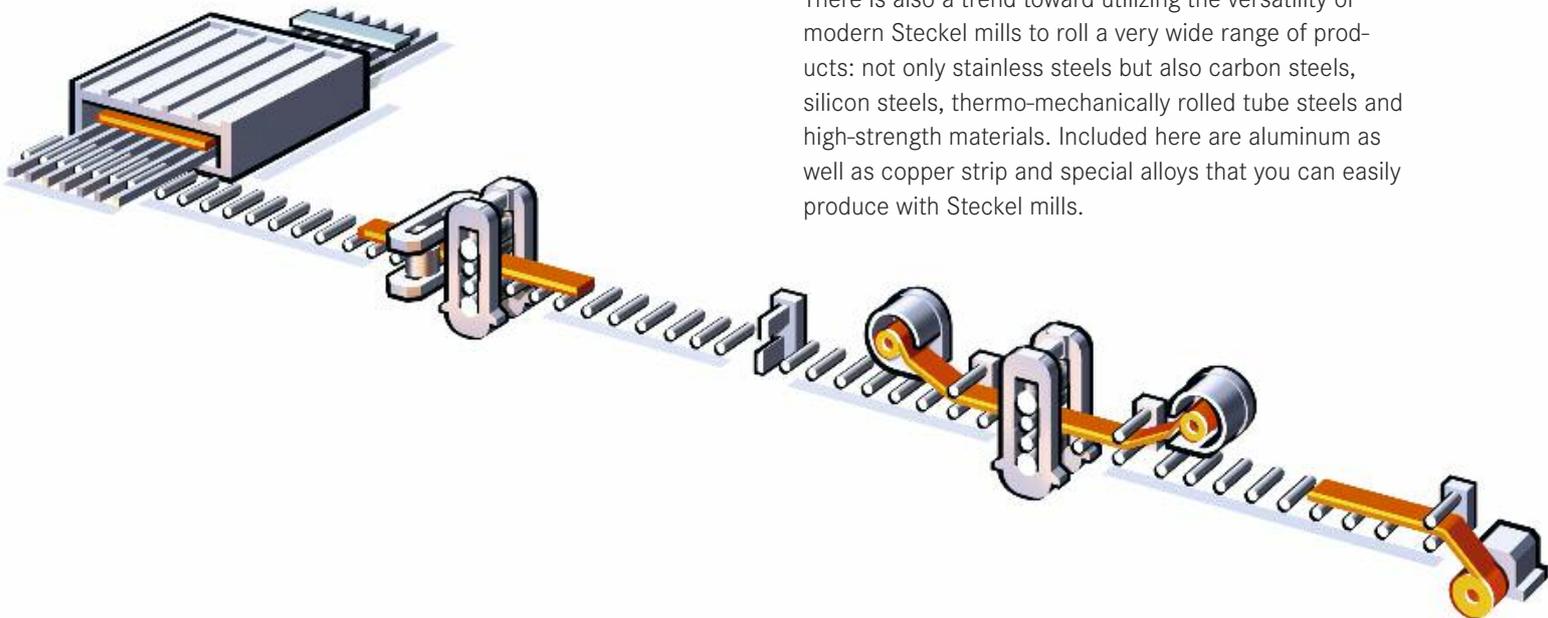
State-of-the-art actuators such as hydraulic cylinders for thickness control, CVC plus® technology and negative work roll bending for controlling profile and flatness are used in today's Steckel mills to achieve product tolerances comparable to those of modern conventional hot strip mills.



Steckel mill stand Outokumpu Avesta, Sweden.

You can see quite a lot of Steckel mills featuring this kind of configuration that we successfully built in recent years for the cost-effective production of stainless and acid-resistant stainless steels.

There is also a trend toward utilizing the versatility of modern Steckel mills to roll a very wide range of products: not only stainless steels but also carbon steels, silicon steels, thermo-mechanically rolled tube steels and high-strength materials. Included here are aluminum as well as copper strip and special alloys that you can easily produce with Steckel mills.





Coiler of Steckel mill Salem, India.



Steckel mill Allegheny Technologies, USA.

Steckel mill Baoshan Special Steel Branch (BSSB), China.

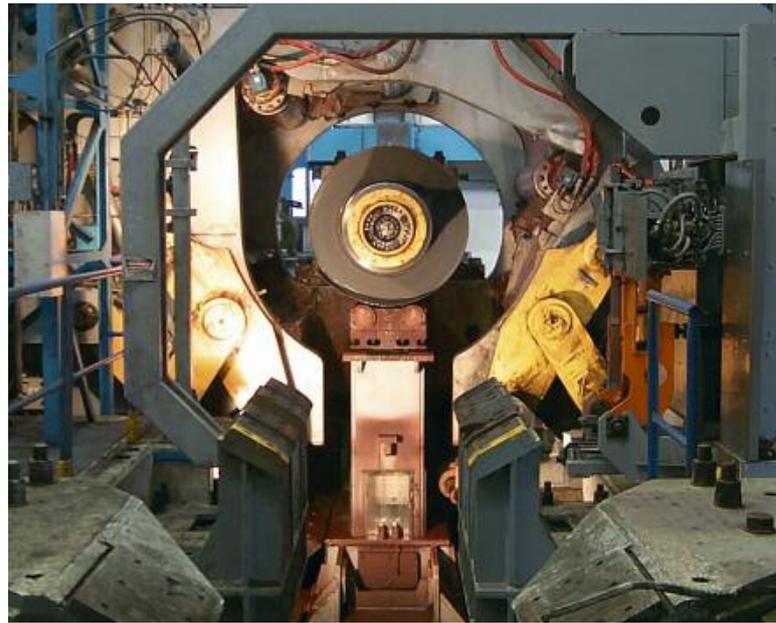
Since 1991 SMS group has installed and commissioned a total of five Steckel mills.

Twin-stand Steckel mills

Twin-stand technology gives you the capacity to produce high-quality thin-gauge hot strip on Steckel mills at production rates of 1 – 1.5 million t per year. That's because we combined Steckel technology and tandem rolling to create a mill that can economically produce the full range of thin gauge materials – all this at production rates suitable for mini-mill requirements.

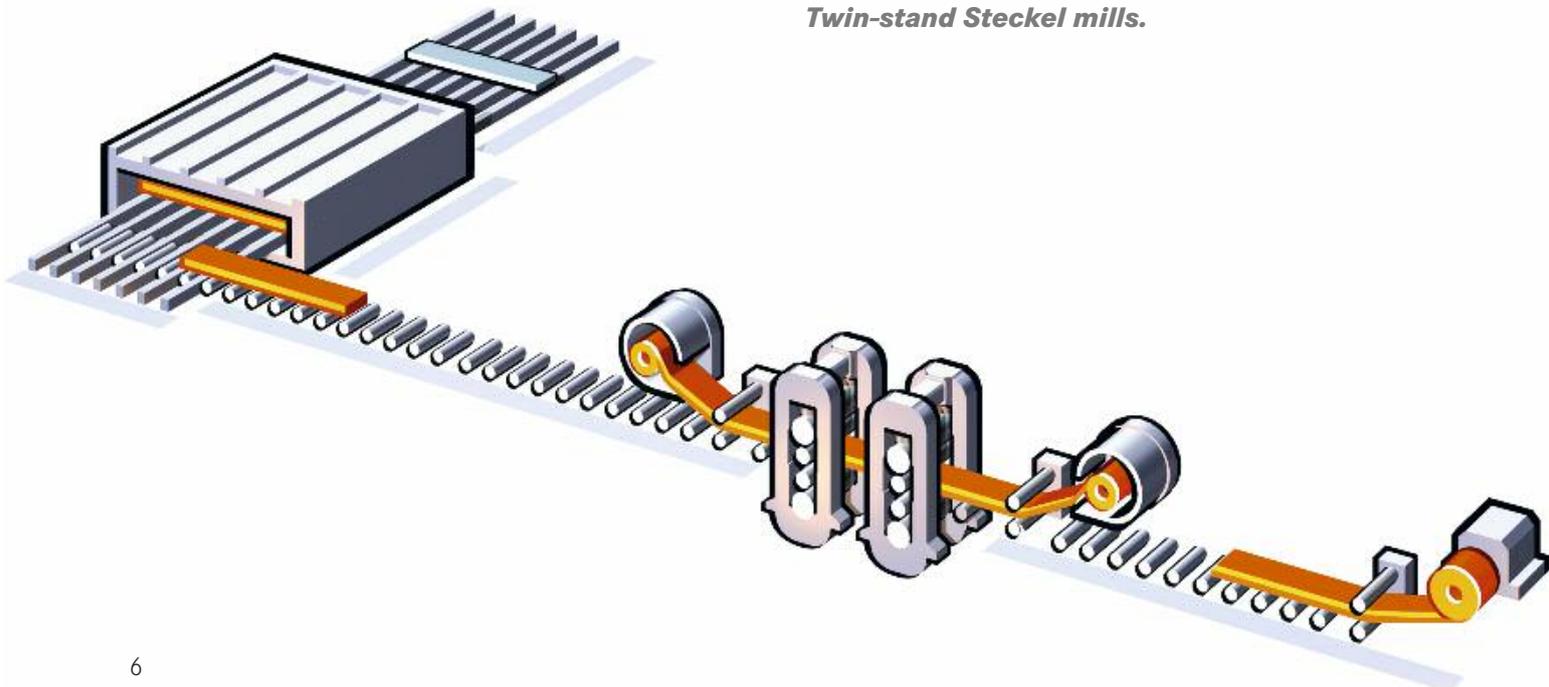
On twin-stand Steckel mills you can produce a wide range of carbon steels and stainless steels in excellent qualities but in smaller quantities.

The SMS group Twin-stand mill is a flexible solution you can integrate into your metallurgical facility. Use it either to roll slabs from a conventional continuous caster, or connect it directly to an intermediate thickness slab caster.



Twin-stand Steckel mill, coiler.

Since 1991 SMS group has installed and commissioned a total of three Twin-stand Steckel mills.





*Twin-stand Steckel mill
Maghreb Steel, Morocco.*



Twin-stand Steckel mill Kunming, China.

CoilPlate® and combined Plate/Steckel mills

CoilPlate® mill operational modes

We upgraded the CoilPlate® process in recent years from a simple Steckel process for broad products into a combination of conventional plate rolling plus the advantages of the Steckel process applied to plate. A CoilPlate® mill produces plate in three distinct modes:

Discrete plates

In this mode, the mill rolls smaller slabs into discrete plates just like a conventional plate mill. Some mills include the capability to cross-roll in order to produce plates wider than the casting width of the continuous caster. This mode is ideal for rolling thick plates and for thermomechanically controlled rolling of API grades. You can use the SMS group CoilPlate® plant to manage several thermomechanically rolled plates in the plant simultaneously and fully automatically.

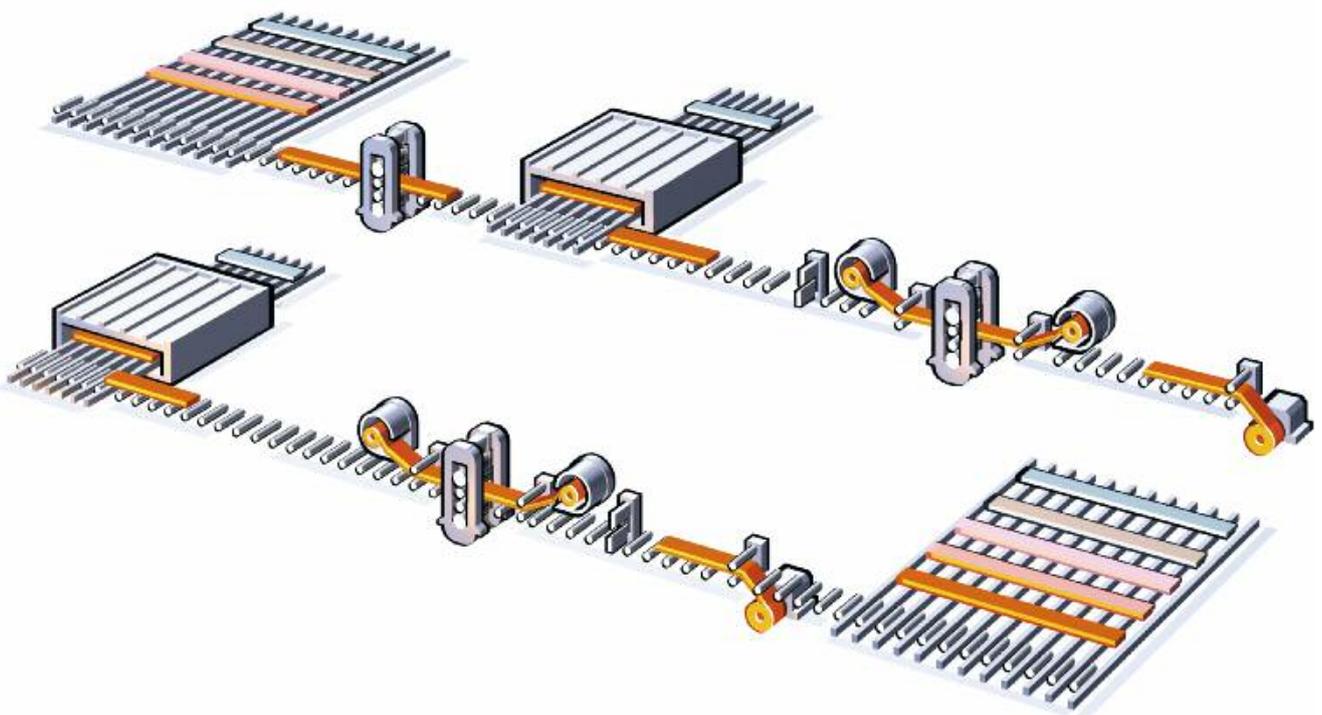
CoilPlates

In this mode, the mill uses jumbo slabs as the starting material. It operates like a plate mill for the initial flat passes and then as a Steckel mill during finish rolling. Cropping and crosscut shears installed on the cooling bed cut the plate into cooling bed lengths, then they are transported to a conventional plate mill finishing line.

Coils

In this mode, the mill also uses jumbo slabs. The rolling process is largely identical with the previously described mode. However, after the final pass, the plate is cooled to the required temperature in a laminar flow cooling system and then coiled to produce a wide hot band coil.

Since 1991 SMS group has installed and commissioned a total of 11 CoilPlate® and combined Plate/Steckel mills.





Ipsco, USA.



Cooling bed Ipsco, USA.



Downcoiler Oregon Steel, USA.

Modernization

Converting plate mills into CoilPlate® mills

There are already several plate mills that SMS group has successfully converted into CoilPlate® mills. We carried out these conversions with minimal interference in production. Now these mills can still roll discrete plates as before. However, due to the upgrade into CoilPlate® mills, it was possible to add a whole new range of products. Now these plants can produce coils, plus they can roll thinner plates. Equally important here is the increase in production capacity by 40% and more as well as a better yield.

Perhaps you are wondering where these improvements come from. Simple: the operators are now able to produce large coils and longer mother plates. Obviously, using longer slabs also improves furnace hearth coverage.

CoilPlate® plants are excellent for rolling API X grades utilizing controlled rolling.

Conversion into a CoilPlate® plant involves adding two Steckel furnaces, two pinch roll units, one laminar flow cooling system and one downcoiler to the plate plant.



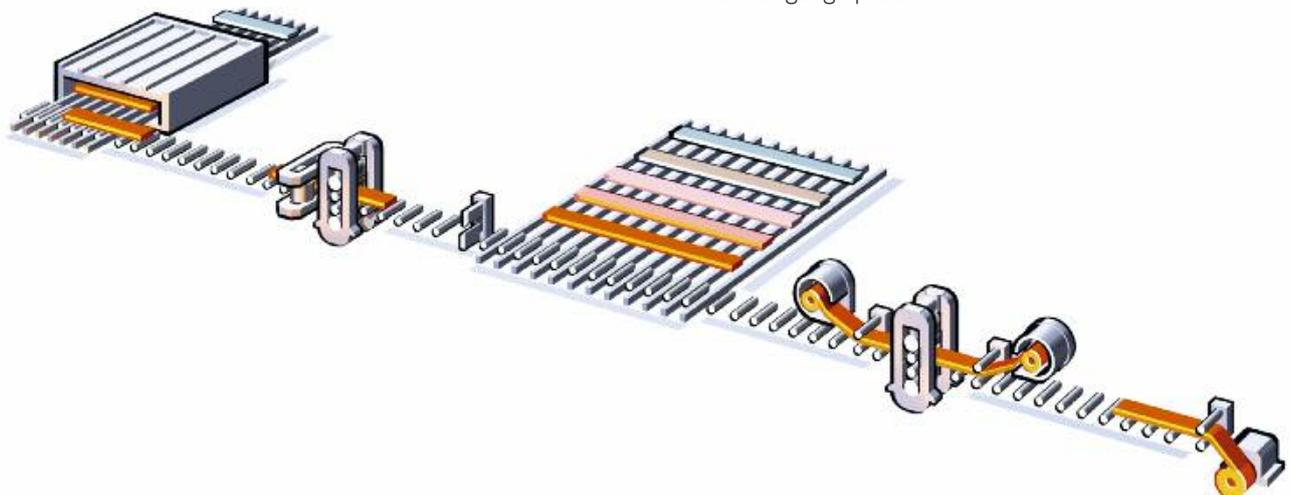
Converting into CoilPlate® mill LPN, Thailand.

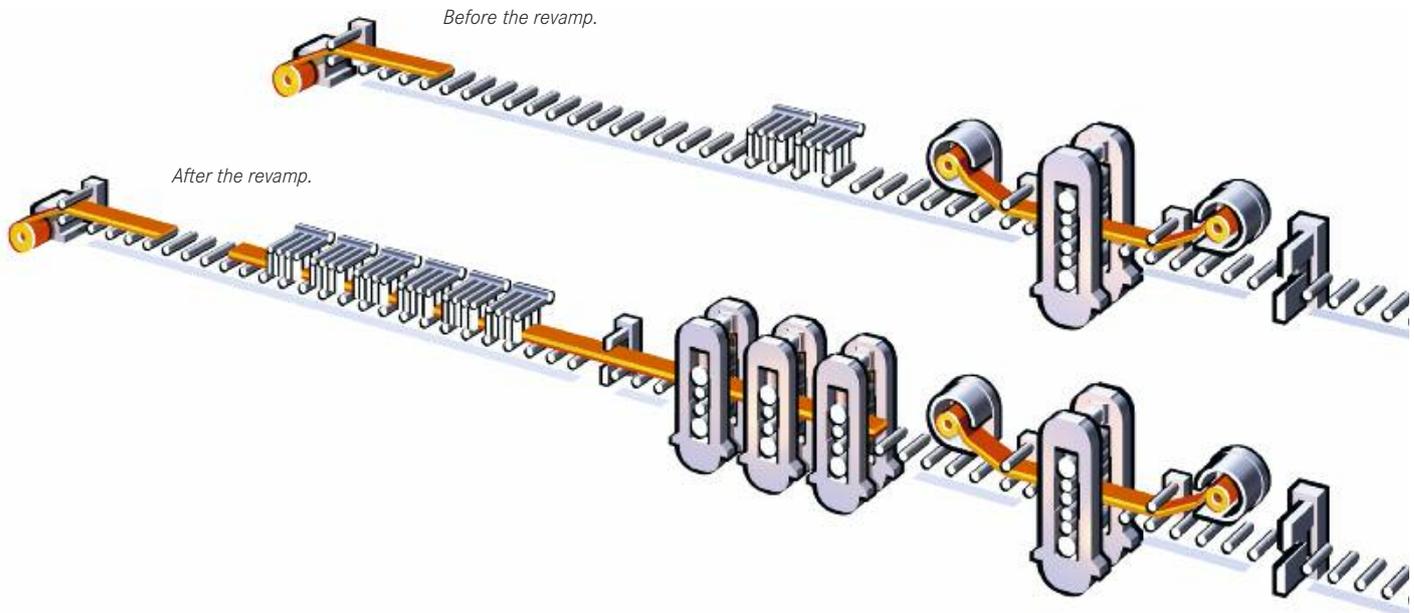
Also included are the associated electrical, fluid and automation systems. It is no problem to prepare the installation of the new equipment alongside the existing plant, then to integrate it during a regular maintenance shutdown.

The Steckel furnaces used to keep the plate ends hot during rolling can be designed stationary or movable out of the line.

This is what you gain from conversion into a CoilPlate® mill:

- Higher production rate
- Better plate yield
- Improved quality
- Thinner-gauge plates



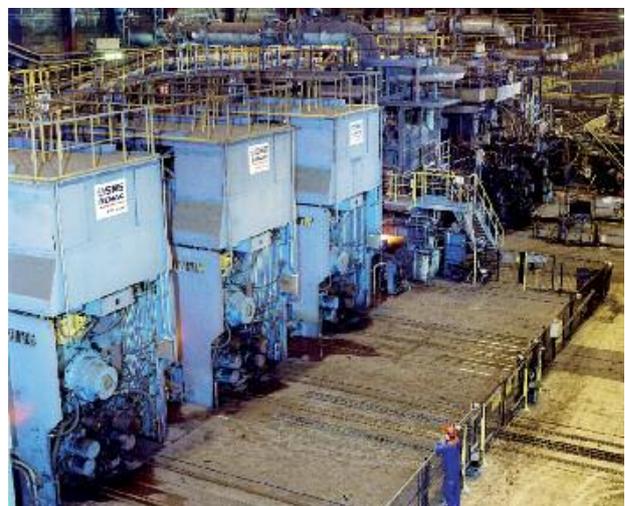


Outokumpu Steckel mill in Finland

One highly unconventional revamp was the upgrade of the Outokumpu Steckel mill in Finland. It was our customer's goal to double the production capacity of its Steckel mill from 0.8 million t to 1.6 million t/year.

This increase in production could only be achieved by installing extra finishing stands downstream of the exit-side Steckel furnace. Additionally, we replaced the coiler with a hydraulic coiler featuring step control, and installed a new laminar cooling system. The new stands were completely assembled and piped beside the mill, and were then shifted into the line on top of a foundation block. Thanks to this revamp concept, the complex expansion of the rolling facility could be implemented during the mill's regular, several days' maintenance shutdowns.

Today the plant mainly produces in combination mode. Specially upgraded for this particular configuration, the SMS group pass schedule model and the profile, contour and flatness model calculate the setting values for the roughing train, the Steckel stand, the new finishing stands and the coiler. Close thickness tolerances at the strip ends underline the quality of the Level 2 system.



Modernization Outokumpu, Finland.

Modernization

Steckel mill Outokumpu, Avesta, Sweden

Outokumpu Stainless in Avesta decided in 2000 to team up with SMS group to carry out an extensive modernization. The company's goal was a significant increase in product quality, productivity, availability and maintainability of the Steckel mill.

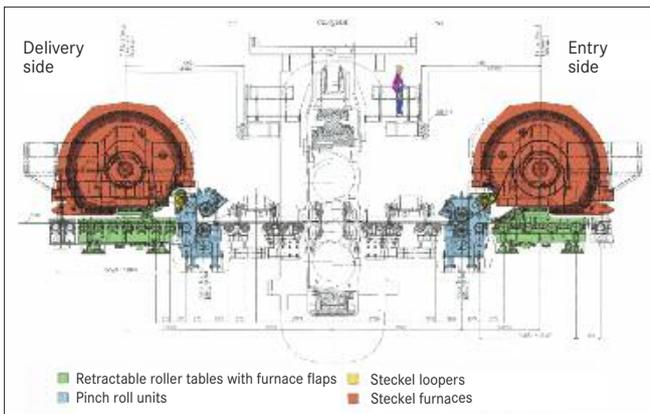
To increase product quality, we had to improve the thickness tolerances, the profile and the flatness. That required a new dynamic thickness control system as well as a revamped profile and flatness model. SMS installed newly developed pinch roll units with special loopers and introduced corresponding tension and strip flow control systems to achieve much more constant strip tension.

Now, after installation of the looper, higher rolling speeds are no problem. Another factor that impacts on productivity is the flow of the strip ends. We implemented a strip steering control system specially developed for the Steckel process that also helped stabilize the rolling process.

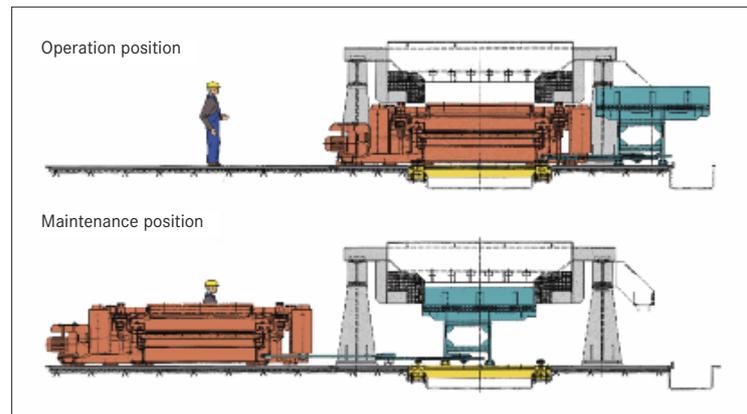


Modernization Outokumpu Avesta, Sweden.

The mill's availability and maintainability were markedly improved by installing retractable roller-table segments underneath the Steckel furnaces. Access to the pinch roll units and furnace rolls is much better when the roller tables are retracted. Maintenance of the roller tables and furnace flaps can be done outside the heat radiation zone of the Steckel furnaces.



Upgrade concept.



Retractable roller table.

Service



There is a special focus at SMS group on you, the customer. After all, your success is our success. However, it can only be sustained if a first-class product is also backed up by first-class service. This is becoming an increasingly crucial factor that affects purchasing decisions and customer loyalty. So we devote just as much care and innovative energy to the services as to our entire product range. Here again, our top priority is to ensure our services seamlessly mesh with your wishes.

The service components are available either individually or in packages. Our own Technical Service Division with experienced service specialists is your contact point, wherever you are in the world. Also available is a 24/7 hotline for rapid troubleshooting.

The advantage for you is optimal plant availability, low costs, and a head start on the market.

Service based on a system

Consulting and auditing

Consulting services aimed at giving you an edge over the competition and preserving the capability of your plants over their entire life cycle. Our audits detect weaknesses and identify savings potentials.

Spare parts management, inspection and repair service

Preventive maintenance of plant components secures all technical functions. It is supplemented by a sophisticated spare parts management with pre-configured, tested spare parts for the entire process chain and guaranteed delivery times.

Integrated Maintenance Management System (IMMS)

Specially designed for metallurgical and rolling mill plants, IMMS supports all aspects of maintenance management. That's how the system increases your plant efficiency and availability.

Technological control and Level 2 systems

We ensure the constant availability of all automation systems we supply by providing a combination of on-site support, hotline and tele-service.

Training

Our qualified training courses with a focus on practical work cover all areas of production and maintenance. They run on site, at cooperation partners' facilities, or in SMS group training centers.

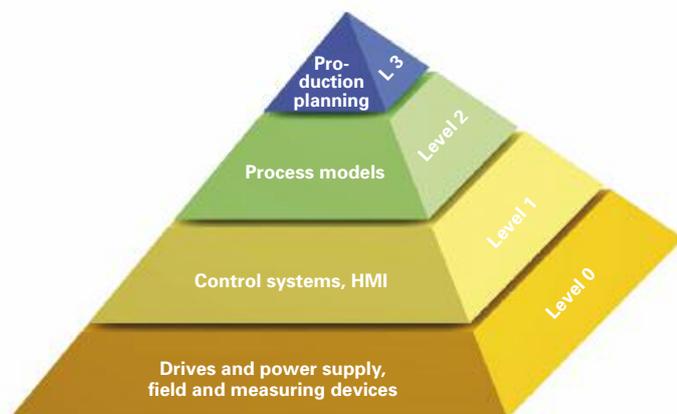
Electrics and automation

Mechanics and automation from one source

Rapid project completion, steep run-up curves and high reliability along with permanent availability right after commissioning – these are the advantages you as a plant operator value most.

It goes without saying that meeting these demands depends on the quality of all the plant components. Yet just as crucial is the seamless integration of mechanics, technology, electrics and automation. That is why interdisciplinary cooperation and the coordination of all plant components as part of our mechatronics approach are standard practice at SMS group.

While, in the past, our focus was firmly on the mechanical components, SMS group has adapted in response to customer requirements. Today the company is an all-inclusive supplier of integrated solutions. You can see this most obviously in the field of automation, where we have steadily expanded our expertise in recent years to meet your demands for all-round solutions.



X-PACT® as a market-oriented package

X-Pact® smoothly meshes the various levels of electrics and automation. It is a clear structure which means X-Pact® can coordinate all processing levels in the metallurgical and rolling mill industry. So mechanics, electrics, hydraulics, sensorics and all automation levels right up to production planning combine to create an effective, modular unit. This leads to another advantage of X-Pact®, because the modular design enables you to flexibly modify the system structure or add to it quickly as you require. That's how the system permanently meets the demands of your production. Furthermore, X-Pact® automation controls turnkey all-inclusive plants just as perfectly as stand-alone or partial plants. This capability of X-Pact® to adjust to your specific demands is reflected in the various X-Pact® configurations for different plant types.

Technological highlights

So how exactly does X-Pact® automation guarantee the rolling stability of a Steckel mill? It allows for the broad and specific product ranges produced on these plants. For instance, the pass schedule calculation feature draws on an extensive material database as well as a work hardening and softening model. These mathematical models and databases are the result of many years of technological analysis and practical experience. They guarantee the necessary roll gap adjustments even for the cold strip ends that are a feature of Steckel mill rolling.

These systems, combined with our special, observation-supported thickness control and roll alignment control for a symmetrical roll gap, achieve a high stability of the rolling process and therefore reliable production.

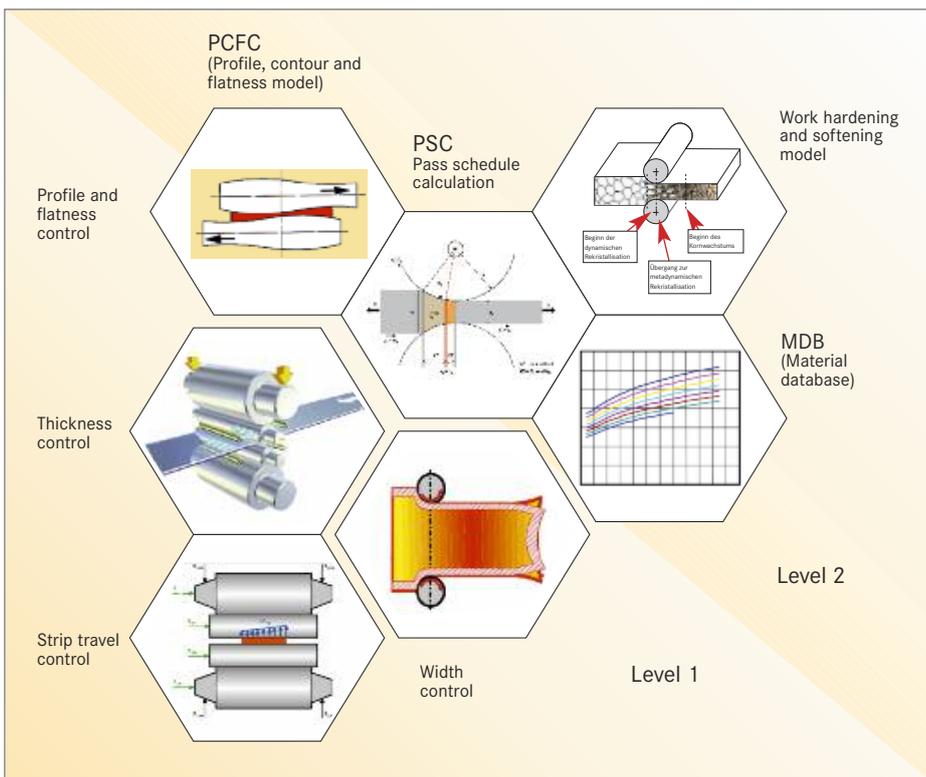
**Plug & Work
for increased customer benefits**

You gain from Plug & Work because your entire automation system is pre-installed at SMS group. That includes everything from the measuring and control technology through the computer systems to the process models. Then, using the actual data from the planned plant, we perform all the control and operational tests.

Here is what this means for you:

- You save a great deal of time, because the system tests allow for initial approvals even before commissioning.
- You benefit from rapid commissioning, because no test runs are required on site.
- You can give your staff hands-on training on the “real” plant control system.

Since 1994 SMS group has installed and commissioned a total of 14 integrated plants with electrics and automation.



Technological highlights.

SMS group GmbH

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