STECKEL MILLS – Creative solutions for the metal industry
SMS Demag AG draws on a long history as a partner of the iron, steel and nonferrous metal industries. It began as early as 1856 when a forerunner 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-molding innovations. Today our group holds a leading position in international machinery and plant construction for the steel and aluminum 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.

STECKEL MILLS – Creative solutions for the metal industry
To pool their activities in Steckel and CoilPlate® mills, **SMS Demag and Tippins** founded **SMS Demag Tippins LLC** in 2005.

SMS Demag Tippins LLC, headquartered in Pittsburgh, Pennsylvania, USA, specializes in the supply and modernization of Steckel mills for the ferrous and nonferrous industries. You gain a great deal from this joint venture. Why? Because it combines the technologies of SMS Demag 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 Demag Tippins 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 Demag Tippins 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.

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 Demag Tippins 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, installation monitoring and commissioning
- All-inclusive project management from the planning phase to final approval

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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 and CVC plus® technology 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.

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.

**REFERENCES**

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<tr>
<th>Customer</th>
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<tbody>
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<td>SAIL (India)</td>
<td>1995</td>
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<td>Outokumpu Stainless (Finland)</td>
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<td>Columbus Stainless (South Africa)</td>
<td>1982</td>
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<td>IPSCO (Canada)</td>
<td>1979</td>
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<td>Mario Maraldi (Italy)</td>
<td>1979</td>
<td>500,000 t/year</td>
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<tr>
<td>Oregon Steel (USA)</td>
<td>1978</td>
<td>500,000 t/year</td>
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<tr>
<td>Allegheny Technologies (USA)</td>
<td>1977</td>
<td>250,000 t/year</td>
</tr>
<tr>
<td>Mittal Canada (Canada)</td>
<td>1967</td>
<td>650,000 t/year</td>
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* After modernization 1,600,000 t/year
Steckel mill Salem, India.

Coiler of Steckel mill Salem, India.

Steckel mill Outokumpu Avesta, Sweden.

Steckel mill Allegheny Technologies, USA.
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 Demag Tippins 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 as part of a TSP® (Tippins Strip Process) plant.

REFERENCES

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<td>Kunming Iron &amp; Steel (China)</td>
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<td>1,200,000 t/year</td>
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<td>Mittal Steel Ostrava (Czech Republic)</td>
<td>1999</td>
<td>1,000,000 t/year</td>
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Twin-stand Steckel mill, coiler.
Steckel mill Mittal Steel Ostrava, Czech Republic.

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 Demag Tippins 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.

REFERENCES

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<th>Customer</th>
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<td>Stelco (Canada)</td>
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<td>Ipsco Steel (USA)</td>
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<td>LPN Plate Mill (Thailand)</td>
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<td>Oregon Steel (USA)</td>
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<td>900,000 t/year</td>
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<td>PT Gunung Raja Paki (Indonesia)</td>
<td>1996</td>
<td>500,000 t/year</td>
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<td>Industeel, Arcelor group (Belgium)</td>
<td>1992</td>
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<td>Nucor Steel Tuscaloosa (USA)</td>
<td>1985</td>
<td>750,000 t/year</td>
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<td>Highveld Steel &amp; Vanadium (South Africa)</td>
<td>1984</td>
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<td>Haynes International (USA)</td>
<td>1983</td>
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TSP® and CSP® PLANTS

TSP®

The Tippins Strip Process (TSP®) is a revolutionary technology for producing hot strip on a mini-mill scale. It is a patented process that combines a medium thickness slab caster (thicknesses of 90 – 150 mm) with a Steckel-type rolling mill to produce a hot strip facility with modest capital expenditure. So, if you are a mini-mill producer, you can adopt this technology to get into the market for flat products (annual production 0.4 to 1.5 million t/year) at low cost.

A TSP® facility consists of four basic components:
- Steelmaking / ladle refining
- Continuous slab casting
- Slab equalizing/reheating
- Hot rolling

REFERENCES

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<tr>
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<td>Mittal Steel Ostrava (Czech Republic)</td>
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<tr>
<td>Ipsco Steel (USA)</td>
<td>1997</td>
<td>1,180,000 t/year</td>
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Your benefits from a TSP® facility:
- Easy integration into mini-mills
- Energy saving due to high hot charging proportion
- Low capital cost
CSP®

Here is another highly cost-effective plant type for you because it combines the CSP® process with the Steckel process.

CSP® casters cast thin slabs with thicknesses of 50 – 70 mm, then cut them to the length you require.

Next, the downstream equalizing furnace heats the thin slabs to the hot-rolling temperature of approx. 1,100° C.

The thin strips are transported with a very even temperature out of the equalizing furnace, through the high-pressure descaler and into the Steckel mill. Depending on the annual production level you want, the Steckel mill is built with one stand or two as a twin stand version.

Significant here is its low investment cost and a much lower energy requirement compared to the conventional process. That’s why this highly economical plant type is also ideal for integration into mini-mills. Equally useful, it can be used to extend the product range of larger mills by special steel grades or sizes.
CONVERTING PLATE MILLS INTO COILPLATE® MILLS

There are already several plate mills that SMS Demag Tippins 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 by 40% and more as well as a better yield.

Perhaps you are wondering where these drastic 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. 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
One recent, 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 drastic 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 flow cooling system. The new stands were substantially 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 in the summer and winter.

Today the plant mainly produces in combination mode. It rolls thicker strips (> 5.5 – 7.5 mm depending on the width) in tandem mode. Specially upgraded for this particular configuration, the SMS Demag 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. Minor thickness deviations at the strip ends underline the quality of the Level 2 system.
Outokumpu Stainless in Avesta decided in 2000 to team up with SMS Demag to carry out an extensive modernization drive. The company’s goal was a significant increase in product quality, productivity, availability and maintainability of the Steckel mill.

Equipped with the existing technology and after a series of optimizations, this mill had reached its limits in terms of both product quality and productivity. It was only possible with a large-scale revamp of the mill and the automation systems to achieve any further upgrade, including better availability and easier maintenance.

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 Demag 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.

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 deflector rolls is much better when the roller tables are retracted. Maintenance of the roller tables and furnace flaps can be done outside the radiation zone of the Steckel furnaces.
Modernization Outokumpu
Avesta, Sweden.
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 Demag.

While, in the past, our focus was firmly on the mechanical components, SMS Demag 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.

The founding of the SMS Demag Tippins joint venture specifically enhanced our technology and automation know-how for Steckel mills.

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.

REFERENCES
integrated plants with automation

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<td>Yieh United (Taiwan)</td>
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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 Demag. 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.
There is a special focus at SMS Demag 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 under our X-Cellize® brand name as to our entire product range. Here again, our top priority is to ensure our services seamlessly mesh with your wishes.

That’s why X-Cellize® is made up of service components 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.

**X-CELLIZE®:
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 Demag training centers.
MEETING your EXPECTATIONS

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