

The new cold-rolling complex at Shougang Shunyi

A Reliable Partner For the Entire Production Chain

In May of last year, Beijing Shougang Co. Ltd. started operations in a new production complex northeast of Beijing. The Shougang Shunyi cold-rolling project is one of Shougang's key projects involving relocation, structural adjustment and environmental protection. Siemens VAI equipped the production systems of the whole process chain – from cold rolling to strip processing – with automation and drive systems.

China's megacities are facing a dilemma: On the one hand, they need millions of tons of steel every year in order to build car bodies, office towers and shopping centers, power plants and bridges, and metro lines and housing. On the other hand, steel production places a big burden on the environment. As a result, the newly industrialized country is locating production facilities in less heavily polluted areas and equipping them with environmentally friendly technology.

Shougang, headquartered in Beijing, is one of the the largest steel producers in China. The company operates production facilities in and around Beijing. Within the framework of measures to improve air quality in Beijing, Shougang moved production facilities to new locations in the Hebei Province. In addition, all production capacity for the supply of raw materials and parts for the automotive companies in greater Beijing have been relocated from the city center to a new location, Shunyi district, northeast of China's capital city.

The new production complex – comprised of a continuous pickling line tandem cold mill (PLTCM) with a capacity of 1.8 million tons per year, one continuous annealing line (CAL) with a capacity of 950,000 tons per year, and two hot-dip galvanizing lines (CGL), CGL 1, designed to produce 475,000 tons and CGL 2 for 370,000 tons of cold strip per year – will be used

for processing low-alloyed, cold-rolled carbon steels for high-quality car-body parts.

All these plants are automated on the basis of the product Siroll^{CIS} from Siemens VAI comprising the technological control system, the entire process automation and the whole drive system. Siemens VAI was also responsible for supervision of installation work, commissioning and customer training.

The challenge: Highest productivity at high plant availability and environmental protection.

What were the main decision criteria from Shougang to select Siemens VAI as single source supplier?

According to Mr. Ma Jia Ji, the general manager of the Shunyi plant, Shougang cold-rolling group, a lot of criteria lead to the decision placing the order with Siemens VAI as single-source supplier. Below the most important factors:

- Competence in Process technology
- Competence in Electrical and Automation systems
- Excellent reference situation especially in China
- Involvement of local resources during engineering and commissioning





Example of Siemens VAI coupled pickling line



High-capacity quality products

Quality Report Shougang PLTCM

Coil-ID.: 0830385411030_1
 Alloy code: SPHC
 Entry thickness: 3,14 mm
 Exit thickness: 0,72 mm
 Strip width: 1285 mm
 Start time: 14:08:24 11.07.2008
 End time: 14:14:10 11.07.2008
 Valid length: 3436 m
 Evaluation:
 • Tolerance limit (thickness deviation): 95.40 %
 • Percentage inside tolerance limit: 99.52 %

Continuous Pickling Line / Tandem Cold Mill

Annual capacity: 1.8 million tons
 Material: Hot-rolled strip, low-carbon steels and high strength
 Strip thickness:
 • Entry: 1.60 – 6.00 mm
 • Exit: 0.20 – 2.50 mm
 Strip width: 800 – 1900 mm
 Coil weight entry: 38 tons max
 Running speeds:
 • Entry: 700 m/min
 • Pickling section: 230 m/min
 • Trimming section: 260 m/min
 • Tandem entry section: 260 m/min
 • Tandem exit section: 1470 m/min
 • Cutting speed: 300 m/min

- >> • Strong local after-sales service
- Reducing of spare parts due to harmonized equipment over all plants
- Availability of spare parts of China

Continuous Pickling Line/Tandem Cold Mill (PLTCM)

The facility consists of two uncoilers, a tension leveler, a turbulence process section, side trimmers and three loopers as well as a 5-stand tandem mill featuring a 6-high design with intermediate roll shifting, roll eccentricity compensation on stands 1 to 4 and flatness measurement and control on stand 5. The finished strip is fully automatically wound up onto a carousel reel. Further components include the fully automatic coil conveyers at the entry and exit site. The automation system is linked to the superordinate production-plan system (level 3).

The plant is automated on the basis of Siroll^{CIS} CM comprising the technological control systems and the entire process automation. A central component for the plant is the thickness-control system based on an advanced mass-flow concept. This guarantees compliance with very fine tolerances such as those demanded by customers in the automotive industry. The online rolling-process control function of the process automation system calculates set points for the operating parameters of the rolling plant on the basis of analytical, mathematical models during ongoing production. Self-learning neuronal networks carry out the adaptation of the models to the respective production conditions, thus enabling flexible production planning. Due to the optimized interaction of exact process models and fast closed-loop control systems, it is also possible to roll critical sections of strip at the weld-seam sections in fully automatic mode with minimum losses in terms of time and material.

Technological controls and process models are the core of the sophisticated automation concept.

Continuous Annealing Line (CAL) and Continuous Galvanizing Lines (CGL1 and CGL2)

The processing lines consist of two uncoilers each. Before the annealing furnace, the band is freed of impurities and mill residues in a cleaning area. The recrystallization annealing is realized with the help of vertical annealing furnaces outfitted with modern fast-cooling facilities. In both galvanizing facilities,



Continuous Annealing Line

Annual capacity:	950,000 tons
Material:	Cold-rolled strip, soft steel and high-strength steel products
Strip thickness:	0.30 – 2.50 mm
Strip width:	800 – 1870 mm
Coil weight entry:	38 tons max
Running speeds:	
• Entry:	700 m/min
• Furnace:	420 m/min
• SPM:	820 m/min
• Side Trimmer:	820 m/min
• Exit:	820 m/min

Continuous Galvanizing Line 1

Annual capacity:	475,000 tons
Material:	Cold-rolled hard coil of CQ, DQ, DDQ, EDDQ, SEDDQ & HSS
Strip thickness:	0.40 – 2.50 mm
Strip width:	800 – 1870 mm
Coil weight entry:	38 tons max
Running speeds:	
• Entry:	240 m/min
• Furnace:	180 m/min
• SPM:	210 m/min
• Exit:	240 m/min

Continuous Galvanizing Line 2

Annual capacity:	370,000 tons
Material:	CQ, DQ, DDQ, EDDQ & HSS
Strip thickness:	0.20 – 1.60 mm
Strip width:	800 – 1520 mm
Coil weight entry:	35 tons max
Running speeds:	
• Entry:	240 m/min
• Furnace:	180 m/min
• SPM:	210 m/min
• Exit:	240 m/min

with the aid of a coating weight gauge and an air knife, the thickness of the galvanization is fully automatically regulated. In order to reach the necessary deep drawability, flatness and finish quality, the continuous annealing line is equipped with a 6-high stand, and the galvanizing facility with a quarto stand and a tension leveler. The finished product is fully automatically coiled onto two coilers. The entry and exit coil



Mechatronic knowledge for optimized performance with Siroll^{CIS} Siflat flatness measurement and control



Shougang PLTCM – TCM entry section

transport and coil tracking is fully automated and linked to the superordinated production-planning system (level 3).

For the new lines, Siemens VAI supplied all the drive systems as well as the basic and process automation, including the technological control systems for the built-in skin-pass mill stand and the tension leveler. All main and auxiliary drives are based on AC technology. They feature among others a compact design, low noise emission, uniform parameterization over the entire product line and ease of maintenance. In addition, the projects include HMI equipment with user-friendly process and plant diagnostic functions.

Automation will be provided in the form of the Siroll^{CIS} PL automation concept for strip processing lines on the basis of Simatic S7 programmable controllers.

Standard application modules will be widely used for programming. This will facilitate commissioning and maintenance. As a special technological highlight, Siemens VAI is equipping the skin-pass mill stand of the annealing line with the Siroll^{CIS} Siflat contactless flatness-measurement system. This system reliably ensures that narrow tolerances – especially demanded by customers in the automotive industry – are not exceeded, thus ensuring quality and that no damage is done to the surface of the strip, for example scratching.

Excellent leadership during commissioning and final acceptance test

There is a long history between Shougang and Siemens VAI. Presently Siemens automation and drive equipment is installed and operated in most of the plants at Shougang. To ensure direct, fast and single-point communication with the customer, Siemens China appointed a single contact person for Shougang.

Thanks to the commitment, the experience and know-how of Siemens VAI – and despite difficult conditions – the project goals could be met to the customer's complete satisfaction. The basis was bundling know-how in the product family Siroll^{CIS}, the dedication of experienced commissioning personnel, and project management on location taking over during commissioning and acceptance tests. According to the general manager of Shougang Shunyi Cold-rolling, Mr. Ma Jia Ji, these aspects guaranteed a successful closing to the project. In particular, he stressed the technological competence of Siemens VAI as well as local presence in Beijing. Together, this assured customer-oriented processing of the project as well as efficient after-sales service of the facility after commissioning.

Siemens personnel based in Beijing and Shanghai accomplished around a third of the commissioning work for the facility. For Shougang this has the advantage that the entire Siemens know-how is quickly available close by well into the future. By using Siroll^{CIS} modules, fewer spare parts need to be kept on hand, and when spare parts are needed, they can be sourced locally.

As a basis for later life-cycle service, a remote-access system was already installed at the beginning of commissioning. This remote-access system allows a connection to be established between the plant network and the Siemens VAI worldwide engineering and service/maintenance specialists, who are ready to provide quick help 24 hours per day. ■

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