

New coupled pickling line and tandem cold rolling mill at Tangshan Steel – 21 months from contract to coil

Primetals Technologies Austria has designed, built and commissioned a combined pickling line and cold mill for Tangshan Iron and Steel Group Co., Ltd in 21 months. Such a short timescale was aided by close co-operation throughout the project between Primetals and Tangshan Steel engineers.

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Fig 1 First cold-rolled coil produced at Tangshan Steel

In April 2013, a contract for the supply of a cold mill complex in Tangshan was signed between Primetals Technologies Austria and Tangshan Iron and Steel Group Co, Ltd (Tangshan Steel) – a member of the HBIS Group, China's largest steel producer. The clear target for the new mill was to produce the highest-quality cold-rolled coils for the automotive industry in the shortest time possible. This ambitious undertaking was met with flying colours: the first coil being produced on 15 January, 2015 (see Figure 1), just 21 months after contract signing.

High-quality steel coils are increasingly in demand from China's automotive industry, so to meet this trend, Tangshan Steel launched a project to extend its existing cold rolling and strip processing facilities with the new Cold-rolling Complex No. 2. The project comprised a coupled pickling line and tandem cold rolling mill (PLTCM) with a rated capacity of 1.6Mt/a, a continuous galvanising line capable of processing 440,000t/a, and a continuous annealing line for the treatment of 750,000t/a. The complex also includes a new roll shop and an acid recovery plant for the pickling of more than 2Mt of steel strip per year.

KEY FEATURES

Hot coils at the entry of the PLTCM range in width from 700 to 1,620mm with a thickness of 1.5 to 6.0mm. The galvanising and annealing lines accept strip with widths from 700 to 1,600mm and thicknesses from 0.2 to 2.5mm. The cold rolling mill was designed and built in a 5-stand, 6-high configuration and features the SmartCrown intermediate roll-shifting system for flatness control. Work roll and intermediate roll bending complement the flatness actuator systems on all mill stands. Stand No. 5 is additionally equipped with a multi-zone cooling system.

In order to cope with the upper level of advanced



🕒 Fig 2a Construction activities in the cold mill complex area

high-strength steels, each mill stand is capable of exerting a total rolling force of 35,000kN. The total installed mill stand power is 32,000kW. At the mill exit, a carousel tension reel is mounted below the strip passline. With this arrangement, finished strip can be inspected in the inline inspection station on the basis of inspection samples cut by a rotary shear downstream of stand No. 5.

PROJECT EXECUTION

A remarkable aspect of this project was the extremely short execution period of only 21 months from contract signing to the first coil. *Figures 2a to d* give a flavour of the construction process. A smooth transition from the pre-project to the project phase and a strong focus on an optimised supply and engineering concept with a large share of local manufacturing were decisive for this achievement. Primetals Technologies China held sole responsibility for Chinese equipment supply, which further expedited project progress. Minimum transportation times were achieved, which was crucial for starting construction activities on schedule and, thanks to intensive design discussions with the customer right from the beginning ▸



Ⓐ Fig 2b Side trimmer workshop testing



Ⓐ Fig 2c installation of the cold-rolling tandem mill

of the project, key topics were thoroughly addressed at an early stage. An additional success factor was that the Primetals Technologies China office was deeply involved in all phases of the project – from engineering and manufacturing up to plant start-up and commissioning. The close cooperation between engineers from Tangshan Steel and Primetals Technologies also ensured that Chinese manufacturing standards were implemented from the beginning, so no drawings had to be converted.

The project timeline is given below:

- Ⓐ 14 April, 2013: contract signature
- Ⓐ November 2013: construction; March 2014: shop testing
- Ⓐ September 2014: installation
- Ⓐ 15 January, 2015: first coil, followed by cold mill ramp-up
- Ⓐ September 2015: preliminary acceptance certificate

In order to guarantee high quality equipment manufacturing, supervision was performed jointly by the Chinese and European teams of Primetals Technologies with customer participation during final inspection. To fulfill the high demands with respect to the automation system, the advanced electrics and automation solution was comprehensively pre-tested during integration tests at Primetals Technologies in Erlangen, Germany, again

with the participation of the Tangshan Steel project team. Supervision of the erection companies was carried out by Tangshan Steel to ensure strict adherence to the challenging time schedule.

The well-coordinated final erection stage enabled an efficient transition to the cold commissioning phase. All of the above factors were decisive for the rolling of the first coil, which was of sellable quality. After production of the first coil, commissioning was carried out at a high pace with rapid ramp-up of the mill to nominal capacity. Output rates of 300t/h and higher were achieved as early as 14 days after the first coil was rolled, and just six months later, more than 13,000 coils were sold on the market. Following the successful completion of the performance tests, the preliminary acceptance certificate (PAC) was signed in September 2015.

PRODUCT RANGE AND QUALITY

Ever since the start-up of the new Cold-rolling Complex No. 2, a strong focus has been placed on extending the product mix in order to meet market demands. Besides high-quality commercial grades, soft interstitial-free (IF) grades and advanced high-strength steels (AHSS) are included in the weekly production schedules. In this context, the continuous optimisation of product quality parameters is a key focus of Tangshan Steel and Primetals Technologies. Specific attention is also placed on rolling thin-gauge material. So far, products with an exit thickness of 0.2mm have been rolled successfully. However, the declared goal is to roll product gauges of 0.18mm, which is below the designed minimum strip thickness for the cold-rolling mill.

FUTURE PLANS

Completion of the Tangshan Steel cold mill complex has set a company milestone for the production of automotive steel grades. With an eye to the future, Tangshan Steel intends to further extend and diversify its product range in order to enter additional markets for special steel grades. *Figure 3* illustrates the expected product mix to be made in the near future. Primetals Technologies therefore investigated and implemented the required upstream plant solutions to enable this product mix extension and an extended knowhow package is being provided which will allow the company to expand its scope of products and to optimise overall production. **MS**

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Fig 2d The completed cold mill

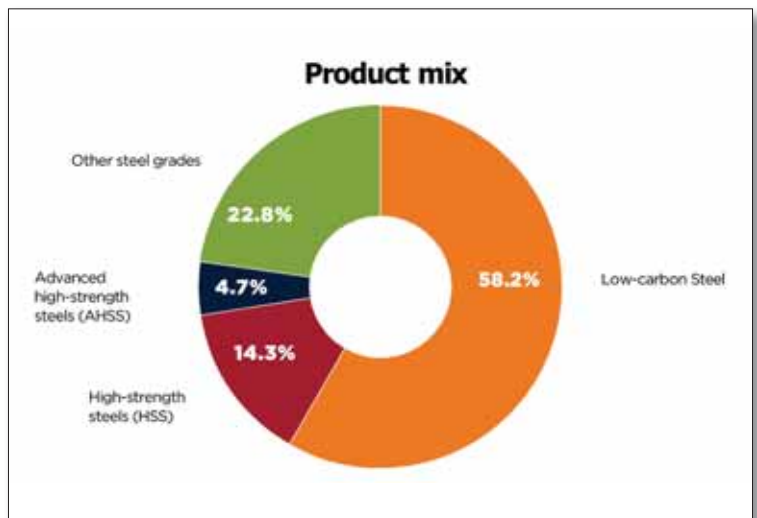


Fig 3 Product mix of Cold Complex No. 2 at Tangshan Steel