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CISDI

NEWSLETTER

Vol. 10, 2019



Ganglu Steel's new PL-TCM exceeding expectations

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- CISDI's innovative solutions are solving problems at Laiwu Steel
- Mould's servo oscillator is hot tested in Chongqing Steel
- Steelmaking solutions for high efficiency, stability and safety



Technology and Solutions Partner for the
Global Metals Industry

🔍 **FULL-PROCESS SERVICES**

CISDI provides full-process services from the bulk material handling yard to the final post-processing line of rolling mill.

🔍 **FULL-FUNCTION SERVICES**

CISDI provides standard and customized consulting, execution, and operations management services.

FULL-LIFE-CYCLE SERVICES

- 🔍 CISDI provides the FEED (front-end engineering & design), implementation, and production and operations management services throughout the entire project life cycle and provides continuous after care services and support.



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CISDI's new research institute will advance ferrous metallurgy



Xuewen Xiao, chairman of CISDI Group and president of the Central Research Institute for Ferrous Metallurgy, unveils the name plaque at the opening ceremony with Zhaohui Yu, CEO of CISDI Group and institute board director

CISDI has launched a Central Research Institute to advance the ferrous metallurgy sector.

The creation of this organisation, which will pool findings from six CISDI research centres, is perfectly timed to assist in the global transformation of the steel industry and China's strategy of steel supply-side reform.

The Central Research Institute will be the umbrella organisation for its centres which specialise in Metallurgical Technology, Intelligent Manufacturing,

Metallurgical Equipment, Material Engineering, Green Manufacturing and Systematic Optimization.

Creating improved systems and technologies will drive green and intelligent manufacturing and make production more competitive by improving costs and quality.

The Central Research Institute will synergise CISDI's resources across engineering disciplines and research and further its contribution to the global steel industrial developments.

CISDI's innovative solutions are solving problems at Laiwu Steel

The upgrade of Laiwu Steel's stockyard is proceeding well under CISDI's expert guidance.

Laiwu Steel, located in China's Jinan Province, was founded in 1970.

China's largest production base for H sections, gear steel and powder metallurgy, its annual production capacity is 10 million tonnes.

CISDI has successfully hot-tested a new dual-conveyor charging system for the blending and proportioning yard at the steelworks.

Previously, two sintering machines (each 265m²) were operating with only one belt conveyor for charging. This had seriously impeded sintering and downstream production for a considerable period of time.

Laiwu Steel needed the belt conveyor rebuilding and also required the rebuild of its blending and proportioning system.

Taking into account charging inadequacy and process layout deficiencies, CISDI's innovative proposal was to build a dual-belt conveyor system, which would greatly increase charging capacity, and to install new blending and proportioning bins at stockpile 3.

The new conveyor applies membrane structures which enable production demand to be met effectively. In



The dual charging belt conveyors at Laiwu Steel have increased charging capacity for the blending and proportioning system

addition, the span has been reduced, which has created a more stable structure.

The upstream and downstream systems of the new bins are made from five membrane structures and cover an area of nearly 300,000 square metres.

CISDI's ECIA technology gives strong results at Baowu Zhanjiang



CISDI's patented Model C yard for Baowu Zhanjiang is operating with 2-charge and 4-discharge lines

Baowu Group Zhanjiang's eco-friendly and intelligent new Model C ore yard is now in operation.

CISDI's patented Eco-friendly Competitive Intelligent Adaptable (ECIA) stockyard technology has upgraded the process layout and stacking-reclaiming match capacity.

Equipment availability has been improved and reclaiming efficiency has been doubled. Maximum stacking capacity is now the largest in China's steel stockyard industry.

Zhanjiang, China's first dual-discharge yard, is 90 metres wide and 650 metres long and has been created with two indoor stockpiles to enable a process route which involves two charge lines from the wharf into the yard and four discharge lines from the yard to the downstream users.

A conventional model C yard generally uses an elevated stacker and semi-gantry scraper reclaimer for its one-charge and one-discharge lines. However the scraper reclaimer has

become a major restriction on the yard's equipment availability and efficiency.

CISDI's one charge and two discharge lines are symmetrically located above the ground of each half of the Model C yard, thus forming totally two charge lines and four discharge lines.

This avoids returns or logistics interruptions and provides effective solutions to the problems of long travel distances for the scraper reclaimer, a limited discharge route from the yard to users, overly frequent changes of stock varieties and overburdened auxiliary equipment.

As a result, in exactly the same site conditions, the yard's production capacity has doubled.

The designed stacking capacity is 6,250 tonnes an hour and reclaiming capacity is 2,500 tonnes an hour - the largest of its kind in China.

Highly intelligent, the top heavy-duty stacker is supplied with power, water, gas and telecommunication via a long-distance mobile drag chain and the need for manual operation has been eradicated.

Intelligent stacking modes are applied to maximise the yard's storage volume and to improve the pre-mixing effect.

A China's first using multi-route semi-gantry scraper caterpillar chains, the reclaimer is a breakthrough for Chinese equipment manufacture and removes the need for importation. The capacity achieved is a record for equipment of its type.

Ningbo Steel BF1 starts up



Ningbo Steel BF1, built by CISDI to an EPC basis

The CISDI-built blast furnace 1 for Ningbo Steel has started up smoothly. CISDI is playing an important part in building a green and intelligent Ningbo Steel, and undertook the furnace project to an EPC basis.

The relocation of blast furnace 1 creates an environmental and technological upgrade and is an important step in Ningbo Steel's aim to improve production capacity and quality.

The furnace has been moved to a reserved site at the existing ironmaking plant. Its volume is unchanged at 2,500 cubic metres and it will continue to tap 2.13 million tonnes of hot metal a year.

CISDI's patented top serial hopper, top gas dedusting and bleeding, top equalised gas recovery, top-combustion stove and intelligent

CISDI's team responsible for building the Ningbo Steel BF 1 are pictured at the site



slag removal technologies have been successfully applied to the blast furnace.

They contribute to energy conservation and environmental protection at the ironmaking plant.

The relocation posed great challenges for CISDI. There was limited space for construction work to be carried out, civil work was problematic, foundations needed treatment and it was important the production was not affected.

But CISDI's team tackled the obstacles and fulfilled the project on schedule.

CISDI wins more blast furnace contracts at TSK

TATA Steel Kalinganagar has placed three more orders with CISDI for system engineering and package supplies to its blast furnace 2 in India.

CISDI will design and supply top-combustion stoves, gas bag filters and stockhouse ecofriendly vibrating screens for the 5,873 cubic-metre furnace.

The latest contracts follow on from two package

supply orders awarded to CISDI last year for the furnace's PCI and granulating drum.

CISDI's team had painstakingly studied the customer's exacting requirements during what was a necessarily lengthy and detailed decision-making process for TSK. The company was understandably cautious about the selection of the supplier for equipment being applied to its blast furnace for the first time.

SFRE's bar mill producing ultra-hard aluminium alloy during hot tests

SFRE has successfully rolled the hardest aluminium alloy grade 7075 during hot-tests of an aluminium bar mill.

The bar mill has been delivered to Dingjiu Advanced Material Kunshan on an EPC basis. It features eight stands with ø500mm H-V rolls and 12 stands with ø370mm Y roll housing.

Series-6 aluminium alloy bar was produced successfully in May.

"Most aluminium bar mills are designed with an incomplete equipment structure and are subject to stopping during production of the hardest aluminium alloy bar," explained a spokesperson for Dingjiu.

"The maintenance required after halt can cause production delays for one or two days.

Commissioning of the hardest bar can be very difficult and time-consuming and take up to two years."

Added the spokesperson: "SFRE spent less than a year in hot testing and have produced extremely hard product. The quality of series-6 and grade 7075 products is to a high standard."

SFRE has delivered the roller table with the pinch roll, ø500mm breakdown mill, follow-up hydraulic shear, ø370mm Y finishing mill, 5-roll coiler, disc car, automatic rotary flying shear and tilter.

SFRE's commissioning has now resulted in rolling of ø150mm aluminium alloys, ø20mm coils and ø30mm bars. These products will be used for aerospace and other critical industries.

CISDI to build intelligent centre for WISCO

An intelligent integrated centre for WISCO's upstream-blast furnace is to be created by CISDI.

It will integrate the 25 upstream-BF central control rooms, giving centralised control.

The electric-instrument-computer system will be modified for this intelligent project.

CISDI Information Technology Co. has been awarded the EPC-based contract.

The centre will achieve integrated operational control and intelligent decision-making for WISCO's upstream-BF plants and become the benchmark of WISCO intelligence.

The upgrades it will create for safety, technology integration, borderless coordination, production efficiency and performance targets will help WISCO greatly in its bid to be one of the world's most competitive steel bases.

FACT FILE

CISDI built Baowu Group's Shaogang Steel upstream-BF intelligent integrated control centre to an EPC basis and put it into operation in January this year.

It has already achieved numerous firsts in the global steel sector:

- Steel's first centralised and mass application of IoT, mobile internet, big data and cloud computing expertise
- First achievement of a long-distance and large-scale centralised control, big data-based decision-making and borderless coordination in upstream-BF and energy plants
- First creation of a new mode of intelligent manufacturing for highly-efficient, coordinated and low-cost ironmaking

Remarkable progress has been made since the centre went into operation:

- Over 400 workers have been removed from hazardous site areas
- There are 60 per cent fewer worksite areas
- A 40 per cent increase in labour efficiency achieved
- Savings of \$3.5 per tonne of hot metal made
- A 500 tonne increase in hot metal tapped daily
- Predictions show a \$28 million profit by 2019, based on consistent increases in output and cost savings in recent months

Liuzhou Steel's new blast furnace is taking shape

The shell construction for a new blast furnace at Liuzhou Steel's Fangchenggang Plant is now complete.

The shells have been finished and all weldings and cooling staves have been installed.

Some 60 per cent of the furnace proper has now been completed and CISDI is about to begin the next stage of work - installing the furnace top equipment and bricking up the refractory.

CISDI is the EPC contractor of this new blast furnace 1, which will have a volume of 4,150 cubic metres.

To meet the target for start-up at the end of 2019, detailed milestone plans have been drafted. This will ensure a safe, quality-controlled and on-schedule construction process. CISDI's construction subcontractor, MCC 11, began construction late last November.

FACT FILE

Liuzhou Steel's new steel plant is located on the Jinsha Industry Zone of Economic Development Area in Fangchenggang city.

The city lies in China's Guangxi Province.

For ironmaking, CISDI is undertaking:

- the design, equipment and material procurement and supply, and
- the civil construction, equipment installation, commissioning and ramp up technical assistance services

for the charging and stockhouse, feeding, top, proper, tuyere platform and casthouse, raw gas



The shell construction has been completed at Fangchenggang's blast furnace1. The top cone is pictured.

CISDI has successfully overcome various difficulties during the process, including limited workspace, a tight time schedule, periods of extremely hot weather, storms and even a typhoon.

An investment of \$4.2 billion has gone into Phase One, which will fund the construction of an integrated steel plant with output targets of 10 million tonnes of crude steel production a year.

cleaning and water treatment systems, pump house and main control room

Tailor-made energy-saver for India's Aarti Steels

CISDI has tailor-made an energy-conserving reheating furnace for Aarti Steels.

The furnace, at Aarti's alloy steel bar rolling line, has been package-supplied.

CISDI has now dried the furnace refractory and the entire bar rolling line was due to undergo hot-testing in mid-October.

CISDI have been responsible for the process from engineering to package supply, commissioning and project management.

The success of this demo project at Aarti Steels has established CISDI's reheating furnace capabilities in the Indian marketplace. It is expected to make its mark in Turkey and the Middle East soon.

Numerous examples of CISDI's expert technological advancements have gone into

the design for Aarti. Features include:

◉ A diesel-heavy oil dual combustion system

The fuel oil main and upstream-burner oil return branch have been combined to ensure oil pressure stability at inlet of the burner.

◉ Heat tracing and automatic drainage system

The steam system with heat tracing and the automatic water drainage system facilitate a certain viscosity in the flow of oil, which ensures its combustion.

◉ Atomised burning

The burner oil can be atomised, thus creating a stable flame and achieving higher efficiency.

CISDI to package-supply granulating drum for Baosteel Shanghai

CISDI's slag granulating drum invention is to be supplied to Baosteel Shanghai's blast furnace 2.

The order is a breakthrough in CISDI's bid to commercialise this unique device, which is designed and manufactured in-house.

Baosteel's furnace will be rebuilt with a new

granulating system installed on both the southern and northern casthouses.

CISDI has designed the granulating drum with a solid structure and has improved its overload capacity. The drum has a much longer service life and can withstand a large quantity of slag washing.

Ganglu Steel's new PL-TCM exceeding expectations



Tangshan Ganglu Steel's 1,450mm PL-TCM has been ramped up and is exceeding its designed capacity.

It has produced 66,000 tonnes of acceptable coils for consecutive 20 days.

Ramp-up was faster than that for similar production lines.

CISDI package-supplied this pickling and cold rolling line, which will produce 2 million tonnes a year.

Ganglu PL-TCM has been performing stably and at high speed to produce thin specifications. The average product thickness is below 0.5 millimetres and the production speed is stabilised at 1,100 metres a minute, or higher.

The core production line for Ganglu Steel's cold mill phase I, the 1,450mm PL-TCM has been equipped with the following advanced technology, units and automation:

- Entry of pickling line is installed with an automatic unpacking device, automatic pay-off reel, automatic welder and automatic accelerating and decelerating unit.

The fully-automatic entry section operates



with minimal manual labour required.

- Tandem 5-stand 6-hi cold rolling mill runs at a maximum speed of 1,500 metres a minute. The high-precision L2 control model and L1 ensure a stable control of product thickness and less than 0.6% deviation in thickness of 0.3mm strip.

Product thickness pass rate exceeds 99.5%; the strip profile is within 5IU; the strip's head-tail out-of-tolerance is limited to less than 5m for the same specification and to less than 10m for the varied specification.

- Against the background of CISDI's remote maintenance system, Pocket Factory light APP, based on CISDI's Nudge mobile office, is developed for a real-time monitor of the PL-TCM production status, product quality and quantity. The line's KPI is dynamically kept on track.

It features a more user-friendly human-machine interface.

CISDI has improved the digital and information technology application levels to this line. Its daily output is now over 200 coils and more than 4,000 tonnes.

Mould's servo oscillator is hot tested in Chongqing Steel



CISDI has developed a servo oscillator for an electro-hydraulically-driven caster mould.

The invention, created for Chongqing Steel, has successfully passed its hot test.

A steel industry world first, the servo oscillator has been running well and has helped the caster to produce a more stable and high-quality slab.

Mould oscillator is the caster's core equipment and there are high requirements on its response speed, positioning accuracy and operational reliability.

There are currently three main types of mould on the market - the mechanical eccentric gear, the hydraulic station with a

servo valve and the mechanical electric servo cylinder.

These moulds are prone to problems, ranging from low oscillation accuracy to high energy consumption. They have a tendency to wear quickly, which reduces service life.

The new-generation mould oscillator developed by CISDI enables a servo motor to directly drive the oscillation hydraulic cylinder.

Intelligent control, remote fault diagnosis, big data analysis and internet of things expertise are integrated.

The electro-hydraulically-driven servo oscillator enables online adjustments of the oscillation frequency and the

amplitude and deflection ratio.

The hot test and operation results show an oscillation deflection of less than 0.01 millimetre. The amplitude is regulated to within zero and 12 millimetres, the maximum oscillation frequency reaches 420c a minute, and the positioning accuracy can be controlled within plus and minus 3 micrometres.

These results are a strong improvement on oscillators currently on the market, for which general deflection is less than 0.1 millimetre, oscillation frequency reaches 400c a minute and amplitude ranges from zero to 10 millimetres.

In addition, CISDI's invention can bring about energy savings of 40 per cent.

The future is bright for the electro-hydraulically-driven servo oscillator, with the potential for numerous applications around the world. CISDI see it having an important role in the metallurgical sector - in continuous casters for square and round billet, rectangular bloom, beam blank and slab - and also way beyond.

It could serve the military, and sectors ranging from new energy and agriculture to industrial equipment and robots.

Steelmaking solutions for high efficiency, stability and safety

MAIN PRODUCTS AND TECHNOLOGICAL HIGHLIGHTS

Rich references and engineering experiences, strong ability of steelmaking system integration

- History: Since 1958, 60 years experience.
- R&D: Eco-friendly, intelligent, high efficient, low cost and high quality of steelmaking plant.
- Ability: Steelmaking process, equipments, control, models and informatization.
- Services: E, EP and EPC services for hot metal pretreatment, converters, EAF, secondary refining device including CAS/CAS-OB, LF, RH VD/VOD etc.

Converter

131

EAF

64

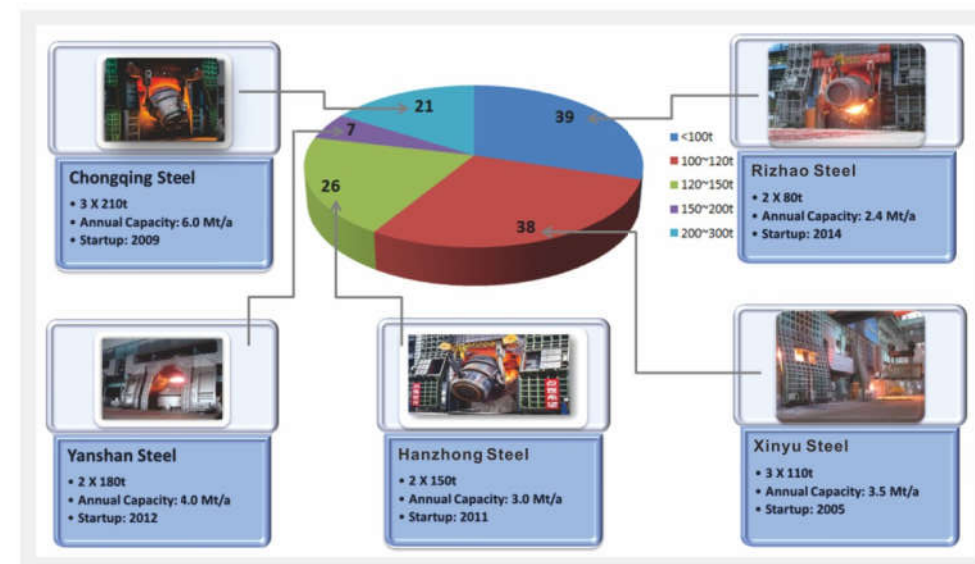
Secondary Refining

177

Hot metal De-S

57

Converter References: In the last 15 years, CISDI has designed and supplied 108 sets of converters



Converter References: 4 sets of 210t converters of Shandong Iron & Steel Group (Rizhao)



ASSB (Alliance Steel(M) Sdn Bhd) of MCKIP in Malaysia



■ ASSB (Alliance Steel(M) Sdn Bhd) of MCKIP in Malaysia



Precise Design of Steelmaking Plant

- ▶ 3D Collaborative Design
- ▶ CAE & CFD Design
- ▶ Logistics & Multi-flow Simulation Design

Advantages:

- The optimized process flow
- The most reasonable general layout
- The Shortest logistics route
- The most investment saving plant design
- The lowest production cost

■ Core Technology and Equipment

CISDI's Patented Technology: SACS Converter (Self-Adaptive Constraint System) 4-Point Linkage Suspension System

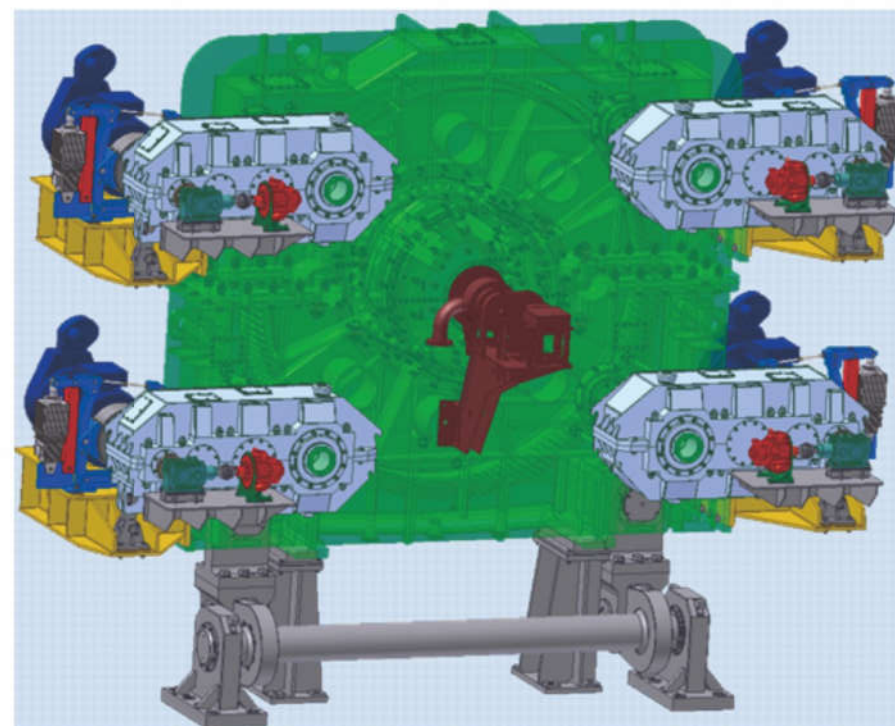
- Perfect mechanical system and perfect mechanism combination, take the road of quality converter equipment technology;
- Converter tilting smooth, suspension and retaining block system can be long-term maintenance-free;
- The suspension system has higher safety, high safety margin and anti-breakout;
- The stress and deformation on the trunnion ring and shell are reduced 25-30%, the safety is improved, as well as the life of trunnion ring and shell will be extended.



TYPICAL REFERENCE

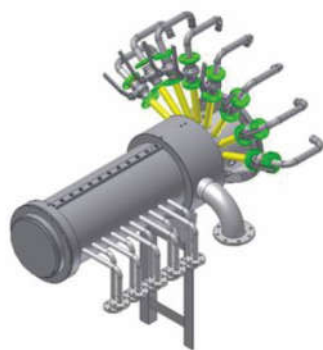
■ CISDI's Patented Technology: Duplex Full-Suspension Tilting Device

- Less maintenance for AC frequency-variable drive
- Efficiency torsion bar counterforce device allows maintenance free due to less equipment impact
- Primary reducer is hung on the bull gear reducer, eliminating the over-constrained 3-support connection between primary and bull gear reducer, contributing to better gear engagement and less bearing stress
- Less impact on the hard-flank primary reducer gear
- Easier installation and maintenance of primary reducer
- During the normal operation of the converter, the four electric motors work simultaneously. When one of the electric motors fails or is dismantled for maintenance purpose, the other three are able to maintain normal operation for one shift, and when two of the electric motors fail at the same time, the other two are able to drive the tilting devices at a lower speed to accomplish operation of one complete heat



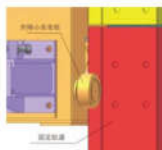
■ CISDI's Patented Technology: Converter Multi-Fluid Rotary Joint

- The multi-fluid (high pressure and low pressure) rotary joint
- Transmitting the media of bottom stirring gas, cooling water, hydraulic and cooling air multi-fluid of slide slag retaining for the converter
- Safety and reliability
- Simple structure and Simply maintenance
- Lower maintenance cost and Lower labor intensity

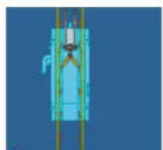


■ CISDI's Patented Technology: Converter Oxygen Top Lance Device

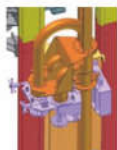
- Twin cars and hoists, oxygen top lance fast exchange technology
- Oxygen lance safety mechanism - Ratchet type of anti-falling device for lance-the unique technology in the word
- Wheel package rail design- the unique technology in the word
- Sleeve type of fast lance replace
- Safe and reliability
- Simple structure and lower maintenance



Wheel package rail design



Ratchet type of anti-falling device



Sleeve connector



Lance carriage



Skin Pass Mill (SPM) for High-strength Hot-rolled Strip

CISDI SPM Units at steelworks

Unit highlights

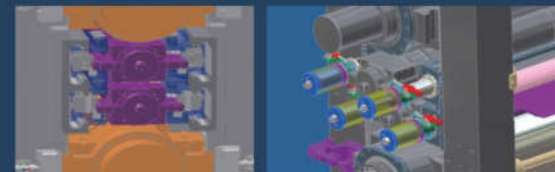
- **High-strength product**
An ultimate strength to 1,200MPa and for a typical steel grade of 1180DP
- **High-quality product**
Strip flatness 6IU with a skin-passed surface and typical steel grade of QSTE700
- **Optimal re-coiled shape**
An absolute value for the total taper $\leq 5\text{mm}$ and for the inter-layer taper $\leq 1\text{mm}$, with a typical steel grade of B750L
- **High-efficiency production**
A unit monthly output exceeding 70,000 tonnes and productivity $\geq 95\%$

Core technologies

- High-strength product tension model and tension distribution strategy



- Bending-shifting integrated SPM know-how



- High-rigidity powerful SPM



- Preparation station of strip head bend forming



- High-efficiency threading clamp

