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CISDI

NEWSLETTER

Vol. 11, 2019



CISDI creates a splash at Baosteel Zhanjiang
- world's first intelligent water system with zero waste

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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 creates a splash at Baosteel Zhanjiang

- world's first intelligent water system with zero waste



An aerial view of Phase 1 in operation at Baowu Group's Zhanjiang Steel

Baowu Group Zhanjiang is seen as a benchmark for green steel development, and a leading force in China's bid to ensure industry can co-exist in harmony with the environment.

An eco-partner in the city of Zhanjiang, it has now created the world's first intelligent water centralised control centre at its steelworks.

Dozens of isolated water sub-systems and 160,000 points of data have been integrated onto a big data platform, which behaves as the smart brain for a zero liquid discharge system.

"Zhanjiang's water system is symbolic of the eco-friendly advancement of the entire steelworks," commented a company spokesperson at Baowu Group's Green Development Convention, which was staged in Zhanjiang City on October 28.

"The scheme fulfills our master-plan targets for a plant-wide water system. It has three water resources - the Jianjiang River,

desalinated sea water and collected rain water.

"It generates zero liquid discharge and has intelligent centralised control. We are China's first ZLD and first intelligent water plant."

CISDI, Baowu Group's most crucial planner, designer and package-supplier, has been serving the Baowu Group's steels division for six decades.

To meet the Group's aim of becoming both a global leader in green steel methods and the world's most efficient producer of prime-quality carbon steel, CISDI provided total solutions to the plant-wide water system in addition to the other sections of the Zhanjiang plant.

To achieve zero liquid discharge, most of the plant's used water is recycled by internal users on-site and the rest will be multi-stage concentrated into industrial salts for external users.

• Innovative water solutions

Baosteel's quest for green developments has guided CISDI since the very beginning of its plans for the plant.

CISDI's tailor-made water total solutions have now implemented that guiding principle and are resulting in reliable, advanced indicators.

Traditionally, steel plants have used huge amounts of water and the waste water discharged at the end of the process has caused serious water contamination.

When Zhanjiang Steel chose the East Sea Island as its site in 2005, the biggest available source of fresh water was the island's Hongxing reservoir. But it is also the living water source for local people, which meant there was a limited supply for a 10-million-tonne steel plant.

Aware of the abundant sea and rain resources also available, CISDI figured out an innovative solution which utilised three natural water supplies:

① .The first source:

A dam was built on the Jianjiang River to the northeast of East Sea Island. Two supply channels were built, passing through a 40-kilometre section along the South Sanhe River and Kwangchowwan to supply water to the plant. This method supplies 34 per cent of the water needed.

② .The second source:

A water reservoir capable of holding 1.20 million cubic metres of rainwater was built. Rain is collected from the plant and the 30km² region on its doorstep.

The reservoir collects 11 to 16 million cubic metres of rain a year, which equals the water volume of China's West Lake in Hangzhou City in the Zhejiang Province. It can supply 40 per cent of the steel plant's water demand. Cost savings on water are at \$4.28 million.

③ .The third source:

Dead steam from the power plant is used to power a low-temperature, multi-stage desalination process which turns seawater into pure water. This supplies 26 per cent of the plant's water requirements.

The three sources solution has reduced the plant's water consumption from 5.17m³ to 3.19m³ per tonne of liquid steel.

Waste water and sewage from the plant's production units are all treated by the central water treatment plant and are recycled.

To prevent the discharge of waste water into the sea, CISDI studied production data and process verification and assisted Zhanjiang Steel in defining the ZLD solution of 'recycle consumption plus concentration for salt extraction'.

By the end of September 2019, the entire ZLD project had been started up successfully, with all discharged concentrated brine being successfully extracted as salts by MVR (mechanical vapor recompression).



The CISDI-built intelligent water centralised control centre at Zhanjiang Steel

• Creating the smart brain for ZLD

The world's first intelligent water centralised control centre has been performing well at Zhanjiang Steel.

Data is being integrated with high efficiency and the full process is being real-time monitored. Workforce productivity has been improved and the centre is reducing water consumption, making production cost savings and preventing waste water discharge.

Achieving zero liquid discharge had been a difficult factor in Zhanjiang's high-efficiency management and control.

Because the water system spreads across the entire plant and water quality and flow rate are closely related to production processes, any abnormal fluctuation in working conditions would affect the water supply and return, causing it to become too excessive or too deficient.

Operators and schedule planners were based across 15 operation rooms and could not interlink efficiently. In spite of telecommunication interfaces, data in information systems across the plant was

stored in isolation, which meant they were unable to support water volume dynamic matches.

To solve these substantial problems, CISDI proposed a concept which would break through the original system's framework and organisation boundaries and enable it to match production process flows and make the information couple with water volumes.

This was achieved by employing the CISDI Digital Industrial Internet platform to collect into the water big data centre 160,000 points of data from dozens of isolated systems and over 100 cameras.

CISDI's Q-Touch system generates a plant-wide water balance sheet and outputs a production monitor drawing.

Sigma AI algorithm, an intelligent dosing system and CISDI's Nudge-plus platform are all used to empower the integrated links and centralised control on remote operations.

Since the start-up of the intelligent water centralised control centre at Zhanjiang

Steel on October 1st, a highly-fused CPS (cyber-physical system) has been formed. The integration of the technological process, management and data has enabled a new water operation, control and management mode.

The centre is the smart brain of Zhanjiang Steel's water system.

It is achieving long-distance, mass centralised control, interconnected information flow from raw water supply and preparation to user delivery, recirculation and the centralised treatment of waste water for recycling.

The wide interlinks are demonstrated between employees on different duty levels, between machines in different closed-loop systems and between man and machine across procedures.

This deep system and duty integration has upgraded and optimised comprehensively Zhanjiang's production control.

The intelligent water centralised control centre also manages Zhanjiang Steel's Phase I hot mill circulating water, cold mill water treatment, steelmaking and continuous casting circulating water and blast furnace circulating water systems.

Phase II of construction will introduce more water systems but their data will be managed by the centre, therefore additional operation rooms will not be required.

By upgrading safety, efficiency, energy conservation and environmental protection, Zhanjiang Steel's intelligent water system is another success story in Baowu Group's bid to build a green steel community.



Zhanjiang Steel's water reservoir has a volume of 1.20 million cubic metres, the largest in China's steel industry. It collects around 12 million cubic metres of rainwater a year, providing Zhanjiang Phase I with approximately 30 per cent of its fresh water requirements.

CISDI wins Baotou Steel intelligent stockyard contract

Baotou Steel is embarking on its largest intelligent manufacturing project – the upgrade of four stockyards.

The modifications will take place at the warehouse centre, ironmaking, rare earth ironmaking and coking plants. The upgraded stockyards will facilitate the intelligent and

integrated control of raw materials, fuel storage and handling.

CISDI has been awarded the upgrading contract, which will enable the stockyards to run with highly-efficient transportation, unmanned operations, a digital storage

system and intelligent control.

This year, CISDI's unique stockyard total solutions, advanced expertise and high-quality services have won contracts at China's Laiwu Steel, WISCO and Masteel – the largest portion of China's steel market.

CISDI to build Hoa Phat's green credentials with HRSG power generator

CISDI is assisting a Vietnamese steel plant to increase its green credentials.

It is to build a heat recovery steam generator (HRSG) power generator unit for Hải Dương Steel, which uses excessive heat from the coke oven to create electricity.

The HRSG is more protective of the environment. It can burn all by-products inside the coke oven to streamline production procedures, without the need of gas purification and chemical byproduct recovery.

It generates power from multiple boilers matching to one turbine to recover the COG fume's excessive heat and plant-wide gas bleed.

It's clean and easy and generates a large amount of electricity. This is the first overseas application for CISDI.

Hải Dương Steel is part of Hoa Phat in Vietnam. The coke oven plant will produce 200,000 tonnes of coke a year and 380x10⁶ kWh electricity a year, creating cost savings of around \$21.36 per tonne of liquid steel.

The power generator unit will contain the following hosts and auxiliary facilities:

Boilers: one 50t/h high-temperature ultra-high pressure HRSG (heat recovery steam generator) boiler and one 100t/h high-temperature ultra-high pressure gas-fired boiler

Generators: one 50MW high-temperature ultra-high pressure intermediate primary reheating condensing turbine and one 55MW generator and auxiliaries

CISDI wins major ops management contract in Indonesia

- An innovative, hotel-style management mode for a steelworks

B&C and Gunung Steel's representatives sign the OM services contract in Shaoguan City in the Guangdong Province



CISDI has won a six-year 'hotel management-style' contract with an Indonesian steel giant.

The company will provide operations management services for Gunung Steel in Indonesia. The service will cover production, finance, sales and procurement.

The contractor will be B&C International Operations Management Co., a joint project company set up by CISDI and Baowu Group Shaogang.

CISDI's innovative service mode will meet the client's 'hotel-style' management

requirements. It has been developed from a series of successful package supplies to Gunung Steel's light section mill, CSP, medium section mill and blast furnace 2, which were assigned in December last year, and project management services assigned in March this year.

CISDI and Shaogang set up B&C to provide tailor-made services for the entire plant's operations management.

This ops management service mode is a breakthrough. Instead of the traditional Certified International Professional Manager method,

a management and operations team will undertake production and business management of the steelworks.

The ops management team will rely on CISDI's proven skills in advanced engineering and full-process services, its overseas project management expertise and the calibre of Shaogang's systematic management.

A strong Management-Technology-Talent system is being established, which will boost Gunung Steel's fund efficiencies, profiting and core competitiveness.

CISDI to package-supply two LFs for Baosteel Desheng

- Creating modernised, intelligent steelmaking

CISDI is to package-supply two highly advanced ladle furnaces to Baosteel Desheng Stainless Steel in China's Fujian Province.

This project is a big step in making Baosteel's conceptual expertise and forward-thinking a reality.

During the production of high-end steel grades, the two new furnaces will operate with a smoother process flow and with safer and more reliable equipment. In addition, service life will

be extended.

Each furnace has a designed tonnage of 150 and will feature optimised process flow and equipment configuration and improved automation levels.

CISDI is creating fully-automatic and intelligent operation and control. Management and primary operation of each furnace will be conducted by one employee per shift.

Equipment operation features:

- ❖ One-touch self-learning and optimisation model
- ❖ One-touch fully-automatic temperature measurement and sampling robot
- ❖ One-touch automatic calculation, weighing and charging model
- ❖ Melting scheduling control and coordination model, and
- ❖ Window-free centralised control system

CISDI wins fourth refractory order from Turkey

Turkish steel company Oyak has entrusted a fourth refractory order to CISDI.

Earlier in 2019, Oyak's Isdemir and Erdemir plants ordered in CISDI's refractory supplies. CISDI UK united with COBEX, a carbon brick specialist in Germany, to offer a competitive proposal and win the orders.

The latest contract win highlights the client's confidence in increasing carbon brick importation.

Servicing the UK, Europe, South America, Turkey and the USA, CISDI UK provides CISDI Group with a gateway to international companies servicing steel and infrastructure projects worldwide.

The UK team is an integral part of CISDI's global sourcing policy and is playing its part in CISDI Group's growing reputation with major clients and supply partners.

Aarti's new rolling line will produce 200,000 tonnes of alloy bar a year

- CISDI's successful export to India starts on schedule



The CISDI-supplied breakdown mill in operation at Aarti Steels



Aarti's reheating furnace discharges a billet for the rolling line supplied by CISDI

A new alloy bar rolling line at India's Aarti Steels has started up on schedule.

CISDI package supplied the IPR-based walking-beam reheating furnace, breakdown mill and short-stress path rolling mill train. It has also provided technical assistance and project management services.

The rolling line will produce 200,000 tonnes a year and the reheating furnace's hourly capacity is 40 tonnes.

Most of the final products will be round bar, flat bar, square bar and hexagonal bar. The

breakdown mill will bloom eight cross-section dimensions and its final products will be in as many as 120 specifications.

The reheating furnace, which went operational two and half months early, is an outstanding showcase of CISDI's engineering originality and adaptation skills.

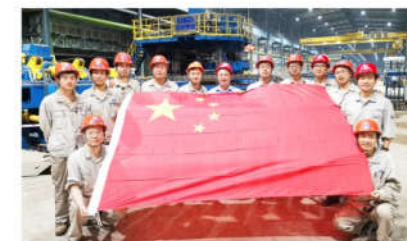
Key Features:

A tailor-made energy saver, the furnace has been developed with a dual-combustion system which relies on diesel and heavy oil. The fuel oil main and upstream-burner oil return branch have been combined to ensure oil pressure stability at the inlet of the burner.

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.

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

CISDI counteracted numerous challenges during construction by stationing a project team and its engineers on-site to give guidance and supervision throughout the project cycle.



CISDI's project team is pictured at the alloy bar rolling line on Chinese National Day, October 1st

Baosteel's new intelligent SPM boasts raft of CISDI innovations



The first coil being hot-commissioned at Baosteel Shanghai's new SPM

Baosteel Shanghai has hot-commissioned the skin-pass mill (SPM) for its 2,050mm hot strip rolling line.

CISDI package-supplied the high-tensile, highly-efficient and intelligent unit.

This unit has been designed to process a large variety of strips with multiple specifications.

Baosteel had invited the world's top suppliers to tender for the bid. However, CISDI's abundant experience and innovations and its successful rebuild of Baosteel Shanghai's 1,880mm high-tensile SPM enabled it to win the award.

CISDI's new developments for improving final strip's quality have been applied to the SPM:

- Coil preparation station for fully-automatic head cutting, threading, coiling and unloading
- Strip head clamp



The SPM, delivered by CISDI to Baosteel Shanghai's 2,050mm hot strip mill

- Dual-jaw coiling drum and anti-kickback simultaneous press
- Multiple deep bending roll
- High-speed dedusting brushing roll
- Dual-drive powerful skin-pass mill
- Pre-bending forming tension unit
- iPad for intelligent mobile operational inspection
- Unmanned autonomous unbundling machine
- Sample cantilever crane
- Sample marker
- Width and thickness gauges
- Automatic surface detector
- Automatic bundler
- Automatic spray marker

CISDI's latest development LHCD achieving world-class results in China



CISDI's laying head LHCD in operation at Liuzhou Steel

CISDI's newly-patented development LHCD is now in operation at Liuzhou Steel in China.

The LHCD – the laying head for a high-speed wire-rod rolling line – is an improved application in China which runs at a maximum speed of 120 metres a second with minimal vibration.

Results show technical indicators matching those of top imported units.

Liuzhou Steel's wire-rod rolling

line is an import. It has a state-of-the-art laying head and finishing mill and runs at a maximum speed of 120 metres a second.

Earlier this year, it needed to replace the laying head and sought a Chinese manufacturer.

Liuzhou Steel required the new laying head to utilise the laying tube it had purchased and to have the same interface as its imported model.

CISDI organised a project team

to carry out site surveys and adjusted its original in-house design to meet the client's requirements.

A laying tube fitting curve was accurately drafted and provided the basis for designing the laying head's surface, and also for making a kinetic analysis of the laying head's rotor.

Having gained a thorough understanding from the client's input data and information gathered during the site surveys, CISDI finalised the installation and interface dimensions to ensure a smooth exchange of the old unit with the new.

The client took part in and accepted the ex-works inspection, witnessing a testing speed of 120 metres a second and a vibration of less than four millimetres a second.

When producing Ø8mm rebar, LHCD results in vibrations of only 1.5mm per second at a rolling speed of 80m a second.

Operational results show CISDI's LHCD is achieving world-class levels and earmark it as another core CISDI product.

HSM technology highlights R2

Integration of HSM Technologies

Optimized scheme:

based on the specific customer requirements and project conditions as well as our technical strength and engineering experience, optimal technological solutions, general layout, product mix, electrical and mechanical equipment configuration are determined using optimization calculation, data analysis and

Collaborative 3D design and digitalized delivery:

3D platform-based collaborative design by multiple disciplines including metallurgical technology, equipment, civil works, auxiliary facilities, electrical and automation, which allows

scientific proofing, and optimal heating pattern, rolling strategy, post-processing and finishing technology are developed, which enables us to present to our customers the design, construction and operation schemes featuring leading technology, reasonable investment and good profitability.

the plant to be delivered in fully digitalized form.

Reference: nearly 40 hot rolling lines worldwide



Technologies for Intelligent High-Strength Skin Pass Mill & Coil Dividing Line

CISDI has good expertise for all mechanical-electrical-hydraulic equipment of skin pass mill & coil dividing line. It has developed patented technology for tension control, roll gap control, elongation control, shape control and automatic threading, etc. CISDI is in a position to supply technology, equipment, automation control system, construction, installation, commissioning and operation services (based on EP or EPC mode) for lines ranging from 1,450 mm to 2,300 mm, with speed up to 600m/min. and maximum strip strength of 1,500MPa. More than 20 lines have been supplied by CISDI.



Skin Pass Mill & Coil Dividing Line, for 2,250mm HSM, Baosteel Zhanjiang Plant

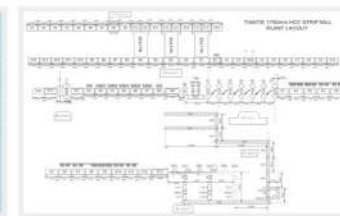
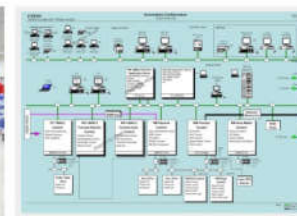
2,250mm HSM Skin Pass Mill & Coil Dividing Line for Baosteel Zhanjiang Plant

- Designed production capacity: 600,000t/a
- Strip strength: 1,200 MPa
- Startup: in 2015

On line L1/L2/L3 automation system of HRM

- CISDI provides users with an integrated solution for automation systems such as power distribution, instrumentation, electrical drives, basic automation, process automation, MES, ERP.
- CISDI has established high-level R&D and technical support platforms such as remote

diagnosis and maintenance center, Siemens laboratory and Rockwell laboratory, and developed core technologies and products such as rolling steel quality control package and control model, program control middleware platform, data acquisition and analysis system with independent intellectual property rights.



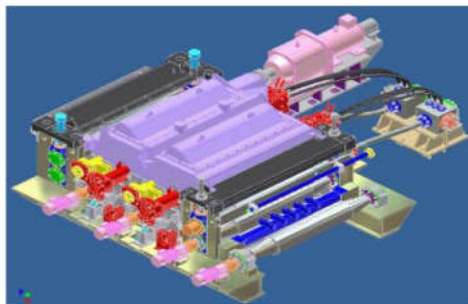
I Main equipment of HRM

HRM of CISDI



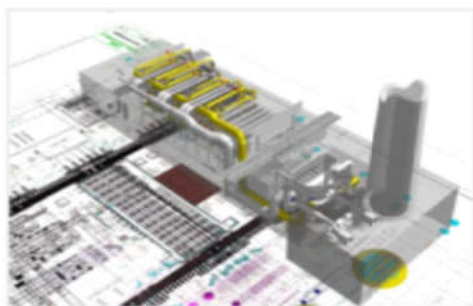
Edger

- Full hydraulic screw down
- AWC and SSC function



Descaler

- spray headers zone control
- Top headers lifted by hydraulic cylinders
- Descaling pressure: max.38MPa



Reheat Furnace

- High efficiency air - gas preheating technology Digital heating technology
- Evaporative cooling technology
- Automatic heating technology Regenerative combustion technology
- Ultra - low NOx combustion technology



Crop Shear

- Crank-Type Crop Shear
- Integrative stand design (patent), ensure high cutting ability and stability
- Multi-inclination cutting technology (patent) bring higher efficiency and energy saving
- Shear limit transform bar specification: pipeline steel X100, section limit size is 70 mm× 2100 mm.



Finishing mill

- Full hydraulic roll gap adjust
- Work roll bending and shifting
- Hydraulic loopers
- Work roll quick-changing device



Roughing mill

- Screw down: mechanical screw down + hydraulic APC
- Pass line height adjustment stepped spacer: for roll wear compensation



Down coiler

- Hydraulic 3 wrapper roll with AJC, reinforce closed housing, fixed type
- Change-over gear ratio
- Coiled Strip Size: Pipeline Steel X100, 20 mm× 2100 mm



Laminar cooling

- Flexible : extensive cooling can work as conventional laminar cooling
- High cooling rate:18mm thickness strip cooling rate >30℃/s
- Meet requirement of all steel grades as: Pipe Steel, DP,TRIP

Hot Strip Mill Revamping

CISDI has more than 10 references of hot strip mill modernization and supply core equipments and systems for 7 HSMs.

Typical revamping Cases : 1700 HSM in Jinanscope of revamping

- Adding new Coibox
- Adding new finishing mill F0
- Updating F1-F6 WRB/WRS device
- Modifying WR cooling, Side guide, roll bite lubricant
- Modifying finishing scale breaker
- Finishing work roll change device modification
- Adding step liner for all BUR
- Updating laminar cooling device
- Updating automation system L1 and L2

Results and evaluation:

- Mass production of strip with a gauge of 1.2mm to 1.5mm is being produced
- Width accuracy : 0~8mm, 95.4%
- thickness accuracy : $\pm 30\mu\text{m}$, 95.4%
- Flatness : 50I, 95.4%
- Down time : reduction by 30%~50%



Shut down "1", 42days

- Coibox installation
- F0 Roller table bridge
- Crop shear & Finishing Scale Breaker (Move forward)



Shut down "2", 55 days

- F0 installation
- R2 : modify
- F1-F6 : modify
- Automation L1~L2 update



Baosteel Shaogang upstream-BF integrated intelligent control platform



CISDI is implementing the EPC-based construction for Shaogang's Intelligent Centre, a benchmark of China's steel intelligence levels. An upstream-BF integrated intelligent center has been put into use, a world's first implementation of steelworks' trans-procedure, cross-area and long-distance (over 5km) endless coordination and big data decision-making.

Critical technologies

- Data center and big data platform
- AI-based math model
- Integrated intelligent control
- Big data-based product ion and dynamic optimization of operation
- Systematic optimization and production consulting
- Remote safety control
- Machine vision

Results and returns

- Reducing 40% staff working at the onsite central control room for the integrated intelligent control center
- Increasing productivity by around 30%
- Creating an annual economic benefit of \$2.24 million through innovations in organization, flow and management
- Achieving a cost saving of \$1.5 per tonne of hot metal