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Baowu Group Zhanjiang's intelligent hot metal locomotive

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Special issue for CISDI intelligence

CISDI

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 commitment to intelligent manufacturing

Core products and solutions for deep integration of intelligence and big data showcased at Smart China Expo 2019

CISDI's intelligent manufacturing stand at the Smart China Expo 2019

The world's scientific and technological revolution and industrial transformation is accelerating and CISDI is firmly focused on intelligence and big data.

The company is committed to integrating cutting-edge technology into the steel industry.

Its benchmark intelligent projects are examples of the value CISDI's intelligent manufacturing total solutions and products are already bringing to steel enterprises.

The company recently showcased three groundbreaking new intelligent and big data-based products at the Smart China Expo 2019.

CISDigital™ industrial internet platform, the safe and autonomous-control industrial cloud, plus CISDI's fire protection and security Xingdun (Star-Shield) attracted wide attention.

Interest was shown by various sectors of Chinese government and numerous Chinese enterprises.

Experts manning CISDI's intelligent manufacturing stand demonstrated the three dimensions of its industrial internet platform – autonomous unmanned production, intelligent decision making and borderless coordination - and their intrinsic role in creating intelligent manufacturing total solutions.

Crowds were able to discover how a number of conventional steelworks have been transformed to more efficient digital operations thanks to the implementation of the industrial internet platform.

References highlighted included autonomous unmanned production at the world's first intelligent stockyard, an autonomous hot metal torpedo ladle car for Baowu Group's Zhanjiang Steel and China's first intelligent hot-rolled coil warehouse for Baowu Group's Bayi Steel.

The world's first steel intelligent integrated control centre, built by CISDI, was displayed at CISDI's intelligent manufacturing stand at the expo

The world's first steel intelligent integrated control centre, now running at Baowu Group's Shaogang works, is a further demonstration of CISDI's intelligent decision-making expertise.

The QTouch industrial scheduling centre and Nudge-plus mobile office are CISDI's borderless coordination products.

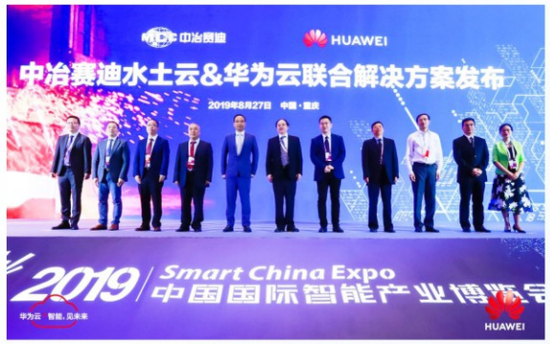
At the Expo's industrial intelligent experience hall, CISDI unveiled Shuitu Cloud, its first industrial cloud which is based on HUAWEI's ARM chip framework and a characteristically safe, autonomous and controllable industrial eco-cloud.

Already over 360 services operate on the cloud and 2,500 businesses, over 200 government systems and hundreds of enterprises are logged onto the platform.

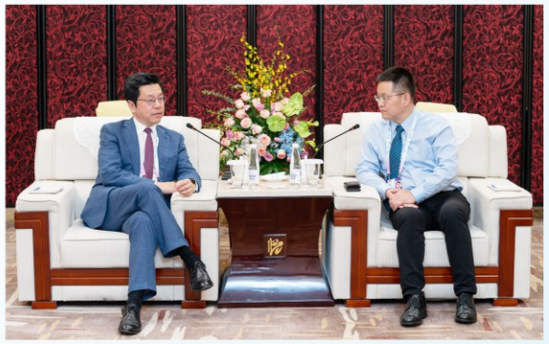
CISDI and HUAWEI publically unveiled their combined solution which is dedicated to industrial intelligence and digitalisation – Shuitu Cloud & HUAWEI Cloud - at a HUAWEI Cloud City Summit which was staged at the Expo.

During SCE 2019, CISDI chairman Xuewen Xiao took the opportunity to meet with heads of the event's partners, Dr Kai-Fu Lee, the chairman and CEO of Sinovation Ventures, and Hocking Xu, the CEO of Sinovation's AI2B subsidiary AInnovation, which is a joint venture with CISDI.

Mr Xiao took part in the summit's discussion on how AI is empowering and reconfiguring manufacturing with Hongbo Wang, the CEO of HIT Robot Group, and Xudong Li, the COO of SAP China.



CISDI's representatives pictured at the launch of the Shuitu Cloud & HUAWEI Cloud



CISDI's chairman Xuewen Xiao discusses joint artificial intelligence projects with the chairman of Sinovation Ventures, Kai-Fu Lee at a forum staged at SCE 2019

CISDI's total solutions for Intelligent Manufacturing

Steel manufacturing is undergoing a huge transformation as the fourth industrial revolution gets into gear.

But switching to intelligent manufacturing methods poses massive challenges for conventional steel processes.

CISDI is helping to smooth the journey. With 61 years of experience in steel engineering and construction and many high-calibre references, CISDI has pooled knowledge collected in its vast steel database with its ever-growing expertise in intelligent manufacturing solutions.

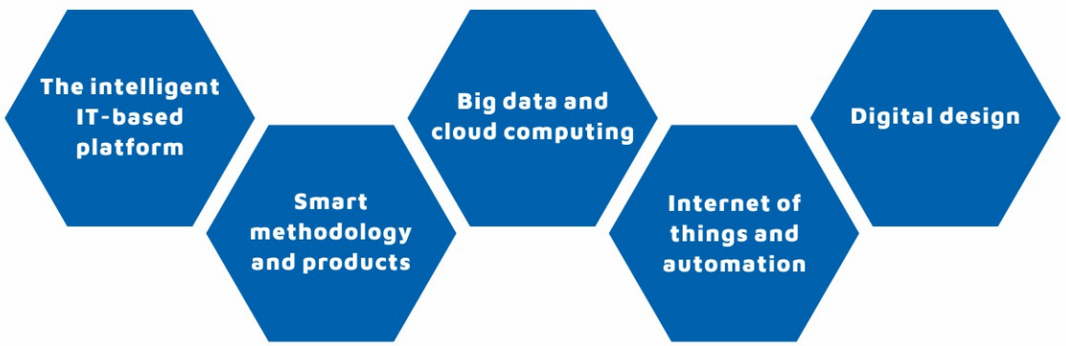
A five-pronged intelligent capability system has been established and released to steel companies around the globe. It embraces:

- The intelligent IT-based platform
- Smart methodology and products
- Big data and cloud computing
- Internet of things and automation
- Digital design

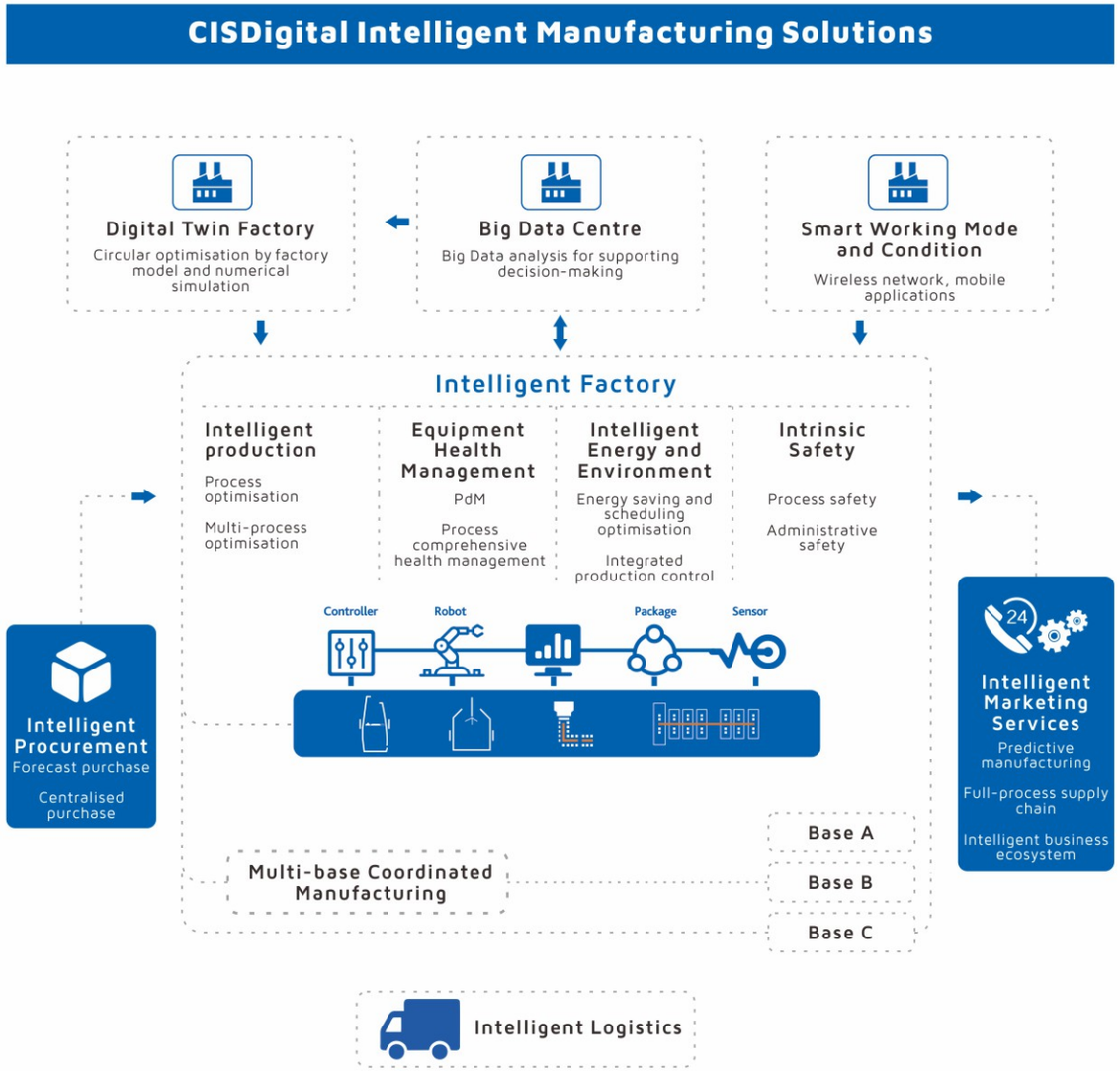
CISDI solutions provide clients with intelligent equipment, intelligent workshops and systems, which together create the intelligent steelworks - a safer, greener, more people-centred environment which operates more efficiently and produces higher quality steel.

Digitalisation of the entire production process enables steel enterprises to switch to automatic production, have full network coordination and enable intelligent decision-making.

CISDI's steel industrial cloud platform provides full-life-cycle, one-stop intelligent manufacturing cloud services which help build a world-class intelligent, network-based demo plant and drive transformation.

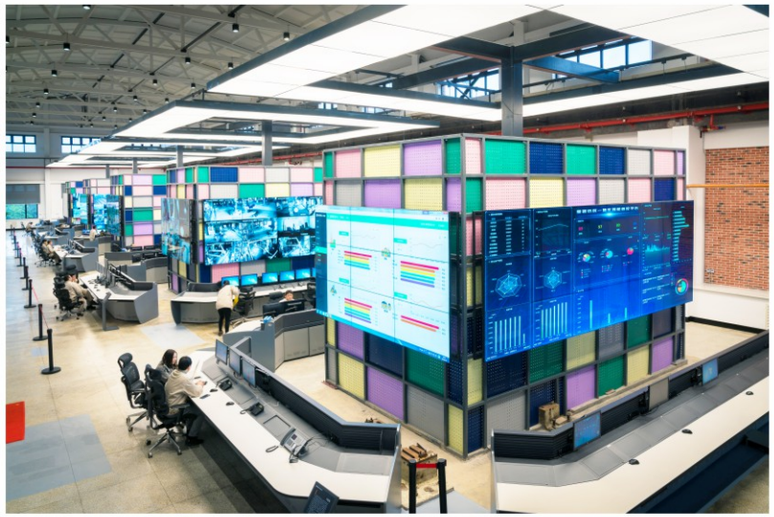


CISDI's five-pronged intelligent capability system



Baowu Group Shaogang's intelligent integrated control centre

Achieving highly-efficient production co-ordination and low-cost ironmaking



The Shaogang intelligent integrated control centre is configured as islands and functions as a mass, centralised control

Shaogang's intelligent integrated control centre went operational earlier this year.

It's the steel world's first for the centralised and substantial application of the internet of things, mobile internet, big data and cloud computing.

The centre has achieved centralised online control of the upstream-blast furnace, thus creating a new model for ironmaking production.

This is the first step towards achieving a remote, mass and centralised control, big data-based decision-making and borderless coordination for the upstream ironmaking and energy systems.

Online working results show that this part of the centre has achieved highly-efficient production co-ordination and reduced the cost of ironmaking.

The centre is now being developed to take over centralised control of the plant's steelmaking and rolling.

CISDI's intelligent integrated control platform has been installed as islands in a 1,600-square metre area. Over 100 big data-based intelligent models have been integrated on that platform.

Since installation, over 300,000 points of data have been acquired from the site and have been analysed and processed intelligently.

Centralised control is doing the task of over 400 manual operators, more than 40 pulpits and control rooms, over 30 systems and 8 major procedures of upstream ironmaking and energy media.

Now that 400 operators no longer have to work in hazardous sites, Shaogang's operation model has been transformed. Work areas have been reduced by 60 per cent and labour productivity has increased by 40 per cent.

Since startup of the control centre earlier this year, Shaogang has seen a stable, tangible improvement of cost effectiveness and output.

A cost saving of $3.52 per tonne of hot metal has been made and daily output has increased by 500 tonnes, according to production data.

A $28 million profit by 2019 is predicted.

A comparison table below shows how Shaogang's production mode has improved:

Item	Before	With Intelligent Centre
Quantity of operation areas	50	18
Quantity of pulpits and control rooms	42	1
Quantity of operation stations	335	123
Quantity of operation posts	81	50

The integrated intelligent control platform developed by CISDI for Shaogang

Baowu Group Zhanjiang's intelligent stockyard

Achieving fully automatic, highly intelligent production and integrated control

Highlights of Zhanjiang's intelligent, eco-friendly stockyard:

- Site labour reduced by 40 per cent
- A 20 per cent increase in yard availability
- 8 per cent less energy consumption
- Rise of 90 per cent in inventory efficiency

Baosteel Zhanjiang's stockyard, which was supplied by CISDI and put into operation in 2016, is the world's most intelligent and eco-friendly coastal bulk material handling yard.

Five intelligent systems have been created – intelligent flow optimised decision-making, intelligent blending and proportioning, autonomous stacking, a digital yard and production simulation.

Each can make an intelligent decision on the shortest and lowest-consumption optimal flow, automatically match the materials of different properties, automatically track the material flow and automatically control transport volume.

Though the stockyard is around a million square metres in size, where only two operators are needed to remotely control management of the production site each day.

Creating unmanned sites or significantly reducing manpower during operation improves safety.

Increasing intelligence makes inventory, operation and management more efficient.

Zhanjiang stockyard operates unmanned stacking and reclaiming

CISDI's digital yard design for Baosteel Zhanjiang

Baowu Group Zhanjiang's intelligent hot metal locomotive

Achieving all-weather, autonomous transport of hot metal

CISDI's autonomous locomotive, loaded with hot metal, traverses the railway crossing from ironmaking plant to steelmaking plant at Baowu Group's Zhanjiang Steel

A hot metal locomotive, a world first for the steel sector, has been in a test-run at Baowu Group Zhanjiang since July.

It will be used to transport hot metal from the ironmaking plant to the steelmaking plant.

The route between these two closely-linked and important logistics and production systems, is fraught with difficulty.

Conventionally, the complicated scheduling of locomotives and all procedures - coupling, parking, aligning, route-planning and ladle matching - have to be done manually and are fraught with problems and hazards.

CISDI's solution to this problematic process is an intelligent, unmanned hot metal transport system.

Featuring a self-learning, self-adapting, high-precision control model, the locomotive has all-weather environmental perception and can identify obstacles in its path and act accordingly.

The hook between locomotive and torpedo ladle car connects and releases automatically and the ladle car is positioned accurately, even in the most severe conditions.

The equipment guarantee system, intelligent battery management system, digital twin, big data analysis platform and artificial intelligence expertise have been integrated into this locomotive and its scheduling.

The test run has shown very positive results:

- The torpedo ladle car's turnover rate has been increased from 3.9 to 4.2
- The locomotive or ladle car's availability has increased by 12.5 per cent
- Transport efficiency has seen a rise of 10 per cent
- Labour requirements have been cut by 80 per cent

Baowu Group Bayi Steel's intelligent hot-rolled coil warehouse

Achieving intelligent warehousing for steel

The intelligent hot mill coil warehouse at Bayi Steel now has unmanned operations, which makes it safer and more efficient

Bayi Steel's hot mill now boasts China's first intelligent, unmanned warehouse to the standard set by Industry 4.0.

Operational since May, the warehouse is capable of autonomous driving, smart warehousing and machine vision.

As a result, processes including truck outbound, walking beam offloading, warehouse pile switchover and transfer car reloading can operate without the need for workers.

The seven 'smart' cranes at the warehouse are also unmanned and across the warehouse, the number of manual operators required has been reduced by at least 50 per cent. The highest reduction in manpower requirements has been made in high-heat and hazardous posts.

Outbound efficiency can be improved by 50 per cent; the maximum lifting capacity has been increased by more than 10 per cent and in addition, the risk of damaging coil which can occur during lifting or transportation is greatly reduced.

CISDI's intelligent warehousing expertise can also be seen at Zhanjiang Steel's all-weather wharf, a rebuild and transformation project which has greatly reduced manpower requirements.

Conventional wharfs rely heavily on manual operators for machine scheduling and lifting and loading coil product onto ships. Working conditions are usually poor and fraught with safety hazards.

CISDI's intelligent solutions to these problems - the driver-less crane, warehousing intelligent control and machine vision - enable the entire wharf to operate with 50 per cent fewer staff.

Online operation takes total control of machinery at the port and enables machinery inside the ship's cabin to run with reduced labour.

The HMI of CISDI’s intelligent warehousing expertise

Bayi Steel's intelligent hot-rolled coil warehouse

The intelligent control desk at Bayi Steel's hot-rolled coil warehouse

Zhanjiang Steel's all-weather wharf is now working intelligently and autonomously

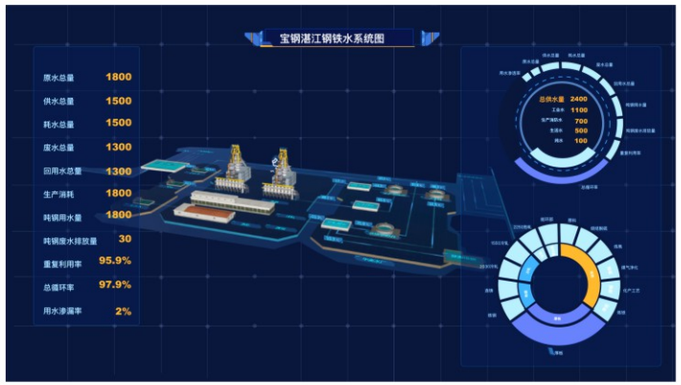
CISDI QTouch - industrial command and scheduling centre

Achieving map-based regional control to multi-scenes

One of CISDI's core intelligent manufacturing products, QTouch is a configuration of the one-map-based regional control system, achieved by combining GIS, BIM and IoT expertise.

This industrial command and scheduling centre can be adapted to multiple scenarios in production and operational scheduling.

QTouch's one-map is an overview of the steelworks and is capable of tracking process details. It's generated from GIS and BIM and a 3D model, encompassing the geographical information and production areas.



A screenshot of QTouch centralised control at Zhanjiang Steel's water treatment plant

It also integrates information on operational performance, equipment running data, process model analysis, energy consumption, environmental monitoring, electronic fencing, event and alarming systems.

The geography of the steelworks - its buildings and the arrangement of large equipment, belt conveyors and pipeline networks - can be seen clearly by the QTouch command centre.

Actuated by events, QTouch carries out an integrated, centralised control on the critical production and operational parameters, event response and disposal tracking, buildings and facilities, staff and operations.

Management can use QTouch to understand and control the enterprise on both macro and micro levels.

Focussed on production management scenes, QTouch applies the event allocating engine and the positioning, IoT and video analysis expertise to manage the production, staff, operations and maintenance on one dimension.

The one map for CISDI QTouch gives an overview of the steelworks' entire production and operations and enables a centralised control

A screenshot of QTouch centralised control for WISCO's upstream-BF plant

On the other dimension, it interconnects the IT-based platforms and assists in production and operational safety control, which can create improvements in event response efficiency and scheduling management levels.

CISDI QTouch has successfully been applied to centralised controls for Zhanjiang Steel's water treatment plant, WISCO's upstream-BF plant and WISCO's hot strip mill in China.

CISDI releases CISDigital™, its industrial network platform

A one-stop cloud platform, integrating intelligent production control, business operations and outsourcing co-ordination services

The launch of the CISDigital™ industrial network platform at SCE 2019

The CISDigital™ industrial network platform, an intelligent manufacturing cloud solution, will be serving steelworks in China and abroad later this year.

It has been built with information gathered over decades from CISDI's steel database and by integrating cloud computing, mobile internet, internet of things, big data and artificial intelligence.

A one-stop cloud platform, it provides the flow-based industry with intelligent production management, enterprise operations and external eco-coordination services.

Future-oriented, the platform assists with network co-ordination at steel plants and the industrial chain's upstream-downstream resource allocation and optimisation.

The platform creates an open, expandable intelligent application and development ecosystem.

"Intelligent manufacturing is the way forward for the manufacturing industry. Some of the steel intelligence apparently for the automation and information technological application fails to solve the cost and efficiency bottleneck," explained Ming Liu, the COO of CISDI Information Technology Co.

"In the new industrial revolution, the industrial internet plays a fundamental role for intelligent manufacturing. The CISDigital™ industrial network platform creates a spatial connection between steel plants."

Added Mr Liu: "As an example, a large steel complex is set up with only one platform HQ, but it needs to have integrated control of multiple manufacturing bases hundreds of miles away.

"CISDigital™ can connect the steel complex's raw materials, logistics and finance divisions and upstream and downstream users. Data gathered will be instrumental in linking and building a co-ordinated industrial ecosystem.

CISDI's Sigma makes your data work harder

A flexible solution for achieving intelligent manufacturing

CISDI's Sigma is an industrial big data and artificial intelligence product comprised of three toolkits: intelligent sensing, a knowledge component and big data-based analysis and decision-making.

Metallurgical companies can designate the modules and create their own tailored solutions like playing block-build.

Sigma can help find data and make best use of it.

500+ application modules

More than 500 modules can be re-combined flexibly for composing tailored, intelligent solutions to every aspect of the steelworks.

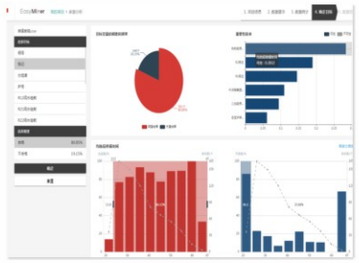
100+ application references

CISDI has over 100 steel references of Sigma - from upstream ironmaking to steelmaking, continuous casting, hot rolling and cold rolling.

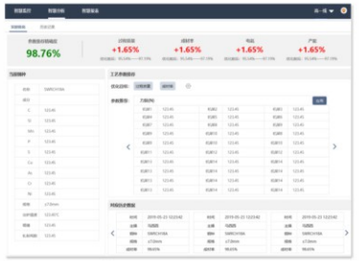
Quality and efficiency enhancement

Sigma has been proved instrumental in the transformation of steel plants to intelligent manufacturing – maximising the data value, improving the production quality and efficiency, saving energy and reducing consumption.

A CISDI Sigma screen shot, showing the use of machine vision to identify the belt conveyor's material flow and volume



An EasyMiner screen shot from CISDI Sigma demonstrates the analysis of defects due to generation of scale



A screen shot from CISDI Sigma showing optimisaton of the hot rolling schedule

A screen shot from CISDI Sigma showing the multi-curve analysis and forecasting of hot rolling cobble

CISDI Digital Twin boosts digital steelworks

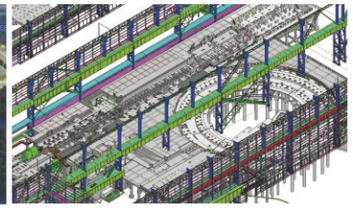
CISDI Digital Twin expertise is BIM based and a digital design with a complete 3D model and project database.

A window connecting the physical plant and the digital domain, Digital Twin provides a digital model for the plant and production line, effectively laying the foundations for the building of smart plants and network-based plants in the future.

CISDI applies the internet of things to integration of production data with engineering and produces a digital plant which corresponds with the real plant.

With the aid of augmented reality, digital information can be directly superimposed on the real plant. This achieves digital managements of equipment patrol checks and maintenance, operator training assistance, production status visualization, and virtual, remote and centralised control.

CISDI Digital Twin is being applied to India's TATA Steel Kalinganagar blast furnace 2 and Australia's Liberty Primary Steel Whyalla PCI plant.



CISDI's digital design delivery for TATA Steel Kalinganagar's blast furnace 2, the world's largest greenfield blast furnace under construction to a volume of 5,870 cubic metres.

CISDI has built a complete 3D model and database for this project. To help TATA Steel achieve digital management of the engineering, construction and production, CISDI has integrated and interlinked the model, drawing and documentation data with the production and operational data.

CISDI's digital design delivery for Liberty Primary Steel Whyalla PCI plant involved the building of a complete, accurate 3D model and database, which will enable a modular construction.

CISDI SPM Units at steelworks

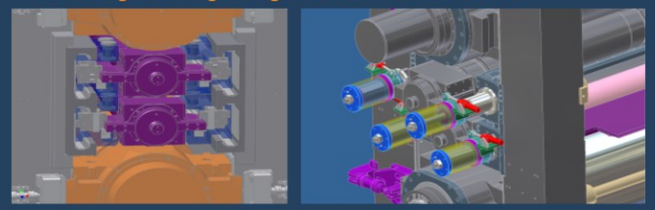
Unit highlights

- **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 ≤5mm and for the inter-layer taper ≤1mm, with a typical steel grade of B750L
- **High-efficiency production**
  A unit monthly output exceeding 70,000 tonnes and productivity ≥95%

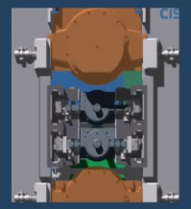
Core technologies

- **High-strength product tension model and tension distribution strategy**

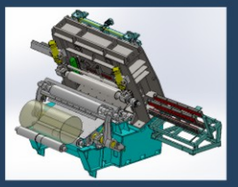
- **Bending-shifting integrated SPM know-how**



- **High-rigidity powerful SPM**



- **Prepration station of strip head bend forming**



- **High-efficiency threading clamp**

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