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Published By: CISDI Corporate Culture Department

# CISDI

## NEWSLETTER Vol. 5, 2017



Two blast furnaces built by CISDI for Formosa Ha Tinh Steel in Vietnam

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- CISDI attends AMM & WSD Steel Survival Strategies XXXII



TOTAL SOLUTIONS AND TECHNOLOGY PROVIDER  
PREFERRED BY GLOBAL METAL INDUSTRY

► **Full-Process Services**

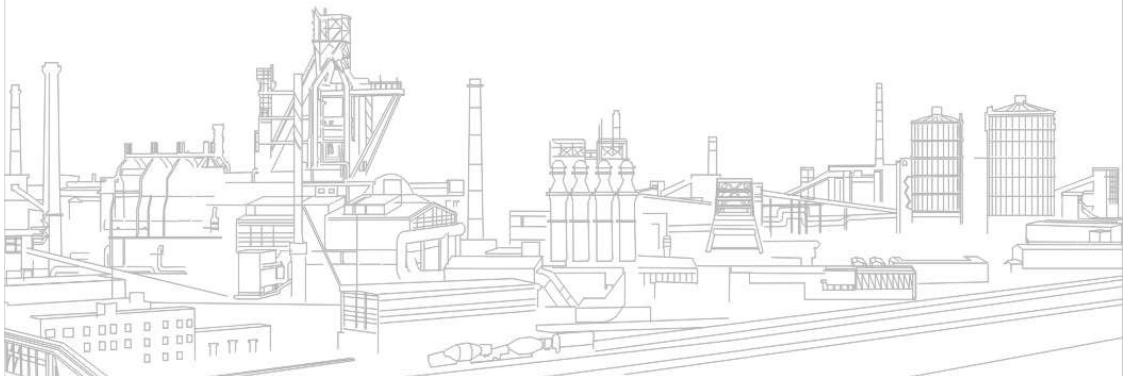
CISDI provides full-process services from the bulk material handling yard to the post-processing line of the hot mill.

► **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 through the entire project life cycle.



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## Anyang's 1,550mm CGL passes hot commissioning

A 1,550mm continuous hot galvanizing line (CGL) capable of producing vast quantities of ultra-slim sheets for the household appliance industry is now in operation in China.

Anyang Steel has reported its CGL successfully passed its hot commissioning test on March 20.

The CGL, contracted by CISDI on an EP basis, is designed to produce the thin and prime surface quality galvanized (aluminium-plated) sheets for high-end household appliances at a rate of 350,000 tonnes a year.

CISDI's engineering technology and expertise have ensured production capabilities of 0.25mm~2.0mm thickness and 800mm~1,400mm product width at the plant.

Designed maximum speeds of entry, process and exit sections are 270m/min, 200m/min and 270m/min, respectively.

The highly automated CGL is equipped with dual pay-off reels, a fully-automatic welder and multi-step rinsing tanks. Radiant tubes reheat the vertical annealing furnace and other impressive features include a dual zinc pot lifting service, an air knife with coating layer edge control and high-accuracy positioning control, a 4-hi skin pass mill, 2-bending & 2-straightening stretcher, 2 sets of roller coating systems (via application of passivant and finger-proof agent), electrostatic oiler, flying shears and dual-drum coiler.

The majority of these hi-spec features were designed and manufactured by CISDI.

The CGL also benefits from CISDI's production and control development technologies that have also given the CGL advanced shape control, coating layer AGC, surface quality control, annealing furnace roll speed softening/flexible control (speed-allowable deviation and compensation), interlayer tension compensation control for strip at vertical looper, material accurate tracking and

annealing furnace combustion control model.

The continuous annealing line (CAL) for the 1,550mm CGL passed its hot test at the end of last year after meeting all performance criteria. Annealed coils to a specification of 0.8mm x 1,000mm were delivered.

The company also supplied the mechanical and EIC equipment and software programming for this project.



CISDI GROUP CO., LTD.

## FHS BF Project Management

Two blast furnaces built by CISDI for Formosa Ha Tinh Steel in Vietnam are the largest of their kind in the world.

The giants are 4,350m<sup>3</sup> and were created despite numerous setbacks - from severe weather conditions to the Vietnam-China conflict back in May 2014.

The project was also a major first - CISDI had never before exported the core technology and

equipment for a blast furnace out of China.

To ensure the smooth progression of consulting, design, procurement, construction and commissioning for this project, CISDI established a complete set of international project management systems.

The company's elaborate engineering, scientific management and precise workmanship ensured the successful startup of #1BF.



### Overview

**Work scope:** 2x4,350m<sup>3</sup> blast furnaces, including BF proper, top, stove, casthouse, stockhouse, central pump station, slag granulation system, blower station, PCI station, gravity dust catcher, gas cleaning system, TRT, pig machine, etc.

**Service scope:** geological survey, EPC, commissioning, supervision for startup and ramp-up

**Date of start (1<sup>st</sup> pile):** 2 Dec. 2012

**Contractual startup date:** #1 BF by 31 May 2015, #2 BF by 31 May 2016

**Actual startup date:** #1 BF by 29 May 2017, #2 BF by 31 May 2018 (adjusted schedule)

## Factual challenges in the process

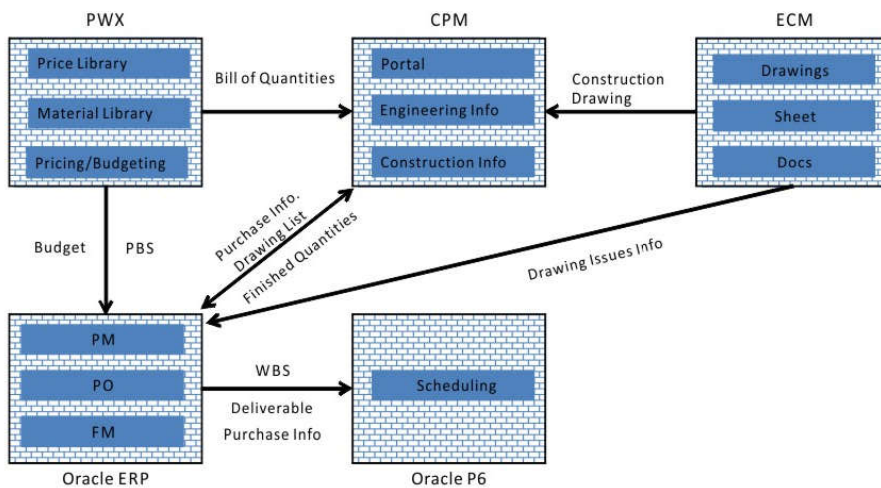
- ◆ **High quality:** strict compliance with FHS global project construction quality standards
- ◆ **Rigorous safety:** strict compliance with FHS enterprise standards
- ◆ **Tight schedule:** factors including quality, logistics and transport, labour, local climate, safety and local support facilities had to be incorporated into the tight timescale
- ◆ **Hard task-focussed management:** large volumes of drawings and design documents, numerous interfaces with suppliers, large volumes of logistics
- ◆ **Multiple risks:** customs, taxation, crossing borders, cultural difference, geo-politics

## CISDI Integrated Control System Architecture

CISDI developed an in-house control system known as 'PMIS' to integrate ERP, Material Management, Engineering Management, Procurement Management, Construction Management, Cost Management, Schedule Management, Content Management and Project

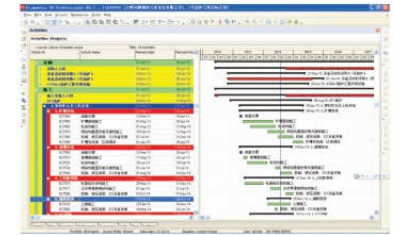
Portal.

PMIS provided all the information and tools needed by the FHS BF project team as the project progressed, from initiation and planning to execution, control of procedures and fruition.



## Schedule Management

EPC tasks were organised on a subcontract structure, which was broken down into detailed work packages. The majority of information generated during project execution was updated automatically by PMIS in real-time. Schedulers regularly generated a project progress report using information collected from the site report, ERP, Portal and ECM.



## Design Management

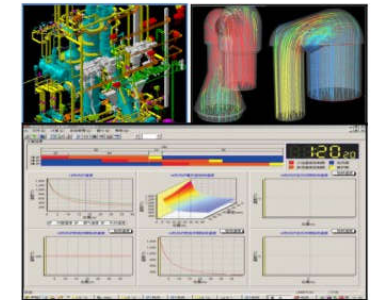
CISDI's complete design management system is based on its over 60 years of engineering experience.

In accordance with FHS's rigorous drawing approval procedures, CISDI's project team prepared the unified design specification, drawing verification procedure and the guidelines pertinent to the project and dispatched the engineering manager and controller to the site.

This thorough procedure guarantees design quality and accelerates the rate of approval. In addition, the approved design plays a positive role in procurement and construction.

3D design and digital simulation enhanced coordination between the various engineering disciplines and ensured accurate calculations. Their applications prevented

interferences of pipeline commonly seen in projects of this magnitude.



3D review and CAE simulation

## Procurement Management

CISDI's procurement management framework ensured tight control of the supply chain. The majority of suppliers to the FHS blast furnace suppliers are CISDI's strategic partners and these long and trusted relationships ensured punctual supply of materials and equipment.

CISDI focussed on the full process control of procurement and carried out a thorough evaluation of the quality assurance systems of its suppliers. CISDI organised regular meetings for key equipment ordering, at which comprehensive assessment of numerous factors were made: the suppliers' capacity, a

manufacturer's stability, the qualifications of key personnel and fittings suppliers, the capability of testing equipment, transport and packing, drawing format and process record. This thorough supplier filtering system is indispensable, say CISDI, for ensuring a smooth manufacturing process and the timely supply of equipment and materials.

In response to FHS's exacting quality requirements on welding and surface



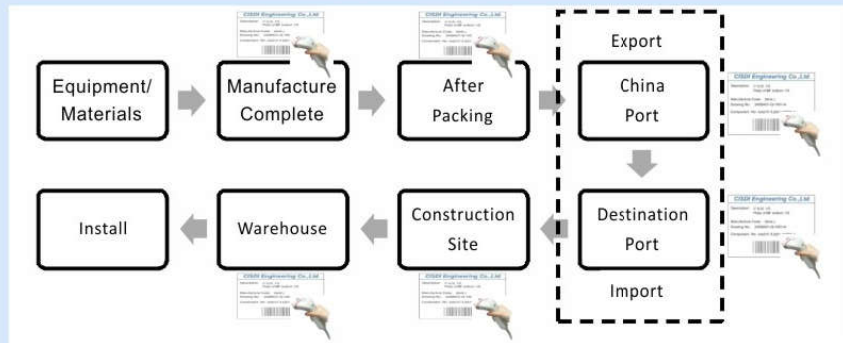
treatment quality, CISDI organised the training of over 370 man-time manufacturing and inspection workers. CISDI also sent over 80 inspection engineers out to numerous suppliers to carry out

inspection and test plans (ITPs) on vital equipment and perform thorough monitor and control tests.

INSPECTION AND TEST PLAN									
ITEM NO.	DESCRIPTION	TEST METHOD	TEST EQUIPMENT	TEST LOCATION	TEST DATE	TEST RESULT	TESTED BY	APPROVED BY	REMARKS
1	Visual inspection	Visual							
2	Dimensional inspection	Caliper, Vernier							
3	Surface finish inspection	Surface finish gauge							
4	Hardness inspection	Rockwell C							
5	Welding inspection	Visual, Penetrant							
6	Paint inspection	Visual, Thickness gauge							
7	Corrosion inspection	Visual, Potentiostat							
8	Leakage inspection	Helium leak detector							
9	Pressure inspection	Pressure test							
10	Performance inspection	Performance test							



ITP being carried out on equipment



Barcode-based logistics management



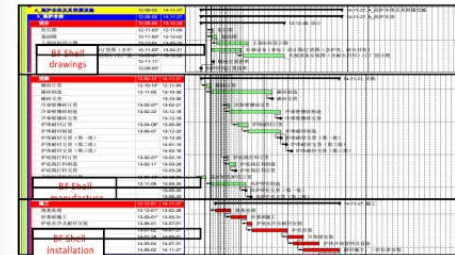
Pre-assembling the tuyere rings for the blast furnace shell at the manufacturer ensured quality on delivery to the site



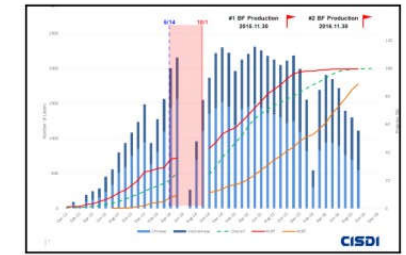
Sand-blasting surface preparation and roughness inspection carried out before painting

## Construction Management

To accommodate the complex construction schedule and Vietnam's six-month rain and typhoon season, CISDI made construction a priority. Drawing submission and goods delivery were carried out to an exacting time schedule and the use of construction machinery, tools and labour was carefully coordinated.



Labor charts



Accumulated BOQ

## Construction Quality Control

Quality control during the construction process has always been a challenge to industry and is not easy to achieve. CISDI insists on a comprehensive inspection of the qualifications of construction personnel and the condition of construction machinery and tools. Material access tracking, drawing reviews and construction proposal optimisation are further precautions carried out on a regular basis. These practises ensure common errors and defects are identified in advance and averted. Furthermore, pre-construction meetings are a CISDI requirement. These meetings facilitate a collective decision-making process on every major construction proposal between client and contractor. Three parties co-review and co-verify the construction process and give assessments on safety and environmental impact.

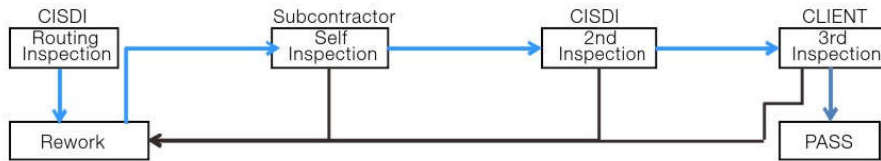
CISDI dispatched an experienced construction supervision team to work alongside inspection engineers stationed at the site to formulate strict inspection procedures and maintain a high level of construction quality.

<b>BACKGROUND ENVIRONMENT</b>	<b>EQUIPMENT</b>
Background Environment Background Environment Background Environment Background Environment Background Environment	Equipment Equipment Equipment Equipment Equipment
<b>CONSTRUCTION AREA</b>	<b>RIS</b>
Construction Area Construction Area Construction Area Construction Area Construction Area	RIS RIS RIS RIS RIS
<b>MAINTENANCE / REPAIR</b>	<b>MAINTENANCE / REPAIR</b>
Maintenance / Repair Maintenance / Repair Maintenance / Repair Maintenance / Repair Maintenance / Repair	Maintenance / Repair Maintenance / Repair Maintenance / Repair Maintenance / Repair Maintenance / Repair
<b>LOGS / JOURNALS</b>	<b>LOGS / JOURNALS</b>
Logs / Journals Logs / Journals Logs / Journals Logs / Journals Logs / Journals	Logs / Journals Logs / Journals Logs / Journals Logs / Journals Logs / Journals
<b>UTILITIES AND SERVICES</b>	<b>UTILITIES AND SERVICES</b>
Utilities and Services Utilities and Services Utilities and Services Utilities and Services Utilities and Services	Utilities and Services Utilities and Services Utilities and Services Utilities and Services Utilities and Services
<b>ENVIRONMENTAL IMPACT</b>	<b>ENVIRONMENTAL IMPACT</b>
Environmental Impact Environmental Impact Environmental Impact Environmental Impact Environmental Impact	Environmental Impact Environmental Impact Environmental Impact Environmental Impact Environmental Impact

Evaluation keywords



Pre-construction meeting at FHS BF site



Strain inspection of pile



Ultrasonic detection after welding



Stave installation gap inspection



Verticality inspection of piping



Bar spacing measurement



Stove grate verticality inspection



Stave bricklaying gap inspection



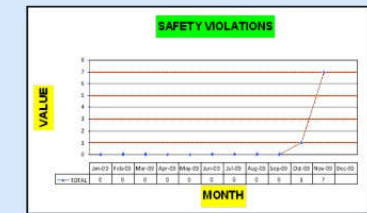
High voltage switch cabinet base installation inspection

## Construction Safety Control

Safety control has played a major role in the successful project management of the FHS blast furnaces project. Since construction began in October 2012 there have been zero safety incidents. In addition to the patrol checks and safety logs, CISDI teams create a safety notice board warning of potential risks and reinforcing safety precautions and the need for workers to act responsibly.



DESCRIPTION	STATUS
1. Full body harness with double lanyard & shock absorber	Closed
2. Fire fighting equipment	Open
3. Barricade & signage	Open
4. Electrical cable unsecured near the gen. set	Open
5. Damage lifting gear	Open
6. Crane accessories damage	Closed
7. Smoking area	Open
8. Gas cylinder storage	Open
9. Electrical cable management	Open



Training



Inspection



Promotion



Correction



## CISDI develops world leading Air-Gas Dual Regenerative Burner

A revolutionary air-gas dual regenerative burner developed by CISDI's R&D teams has been hailed as a major breakthrough in green combustion for the ferrous metal industry.

The R&D project to develop a high-efficiency, long-service-life air-gas dual regenerative burner was conducted by CISDI and verified by the Chongqing Academy of Science and Technology.

Green combustion will play a key role in developing a ferrous metal industry which leaves less impact on the environment.

This R&D project was conceived by CISDI for the purpose of converting waste to energy.

By-product gases with low calorific value were the focal point of the study for being preheated up to the high theoretical burning temperature, and the Air Gas Dual Regenerative Burner was developed for this purpose.

To understand the commercial application, CISDI established a mathematical simulation model for the Regenerative Burner as part of an entire heavy slab reheating furnace. The model was used to simulate combined heating modes, namely, dual-regenerative and conventional burners.

The results showed reduced slab LOI, reduced

emissions and improved slab reheating quality, with the added benefit of extending the service life of burners.

To date, the R&D project has achieved several milestones in combustion technology, design concept, core equipment and smart control.

Commercialisation of the Dual Regenerative Burner achievements can now be seen in 20 heavy slab reheating furnaces both in China and overseas.

It has brought about savings in excess of 700 million cubic metres of BFG and a reduction of CO<sub>2</sub> emissions in excess of 1.32 million metric tons.

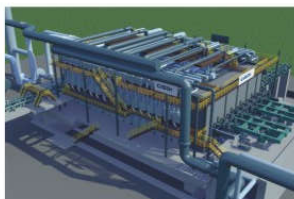
The Dual Regenerative Burner also allows for the effective use of low-calorific-value gas in high-end rolling lines, which previously relied on high-calorific-value gas.

Such R&D projects carried out by CISDI promote the optimisation of metals production and processes for both domestic and international steel enterprises.

The Air-Gas Dual Regenerative Burner has been awarded 1 patent for its invention and 3 patents for its utility model.



BFG-fueled Dual Regenerative Burners in operation at TISCO 260t/h slab reheating furnace.



BFG-fueled Dual Regenerative Burners at the GUSA 120t/h billet reheating furnace for long products mill in Brazil



BFG-fueled Dual Regenerative Burners at the Pangang Chengdu Steel Φ177mm tubular billet annular furnace

## CISDI's vision on Energy Systematic Optimization (ESO): Four NEW's: Change – Mind – Technology – Competitiveness

With the new global steel trends: new trend of international trade, new price fluctuation of resource and energy, new impact of China, new technology, energy systematic optimization serves as an important and efficient method to improve competitiveness to steel enterprises worldwide. Systematic, economic and

sustainable are the overall principles guiding our energy systematic optimization service. With the right service provider, steel enterprises can enjoy the benefit to make full extent of potentials in operations and gain strong competitiveness in steel market via continuous optimization.

### Global Steel – the four new trends

Throughout the world, steel development in the 20th century saw two growth periods accompanied by two adjustment periods.

China's iron and steel demands heralded the third growth period at the beginning of the 21st century.

However, global steel production entered the third adjustment stage in 2015 due to the over capacity of China's steel and a slowing in worldwide demand.

By analysing steel industries in developed countries during the first and second adjustment

periods, emerging economies have been able to identify the driving factors now affecting the future of the steel industry.

The driving factors are global growth, product restructuring, diversified development, energy conservation and environmental protection.

And four new trends have been identified as the key forces now influencing the current global iron and steel industry: international trade; the price fluctuation of resources and energy, the impact of China and developments in technology.

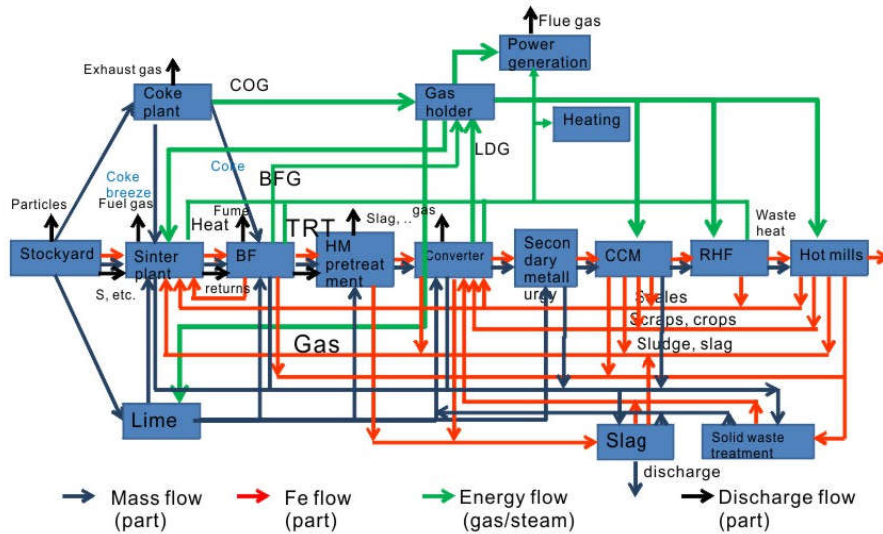
### Energy Systematic Optimisation

As the global market increases in competitiveness, the importance of Energy Systematic Optimisation (ESO) is being recognised by more and more steel producers.

ESO delivers valuable efficient and economic benefits. It improves competitiveness by taking an overview of the various energy flows in the steel production process.

With the right service provider, an operation's maximum potential can be achieved.

Systematic Analysis, Economics and Sustainability are the overall principles guiding CISDI's ESO service. Our systematic approach, solid experience, scientific tools and methods ensure effective and continuous energy optimisation.



ESO aims to increase economic benefit by examining not only the energy index, but also energy cost.

Systematic analysis, economics and sustainability are the overall principles guiding CISDI's ESO service.

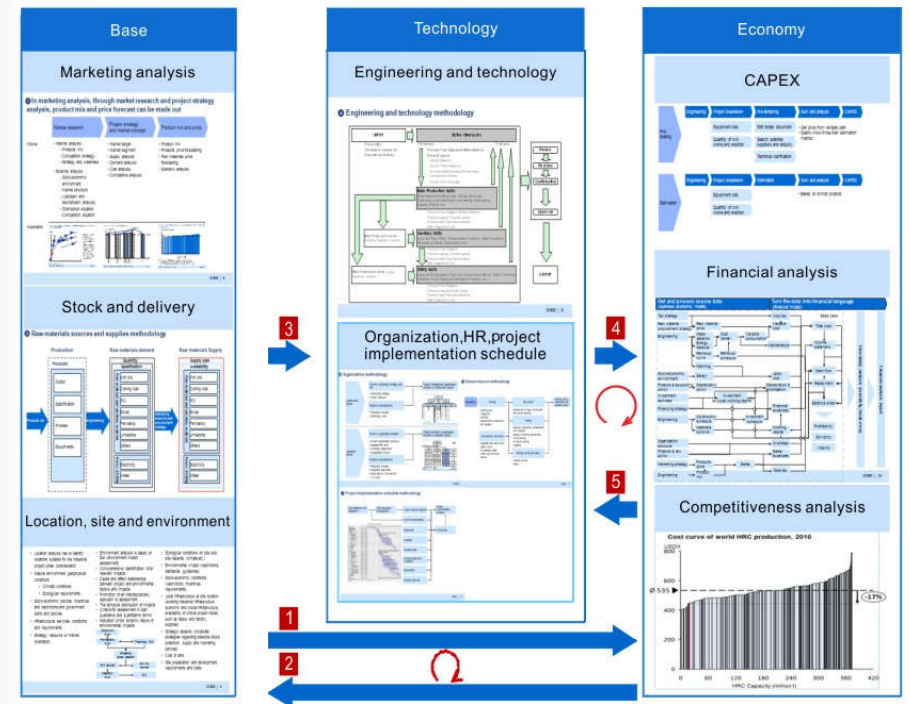
## Systemic Analysis

For External Factors: integrated analysis by systemic models.

For Internal Factors: flow, interface and sequence analysis.

## Economics

A closed-loop design concept assures continuous improvement and produces the optimal technical solution, focussed on economy



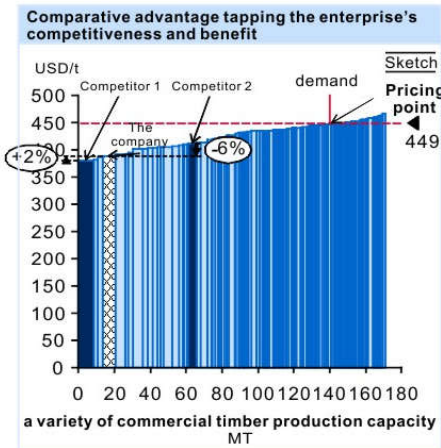


## Sustainability

Economic sustainability is dependent on effective control of the most critical factors

CISDI's ESO service has been working with over 20 iron and steel producers since 2009. Clients in

China, India, Brazil and Vietnam have successfully reduced their overall energy consumption and reaped significant economic benefits.

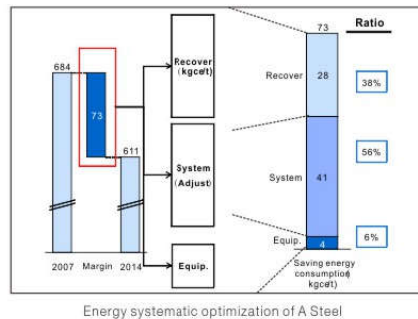


## Case Study 1 – Steel Plant A

Steel Plant A in China employed our ESO services from 2007 to 2014 and significantly reduced its energy costs as a result.

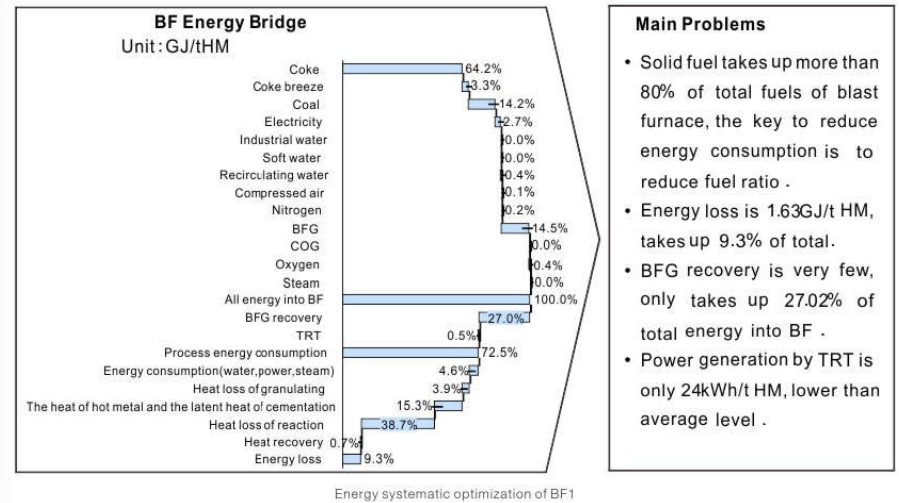
Total energy consumption fell by 73kgce/t as a result of implementing:

- system upgrade (41 kgce/t)
- waste heat recovery (28 kgce/t)
- equipment restructuring (4 kgce/t)



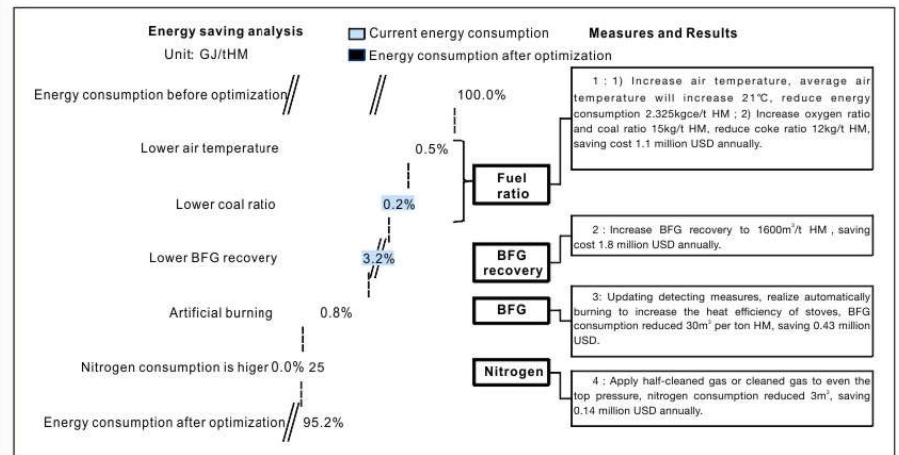
## Case Study 2 – Blast Furnace

By analysing the blast furnace energy bridge, CISDI's ESO service detected a problem with the energy system. As a result, remedial work was carried out and the BF energy consumption was decreased by 4.8%, saving 3.4 million USD.



### Main Problems

- Solid fuel takes up more than 80% of total fuels of blast furnace, the key to reduce energy consumption is to reduce fuel ratio.
- Energy loss is 1.63GJ/t HM, takes up 9.3% of total.
- BFG recovery is very few, only takes up 27.02% of total energy into BF.
- Power generation by TRT is only 24kWh/t HM, lower than average level.



## CISDI attends AMM & WSD Steel Survival Strategies XXXII

CISDI Group delivered a keynote speech on high tech Smart Factory developments at the AMM & WSD Steel Survival Strategies XXXII conference in New York.

The June event attracted a number of American steel enterprises and suppliers to the global metal industry.

CISDI, a gold sponsor of the event, introduced the audience, which included representatives of SMS, Primetals, Danieli, Midrex and Tenova, to its research and development applications for the ECIA stockyard, big data and visualisation technology.

Robert Smith, the representative of CISDI USA, spoke on behalf of the group and exchanged views with the experts on new technologies capable of maximising steelworks efficiency upgrades and transforming factories to 'smart' operations.

CISDI was the only Chinese ferrous engineering company to attend the event.



CISDI team members from the headquarters and its UK and USA subsidiaries are pictured at the AMM & WSD Steel Survival Strategies XXXII



Robert Smith, of CISDI USA, who addressed the forum on behalf of CISDI Group

## CISDI: the total solutions and technology provider preferred by the global metal industry

- 38 of the world's top 50 steel enterprises are our clients
- We provide full-process solutions and plant-wide systematic services centred on enhancing competitiveness and are leaders in the core technological development of industrial upgrading



### Baosteel Zhanjiang, China

A world leading carbon steel plate base, modernized, eco-friendly and high performance  
CISDI undertakes the general design and core units/projects E, EP or EPC services



### Formosa Ha Tinh (FHS), Vietnam

The largest steel complex in Southeast Asia  
CISDI undertakes the consulting, general design and core units/projects E, EP or EPC services