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# CISDI

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The CISDI team at India Steel 2017

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### ► Full-Process Services

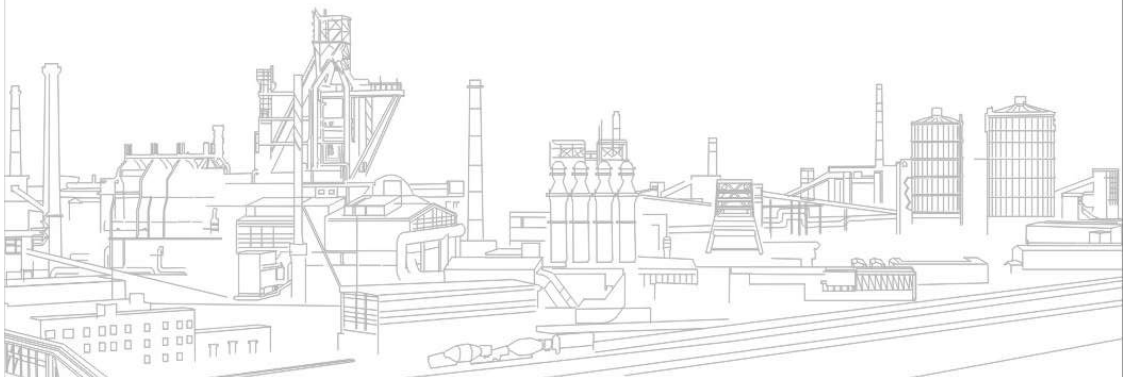
CISDI provides full-process services from the bulk material handling yard to the post-processing line of the hot mill.

### ► 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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## CISDI Showcases World's Largest Blast Furnace and Other Innovations at India Steel 2017

CISDI drew the crowds at India Steel 2017 by unveiling plans for its latest global first, the world's largest blast furnace.

Among the impressed visitors to CISDI's stand were Mr T.V. Narendran, director and managing director of TATA Steel, and Mr. Naveen Jindal, the chairman of JSPL.

The BF2 in a volume of 5,870m<sup>3</sup>, the biggest in the world, is currently at the detail design stage and is planned to be built at Tata Steel's greenfield steel plant at Kalinganagar.

Located in Odisha's Jajpur district, the plant went into operation in 2016 and achieved a major milestone this February, with hot metal production exceeding the two million tonne mark.

The International Exhibition and Conference India Steel is a joint initiative led by the country's government, the Ministry of Steel and the Federation of Indian Chambers of Commerce and Industry. A platform for key decision-makers in the steel industry and related sectors to interact and explore new business avenues, the third annual conference was staged in Mumbai in April.

Attendees included representatives from TATA Steel, JSW, ESSAR, JSPL and SAIL, and engineering companies SMS, PW and Baosteel Engineering.

CISDI Group took advantage of the influential audience to showcase the engineering highlights behind the BF2 furnace and a host of its latest innovations and developments in iron and steel core technologies that are eminently suitable for the challenges of India's steel industry.

Its personnel demonstrated the company's total solutions competence and its expertise in energy conservation and environmental protection, big

data and other technologies tailored to the Indian market.

During its time in India, CISDI visited a number of metal enterprises, material suppliers and construction companies in order for further communication and understanding of their needs.

Said a CISDI spokesperson: "We at CISDI believe the smooth execution of a project relies on effective communications, mutual understanding and an in-depth knowledge of the client's requirements."

CISDI also visited Chinese suppliers Dalian Huarui Heavy Industry Group Co., Ltd. (DHHI) and Shantou Huaxing Metallurgical Equipment Co. Ltd.



CISDI India representatives welcome Mr T.V. Narendran, director and managing director of TATA Steel, to their stand at India Steel 2017



The CISDI team at India Steel 2017

## CISDI Subsidiary Makes its Mark in India

CISDI's Indian subsidiary, launched just a year ago, has already worked with some of the most respected Indian steel giants.

One of the significant support teams to CISDI's overseas operations, CISDI India is based in Powai in North-East Mumbai.

Its team is oriented to the demands of the Indian market and aims to provide a more convenient and tailored service for CISDI's clients throughout India, including assistance during project implementation and ongoing after care service and support in the long-term.

CISDI India has undertaken the master plan of TATA Steel's TSK greenfield steel plant at Kalinganagar and is currently engineering the world's largest blast furnace, which will significantly boost TSK's productivity. Its team has also undertaken the engineering of the JSW Dolvi stockyard and the package supply of Dolvi's blast furnace.

TATA selected CISDI as its engineering contractor for the new TSK BF2 in the face of powerful bids from UK, ROK, Italy and Luxembourg.

During the engineering phase, CISDI India has worked closely with TATA to assist the client in understanding the drawings. It is closely coordinating with the TATA team, which has made several visits to CISDI offices for engineering reviews. The basic engineering phase has been completed and the detail engineering is progressing.

Said a CISDI spokesperson: "The Indian steel industry is seen as one of the world's greatest potential growth areas. It is gearing up to respond to the national call for a major boost in steel production. Its target is to expand its steel output to 300Mt by 2025."

"Currently the local average consumption of steel product per capita is at less than 70kg, which represents huge potential for expansion when

compared with many other countries. CISDI India aims to assist that growth and be the preferred engineering solutions provider in India."

Following on from its success with TATA Steel and JSW, its team is now exploring further collaboration with JSW, Essar, SAIL, JSPL, Bhushan and RINL.



CISDI chairman (Left) at CISDI India Office

### Typical References in India

**TSK BF2** — the largest new blast furnace under construction in the world

- Volume: 5,870m<sup>3</sup>
- Service mode: engineering
- Status: CISDI completed basic engineering



TSK BF2 under construction



### TSK Master Plan

CISDI's advanced analysis, planning tools and methodology were used to deliver the master plan for TSK, taking into consideration the phased construction and planned future developments.

The general layout was optimized from the original 'U' shape to an 'L' shape.

CISDI-ECIA environment-friendly stockyard technology is being utilised to greatly improve the bulk materials logistics upstream the blast furnace ironmaking.

The existing railway systems in TSK Phase I (outside of CISDI scope) have been upgraded and the aboveground handling and transporting potential has

been exploited to better meet the final target production capacity.

The master plan facilitates a constructive way of thinking which greatly assists the client in its decision-making and in addition, the plant's sustainable development.



TSK master plan

### JSW Dolvi Stockyard (E) & BF (EP)

CISDI India has now completed innovative projects for the JSW Dolvi stockyard and BF projects.

CISDI-ECIA stockyard technology was a major contributing factor in the award of the contract in 2014, when the client set its sights on building a new enclosed stockyard at the wharf which had the ability to match a planned expansion of capacity, and modifying the original stockyard as an enclosed blending yard.

The Dolvi BF (revamp) is currently underway and CISDI's services have been unanimously recognised by the client.

In addition CISDI India has undertaken the package supply of Dolvi's blast furnace, one of CISDI's technological strengths being blast furnace iron-making.



JSW Dolvi BF1 revamp

## CISDI Takes a Major Role in Building of ASSB in Malaysia

CISDI is developing the construction design and procurement for the 3.5Mt/a steel complex ASSB in Malaysia.

The design has been carried out on schedule to the customer's satisfaction.

The procurement of proprietary equipment and construction of the major production units are progressing to schedule and the foundation work is almost complete, CISDI report.

The blast furnace shell, scrap yard and steel structures of the bar and wire rod mills are under installation.

The first batch of blast furnace shell arrived on site on April 8 and within ten days the shell had been lifted for the first time, representing a significant milestone in the site's construction.

ASSB expressed their satisfaction with the performance of CISDI, and other contractors involved, at the Third Summit of Promoting MCKIP ASSB on April 29.



CISDI personnel for on-site services



Installation of ASSB BF1 shell



The initial steel structures for the Steelmaking Unit's scrap yard being lifted into place.



## Successful Hot Test of the Revamped Xinyu Steel Billet Caster

**A**worn and ageing steel billet caster at Xinyu Steel in Jiangxi Province, China, has been transformed into an efficient and cost-effective device powered by the latest modern technology in just four months.

The demanding project required a very tight schedule from signing of contract to startup. CISDI's project management and engineering teams worked on-site to ensure the necessary communication, troubleshooting support and performance quality that resulted in the on-time delivery.

The rebuild upgraded the severely-worn mechanical equipment and replaced aged electrical and automation components with latest spec modern technology.

The project was a resounding success, resulting in a reduction in maintenance time and expense, improvement in equipment stability and the elimination of defects in steel grade quality.

During a month of trial production, the modernised CCM #3 caster at Plant #1 of Xinyu Steel reached 90,000 tonnes of billets, and Xinyu Steel reported high good quality results were achieved in the grade of hard wire and high carbon steel.

To achieve this result, CISDI applied multiple patented technologies in continuous straightening, strand cut-to-length management and dynamic secondary cooling control.

CISDI supplied the critical equipment, including the withdrawal straightener, in a timely manner from its workshops in China.

The revamped caster is on target to reach 1Mtpy output, product specifications of 135mm x 135mm and 160mm x 160mm, and in grades of quality carbon structural steel, low alloy steel, spring steel, cold headed steel and hard wired steel.combustion control model.



## TISCO Meltshop De-Phosphorization Plant Rebuild Project Passed Hot Test

**C**ISDI provided an innovative solution for TISCO, one of the world's largest steel producers, when it needed to upgrade its de-phosphorization (de-P) plant.

TISCO's hot metal de-P equipment has been rebuilt in the north zone of its No.2 meltshop and passed its hot commissioning tests on April 7.

The original 180t Mg-base combined-blown hot metal desulphurization device system was modified by CISDI to a hot metal de-P system.

CISDI Engineers provided an innovative solution to meet the challenge of site space limitations, difficulty of modification and a tight time schedule.

CISDI achieved hot metal de-P functions by modifying the original flux injection system, installing a new dual-lance lifting and shifting

device, a new single-lance lifting device and a new splash guard lifting device. As much of the existing equipment as possible was re-used.

The new de-P system injects pulverized lime and fluorite powder into the hot metal ladle. The process continues with the adding of red mud pellets via a hopper and belt conveyor system into the ladle, in order to create high-alkalinity and high-oxidation slag. Oxygen is blown in to remove the elements of Si and P from the hot metal.



## Development of Wet Electrostatic Precipitator for BOF Primary Fume

**B**OF primary fume is one of the main sources of steel plant atmospheric pollution.

The OG process is widely used for cleaning primary fume discharged from steel plant converters, however the dust concentration results achieved can still be over 100mg/m<sup>3</sup>, and in some cases up to 200mg/m<sup>3</sup>, way above the legal discharge limit of 50mg/m<sup>3</sup>.

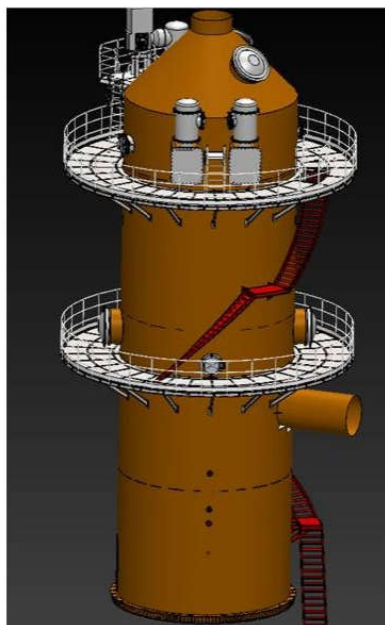
If the customary wet dedusting process is changed to dry process, BOF fume discharge would easily fall in line with the legal requirement. But changing to this process is very costly.

CISDI's Research and Development Center has pooled its wisdom and developed breakthrough technology which provides a highly effective and less costly method of cutting back on atmospheric pollution from primary flume.

The technology upgrade enables the wet electrostatic precipitator downstream OG dedusting system to carry out a secondary cleaning of the fume.

According to lab tests, the precipitator can reduce the post-OG process discharge concentration to less than 20mg/m<sup>3</sup>. In some cases during testing, the discharge was reduced to 10mg/m<sup>3</sup>.

The precipitator is also highly efficient in the collection of PM2.5, the technology involved is relatively low in cost and the upgrade can be carried out with a relatively short down time.



## Steelmaking Technology

CISDI is committed to building green, smart and highly efficient, high quality steelmaking plants at a competitive cost. Being a master of steelmaking process, equipment, automation control, model and IT, CISDI ably provides the engineering, package supply and turnkey services for global clients for hot metal pre-treatment, BOF, EAF, CAS, CAS-OB, LF, RH, VD/VOD and related projects.

### CISDI-SACS(Self-Adaptive Constraint System) 4-Point Linkage Suspension System

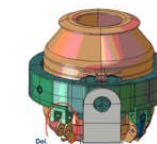
- Patented invention;
- A wealth of knowledge and experience in the application of 4-point linkage suspension system to 13 of the 57 references of CISDI-SACS BOFs;
- Suspension system characteristic of uniform distribution of loads, resulting in low stress and deformation to trunnion ring and converter shell, safe operation with built-in redundancy and an enhanced service life;
- BOF tilting with smooth stability through the acceleration / deceleration curve;
- Suspension system and supporting bracket free from maintenance.

Table showing comparison between a 3-point and a 4-point suspension system derived from a 300t BOF:

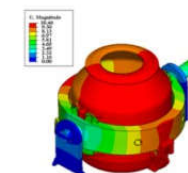
Bracket's Alternating Elastic Slip (AES)	Displacement of Bracket (mm)	Displacement of Converter Shell (mm)	Item
4.55~4.65	4.65~5.81	9.2~10.46	3-point suspension
2.0 (-50%)	-1.34~-2.19	-3.04~-3.89	4-point suspension



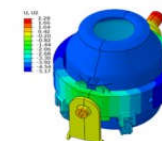
CISDI-SACS BOF with 4-point suspension system



Safety analysis on 4-point suspension system



3-point linkage suspension



4-point linkage suspension

### Typical reference:

Baosteel Meishan Steel — 280t BOFs with CISDI-SACS 4-Point Linkage Suspension System

- Converter capacity: 2 x 280t
- Production capacity: 4.21Mt per annum
- Startup time: April 2012
- Service mode: EP





## CISDI-Green EAF

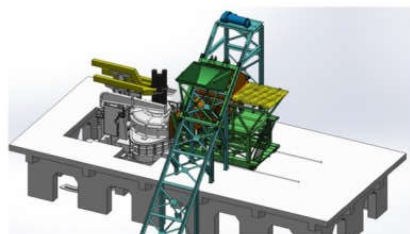
Over 60 years of EAF-dedicated design, manufacture and research has seen the exported conventional HI and UHP EAFs attaining the world's leading technical figures, represented by the power consumption of pure scrap smelting of 385kWh/t-liquid steel. CISDI developed FocusArc EAF and AutoArc EAF in response to the national call for environmental protection and energy conservation. Such new equipment has become the model for continuous scrap charging and preheating method.

### Technical highlights:

- Fully automatic and enclosed charging of scrap;
- Penetrated preheating of scrap, enhanced scrap specification, putting preheating time under control;
- Top-side-chute charging structure, targeting charges to the center of EAF heating, improving the cold zone inside the furnace, and enhancing thermal efficiency;
- Good control of fume temperature during scrap preheating process, whilst at the same time taking care of dioxin control;
- CISDI-DMI-AC electrode regulation system: giving the capacity of reducing power consumption by 15~25kWh/t-liquid steel;
- Metal yield: enhanced by 1~2%;
- Increased hot heel by 15~60%, especially relevant for project upgrades.

### Technical figures:

Figure	Unit	Item	S/No.
90~92	%	Metal yield	1
320~360	kWh/t	Smelting power consumption (pure scrap)	2
0.1~0.5	ng-TEQ/Nm <sup>3</sup>	Dioxin discharge limit	3
50~55	min	Tap-to-tap cycle	4
about 1.5	kg/t	Electrode consumption (pure scrap)	5



CISDI-FocusArc EAF



CISDI-AutoArc EAF

### Typical reference:

SPCO VKS EAF in Vietnam

- Exported green EAF with design and manufacture according to Japanese standards and requirements
- EAF capacity: 90t
- Production capacity: 550,000t/a
- Startup time: June 2015
- Service mode: EP
- Transformer capacity: 64MVA
- Power consumption: 385kWh/t-liquid steel (pure scrap)

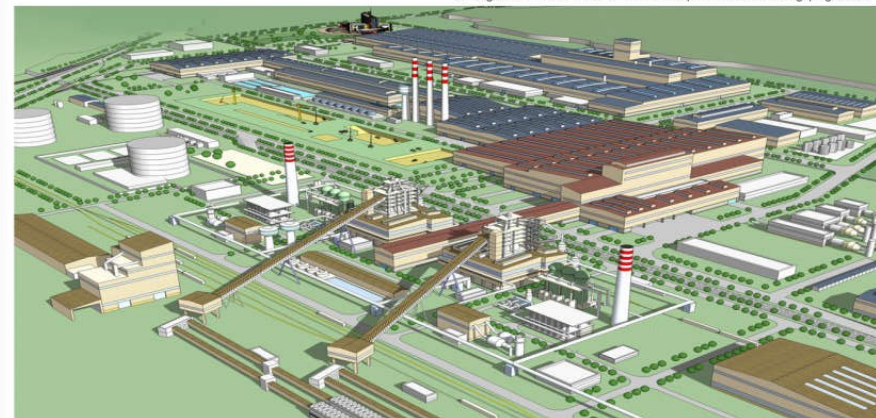


## Single Ladle Hot Metal Transport System

CISDI has developed the technology for a unique compact single ladle transfer of hot metal from ironmaking to steelmaking workshop. It replaces the traditional need for a railway transfer system, instead utilising car or truck. This technological solution, when combined with steelmaking logistics simulation, enables CISDI to create tailor-made, practical solutions for actual site conditions.



A single ladle hot metal corridor in operation at Chongqing Steel

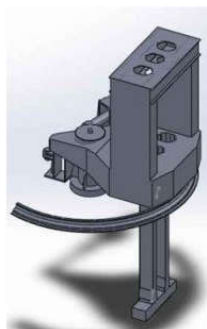
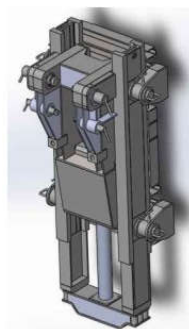
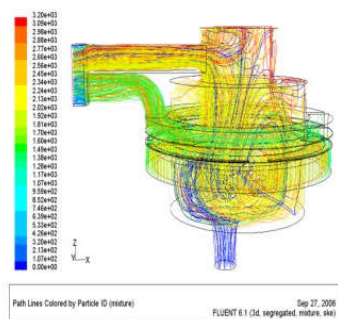


Transfer car used for single ladle hot metal transport technology at Xinyu Steel



## Dual-Position LF with Reliable Electrode Rotation Mechanism

- LF lid with inert gas and full water cooling, extending service life;
- Overhead structure for lid lifting, safe and reliable;
- Electrode rotation mechanism: rotating spindle and double support wheels, allowing precise reset position;
- Efficient electric energy input and smart electrode regulation system: greatly reducing refining power consumption to 0.45kWh/t·°C;
- Integrated argon flow control expertise;
- Smelting model expert system: controlling S content in the range of 5~10ppm and T.O. within 10ppm.



### Typical reference:

Rizhao Steel — 300t Dual-Position LF

- LF capacity: 2x300t
- Production capacity: 2.5Mt/a
- Startup time: 2015
- Service mode: EP



## CISDI Stockyard Online Upgrading Technology

- ◆ CISDI offers a ground-breaking online upgrading service for steel stockyards.
- ◆ Upgrades are carried out safely and economically - and without incurring down-time - thanks to the company's advanced technology in systematic processes and procedures, its expertise in construction crafts, production scheduling and production warranty.
- ◆ Customers can rely on the safe and reliable supply of raw materials for downstream users of the stockyard during the entire upgrading process.

**Baosteel Stockyard Revamp** — the world's largest stockyard, upgraded to an environment-friendly application

**Receiving capacity:** 50.95Mt/a

**Yard storage capacity:** 4.38Mt/a

**Yard proper area:** 680,000m<sup>2</sup>

**Startup time:** stepwise between 2015 and 2020

**Service mode:** E/EP



**Tangshan Ruifeng Stockyard Revamp** — the world's 1st stockyard upgraded with CISDI-ECIA technology

**Receiving capacity:** 10.10Mt/a

**Yard storage capacity:** 250,000t

**Yard proper area:** 21,000m<sup>2</sup>

**Startup time:** 2016

**Service mode:** EP+CM

