SINOSTEEL E&T ENGINEERING NEWS TECHNOLOGY LETTER

2023

Collaboration Updates:
Turn Green, Complete the Value Chain, Building New Beneficiation & TGIOP Plants for Tosyali

Clean Solution:
with Baostrip China's First Thin-strip Casting & Rolling Line

METEC 2023
Hall5, Booth 5CI5

GREEN MANUFACTURING
GREEN LIFECYCLE

Innovative Prowess

Beyond Expectations

SINOSTEEL

SINOSTEEL ENGINEERING & TECHNOLOGY CO., LTD.

As a member of China Baowu Steel Group Corporation Limited and a listed company (stock code: 000928), Sinosteel Engineering & Technology Co., Ltd. (abbr Sinosteel E&T) is a leading industrial engineering company focusing on industrial engineering & service with multiple businesses including mining engineering, energy saving, safety & health and environment protection.

Pursuing sustainable development and innovation-driven growth, Sinosteel E & T provides outstanding life-cycle service along the entire iron and steel production chains, as well as all-in-one green solutions to customers around the globe. Thanks to its continuous input into technological innovation & research, Sinosteel E&T is steadily moving forward into a new stage of growth: innovation of ground-breaking green & low carbon technologies and advancing future-oriented digitalization measures to enhance quality and efficiency, reduce carbon footprint and improve sustainability. Making the Solution Provider of Low-carbon Metallurgy, Pioneer of Greener Growth as the company's business motto in the new era, Sinosteel E&T is determined to forge a leading low-carbon metallurgy company in China and assist iron & steel industry to achieve the goal of carbon dioxide peaking and neutral ahead of time.

Environmental Protection

Sinosteel Tiancheng Environmental Protection & Technology Co., Ltd *(abbr Sinosteel Tiancheng)*, a subsidiary of Sinosteel E&T, is a front runner in developing green solutions for iron & steel makers. Boasting of two national technology centers and one workstation for academicians of the Chinese Academy, Sinosteel Tiancheng has built a great number of model projects by applying its pillar tech on ultra-low emissions. With its dedication to technology innovations, Sinosteel Tiancheng will help customers achieve the synergy between pollution and carbon emissions control.

Health, Safety & Protection

Sinosteel Wuhan Safety & Environmental Protection Research Institute Co., Ltd *(abbr Sinosteel SEPRI)*, a subsidiary of Sinosteel E&T, focuses on providing professional HSE consulting services & solutions. Possessing rich experience in risk management & control, the company expands its business into the area of green and decarbonization development. Excels in basic research and best-in-class know-how, Sinosteel SEPRI can tailor-make roadmap & strategies for customers to cope with CO_2 emission controlling targets and climate change.

Industrial Engineering & Services

As Sinosteel E&T's wholly-owned subsidiary and founded in 1972, Sinosteel Equipment & Engineering Co., Ltd *(abbr Sinosteel MECC)* has grown into an industry-leading company and made significant contributions to the development of Chinese steel industry. The company is capable of industrial general contracting covering diversified areas including metallurgy, mining & mineral processing, coal chemical, energy and infrastructure.

As one of the Chinese companies expanded global presence at the earliest time, Sinosteel MECC has gained excellent reputation in overseas metallurgical engineering market, with over 150 projects accomplished and business footprints in more than 40 countries.

As proper utilization of resources and lower carbon footprint rise on the list of steelmakers, Sinosteel MECC is undertaking prominent carbon-cutting projects both at home and abroad. With continued efforts into developing and deploying a broader portfolio of technologies to optimize process efficiency and mitigate CO_2 emissions, the company is paving the way for the metallurgy industry to accomplish low-carbon transformation in the coming years.

Solutions Provider of Low-Carbon Metallurgy

Pioneers of Green Growth

Low-Carbon Metallurgy

Green Building

Environmental Protection, Safety & Energy Conservation

Beyond Expectations

Sinosteel E&T

SINOSTEEL
中钢国际
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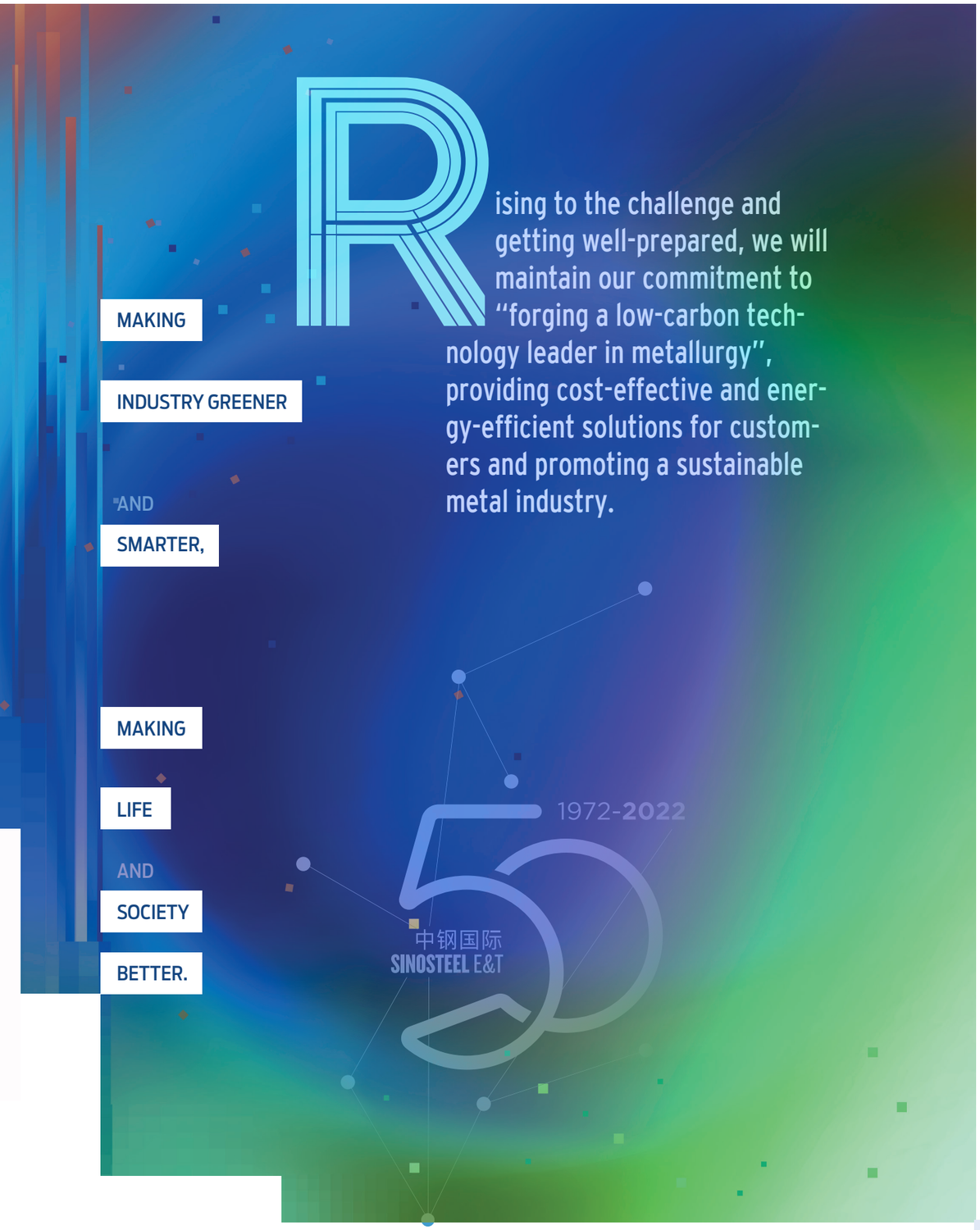

CHAIRMAN'S MESSAGE

Dear Valued Customers

The past year has been a truly momentous one, marked by historic changes and significant global shifts. Through our unwavering commitment to science and technology innovation, Sinosteel E&T has delivered exceptional solutions to our valued customers, both domestically and abroad.

The past year marked a significant milestone for Sinosteel E&T as we celebrated our 50th anniversary. Reflecting on our journey, we have grown from a ministry unit to a world-class metallurgical engineering company with a global presence in over 40 countries. Our dedication and commitment to excellence have earned us a reputation for leading technology and exceptional service in overseas markets. Our persistence and efforts have not been in vain, and we are proud of the mark we have left in the take-off of China's iron & steel industry. Looking back, our 50-year journey has been one of continuous growth and development, fueled by our unwavering commitment to our corporate culture. It is our driving force to fulfill our mission of "Making industry greener and smarter, and making life and society better."

The past year also witnessed how Sinosteel E&T responded to climate change, finding pathways to an ever sustainable and green metallurgical future. We prioritize technology-driven innovation and focus on cutting-edge low-carbon metallurgical technologies to tackle the ever pressing environmental challenges. Baowu's HyCROF, a hydrogen-enriched carbon cycle and oxygen blast furnace, constructed by Sinosteel E&T, has achieved a 21% carbon emission reduction target, making it the first 400-cubic-meter level low-carbon metallurgical blast furnace in China. We are now responsible for expanding this technology to larger facilities, gradually being carried out on three 2500m³ blast furnaces. Besides, the hydrogen-based shaft furnace at Baosteel Zhanjiang Iron and Steel's green demonstration plant has proceeded to the phase of equipment installation. This is the first direct reduction iron (DRI) production line integrating hydrogen, natural gas and coke oven gas for industrial production. As the effort to cut carbon emissions continued, Shanxi Hongda has contracted us for the engineering, procurement and construction of China's very first thin strip casting and rolling line, by utilizing Baostrip, a self-developed technology. Our progress

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also includes theoretical research, such as our participation in the national key R&D program to study system integration and smart interconnection technology of hydrogen metallurgy entire-process storage and supply.

In addition to our domestic achievements, our overseas business also had unforgettable highlights in 2022. Thanks to the support of our customers, we secured new contracts and saw the seeds of projects continue to sprout. Phase IV of Tosyali's green steel complex began site construction in April, and the beneficiation plant we built was put into operation in the same month, making it the first in Algeria. I feel proud that our team of professionals continued to work on MMK's coke oven project in times of adversity and helped upgrade two blast furnaces for Kardemir. Integrating leading technology and professional project management, Sinosteel E&T provided expert services, advanced technology and holistic solutions along the entire iron and steel production chain to customers, strengthening confidence and solidarity.

Throughout the past year, Sinosteel E&T has kept devoting itself to guiding steel makers into an environmentally friendly nonetheless profitable future, fulfilling the customer's determination to become even more resilient to changing market conditions.

As spring arrives, we are filled with renewed hope and usher in a promising 2023. Embarking on a new journey, we are more optimistic than ever about the green future of the steel industry. With rising awareness of the environmental impact of steel production, steelmakers are accelerating their green transformation, and Sinosteel E&T is always ready to be your trustworthy partner. Rising to the challenge and getting well-prepared, we will maintain our commitment to "forging a low-carbon technology leader in metallurgy", providing cost-effective and energy-efficient solutions for customers and promoting a sustainable metal industry.

Mr LU Pengcheng

Chairman of Sinosteel E&T

April, 2023

MAKING INDUSTRY GREENER

Sinosteel E&T keeps devoting itself to guiding steel makers into an environmentally friendly nonetheless profitable future.

FORGING A LOW-CARBON TECHNOLOGY LEADER IN METALLURGY

MAKING

INDUSTRY GREENER

AND

SMARTER,

MAKING

LIFE

AND

SOCIETY

BETTER.

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BIM Drawing of flotation

Sinosteel MECC Wins Contracts of Beneficiation Plants and Travelling Grate Pellet Plant from Tosyali

1 **Algeria 4mtpa**
Travelling grate pellet plant

2 **Algeria 4mtpa**
Beneficiation plant

3 **Angola 1.7mtpa**
Beneficiation plant

On October 15, 2022, Sinosteel MECC was awarded the contracts to build a 4mtpa travelling grate pellet plant and a 4mtpa beneficiation plant in Algeria, as well as a 1.7mtpa beneficiation plant in Angola by Tosyali Group, with total value over US$ 400million, following the deal of a new DRI-EAF route steel plant on EPC basis clinched at the end of 2021.

Employing digital technology empowered by BIM 360 & CFD

CS

1 4mtpa Travelling grate pellet plant for Tosyali in Algeria

As the second travelling grate pellet plant built by Sinosteel MECC for Tosyali, the newly signed 4mtpa project will still be applied with Sinosteel MECC's self-developed technology and employ the world-leading numerical simulation and digital delivery technology empowered by BIM 360 and CFD. **The energy consumption at full magnetite production is less than 18 kgce/t.**

A firm shakehand between Sinosteel MECC's GM Hua Guanglin and Fuat Tosyali, President of Tosyali group

2 The 4mtpa beneficiation plant in Algeria

The 4mtpa beneficiation plant in Algeria will either grind coarse-grained hematite of high grade or process magnetite of low grade through grinding and magnetic separation to high grade thus to output the pellet concentrate eligible for direct reduction. Its further processing capability will guarantee the stable operation of pellet and DRI plants. Besides, the reduced silicon content will facilitate the subsequent ironmaking process in impurity removal and lessen the steel slag, therefore lowering energy consumption.

> *Winning the bid for the pellet and beneficiation plant offers Sinosteel MECC a great opportunity to be reinforced in self-developed and low-carbon technologies and to consolidate our cooperation with Tosyali which started 15 years ago.*

Hua Guanglin

General Manager of Sinosteel MECC.

7.5m/t

Annual Output

65%

Concentrate grade

4-5%

Silicon dioxide content

3 The Angolan 1.7mtpa beneficiation plant

The Angolan 1.7mtpa beneficiation plant will use dense medium iron ore beneficiation process, which is applied for the first time in overseas EPC project by a Chinese company, features a shorter process flow, higher efficiency and lower energy consumption and operation cost compared with the conventional process. The project is expected to process 7.5 million tons of raw iron ore yearly and output iron concentrate respectively sized 0.5-2mm and 2-6mm, with concentrate grade of 65% and silicon dioxide content 4-5%. It is also a symbol of Sinosteel MECC entering into a new market overseas.

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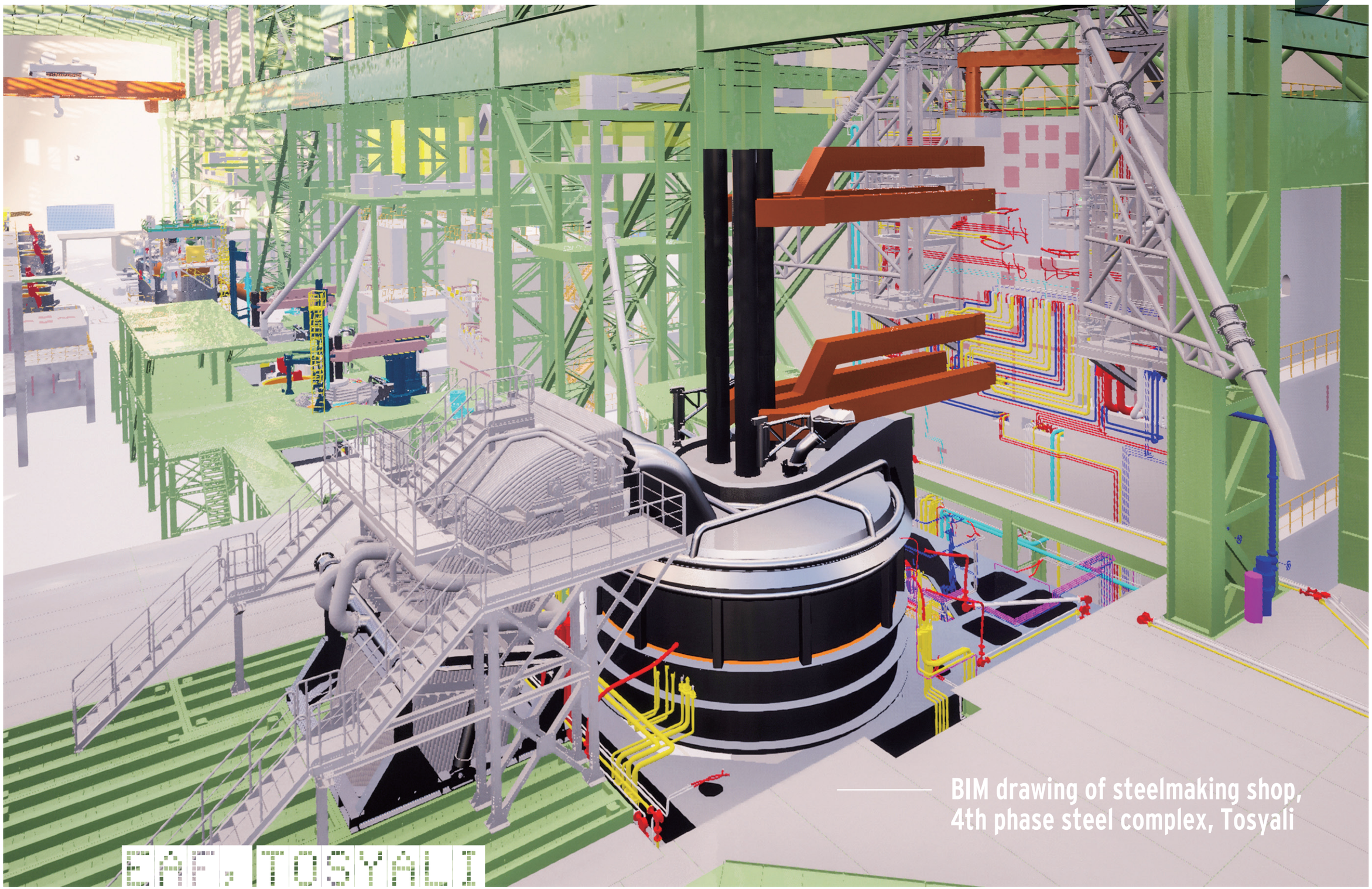
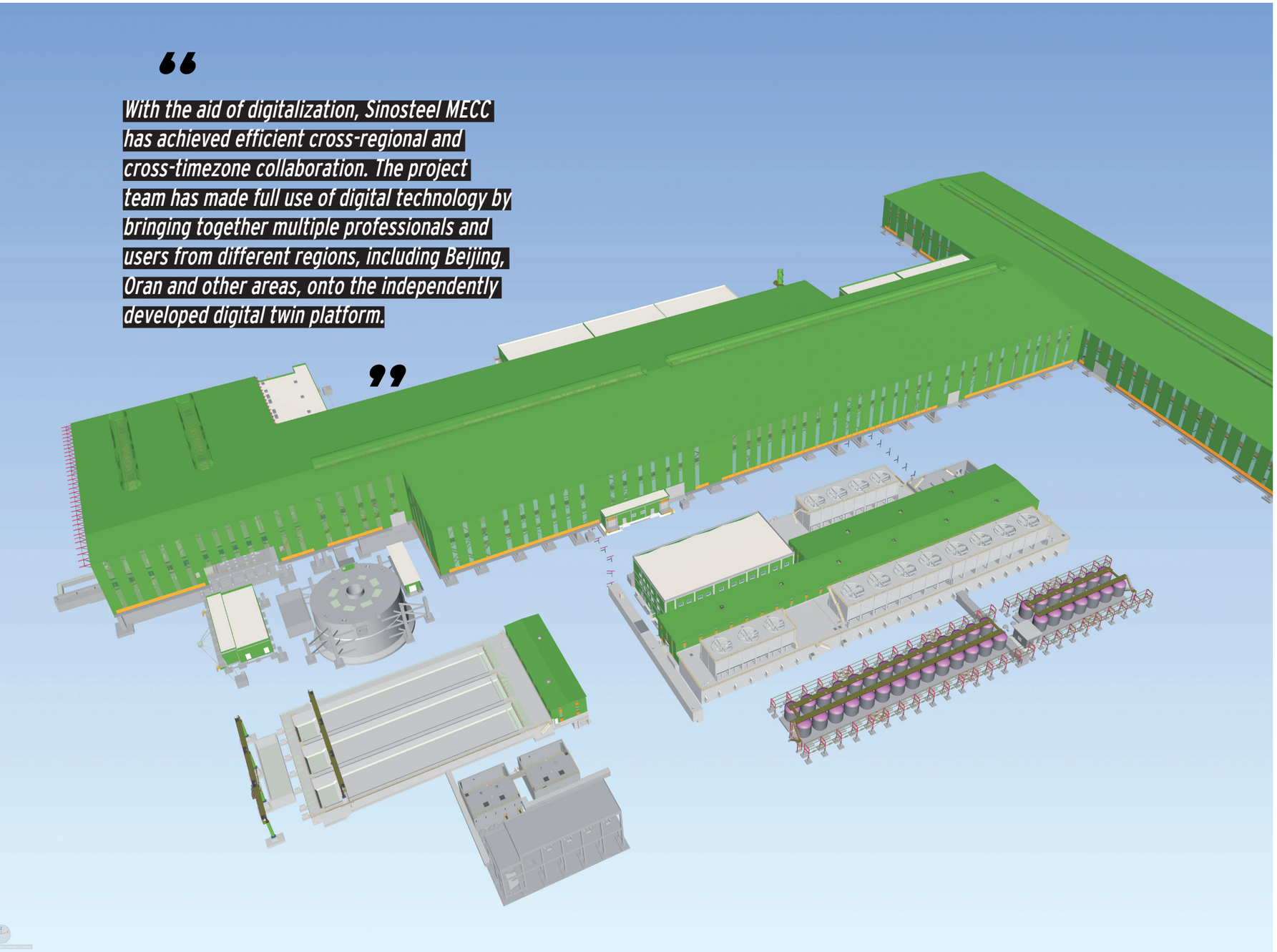


BIM drawing of steelmaking shop, 4th phase steel complex, Tosyali

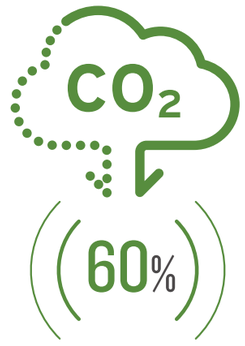


With the aid of digitalization, Sinosteel MECC has achieved efficient cross-regional and cross-timezone collaboration. The project team has made full use of digital technology by bringing together multiple professionals and users from different regions, including Beijing, Oran and other areas, onto the independently developed digital twin platform.

Phase IV steel complex project in Algeria

In the past two years, Sinosteel MECC and TOSYALI have been closely working together in spite of the epidemic and complex international situation. The Phase IV steel complex project in Algeria contracted by Sinosteel MECC at the end of 2021 is under construction. The plant consists of a 2.5mtpa DRI shop, a steelmaking shop with a 240-ton EAF, a 1,800mm hot strip rolling line, two 600-ton lime kilns and the supporting auxiliary facilities.

The DRI-EAF steel-making route greatly reduces environmental pollution and energy consumption in the processes, and remarkably improves the efficiency and cleanness of steel production. Compared with iron-making process using coal as the reducing agent, a gas-based shaft furnace for direct reduction with HDRI will cut power consumption from 550kWh to 400kWh per ton of steel. The carbon emission per ton of product is about 0.5-0.6 tons of CO_2, 60% lower than the iron-making process. At the same time, the smelting time will be shortened by 17% and the steel production capacity of an EAF can be increased by more than 17%.



The plant and the supporting auxiliary facilities consists of:

2.5mtpa
DRI shop

240t
EAF steelmaking shop

1800mm
Hot strip mill

2X 600t
Lime kilns

COOPERATION CASES

4mpta Concentrate Regrinding and Re-separation Plant

EPC put into operation in April 2022

It is Tosyali Group's first beneficiation plant, also the first one in Algeria. The further processing and grade improving capabilities enable Tosyali to use low-grade ores to be processed by the Plant to improve the quality and ensure stable downstream pellet and DRI production.

4mtpa Travelling Grate Pellet Plant

EPC put into operation in April 2018

It is an integral part of the 2.3mtpa DRI-EAF route steel complex built by Sinosteel MECC in Algeria, also Tosyali's first travelling grate pellet plant. An annual output of 4 million tons makes it the largest iron ore pellet project in Africa.

Sinosteel MECC's self-developed travelling grate pelletizing technology is highly adaptable to raw materials and environmentally friendly. Moreover, the advanced equipment and automation level can effectively reduce the operation cost and difficulties. The stable operation of the Project has led to low energy consumption, high efficiency, and green production of pellets.

"Supported by digitalization, the company's independently developed and leading technologies can enhance efficiency, reduce energy and material consumption."

Beneficiation plant and pelletizing plant, Tosyali

Carbon Reduction

From Steel Producer to Strategic Investor

Heavy plate rolling

Efficient Utilization of Mineral Resources

New Clients Collaborations

Breakthrough in Indian Market

Greater market share

Market Recognition

Integrated solutions

Safety Services

NEW DEALS

Our ability to provide a comprehensive set of services for the entire lifecycle of a steel plant, has been successful in closing deals with customers both home and abroad. Rather than concentrating on numbers, we always strive to develop integrated solutions that are tailored to our customers needs. As we continue to advance solution-focused and emission-reduction technology, some of our self-developed ones have gained greater market share, enabling more and more customers to achieve higher productivity, reliabilityand efficiency.

Carbon Reduction: Sinosteel E&T Awarded Contract of 1MTPA Low-Carbon Thin Strip Casting and Rolling Project

01

Rendering of Baostrip – thin strip casting and rolling technology

Signing ceremony

We offer low-carbon solutions to consumers through green, high-quality, intelligent, and efficient innovative technonogies.

The project will make use of Baowu's unique thin strip casting and rolling technology, known as Baostrip.

Sinosteel E&T and Shanxi Hongda Group inked a contract on August 16, 2022, in Yuncheng City, Shanxi, to build a 1mtpa low-carbon thin strip casting and rolling plant, the first of its type in China with independent intellectual assets.

Sinosteel E&T will construct a thin strip casting and rolling demonstration line to the east of Hongda's existing steelmaking and CCM shop on EPC basis. The new line boasts a capacity of 1 million tons of qualifying hot rolled coils per year.

Thin strip casting and rolling is a cutting-edge technology that offers benefits such as short flow, lower energy consumption, and lower emissions. Its energy consumption per ton of steel is just one-fifth that of the conventional continuous hot rolling process, and its CO_2 emission is only one-quarter. As a result, it is bound to become a significant strategy to carbon reduction in the steel industry. The project will make use of Baowu's unique thin strip casting and rolling technology, known as Baostrip.

80% 75%

Comparision to conventional continuous hot rolling process

Following 20 years of development, the Baostrip technology has shown its reliability through both the Ningbo Steel demonstration line and the highly recognized product quality.

China Baowu is now planning to establish a state-of-the-art thin strip casting plant in Xinjiang with an incredibly short process flow and zero carbon emissions.

The contract marked deeper collaboration between Sinosteel E&T and Hongda Group in the field of green and low-carbon development. Since the start of strategic cooperation in 2020, the two parties have successfully upgraded one 230 m^2 sintering plant, one 1.3mtpa pelletizing plant, one 1,250 m^3 BF, and two 1mtpa high-speed wire rod lines.

The steel industry is a backbone of Yuncheng. The 1mtpa low-carbon thin strip casting and rolling project will significantly upgrade the equipment, complete the supporting facilities, extend the industrial chain and achieve the green and low-carbon development of the city's steel industry.

Li Zhe

Deputy Mayor of Yuncheng

Li Zhe, Zhang Huimin and Lu Pengcheng delivering speeches

From Steel Producer to Strategic Investor: Jianlong Expands Collaboration with Sinosteel E&T

02

Shakehands of deeper cooperation

Jianlong Group is a large group with interests in a variety of industries, including mining, steel, shipbuilding and electromechanical equipment.

Zhang Zhixiang made a visit to the Smart wearable product research and development base of SEPRI.

Jianlong Xigang, a subsidiary established in 1966, is the largest steel complex in Heilongjiang Province and an important production base of construction steel in Northeast China. Jianlong Group recently set a goal of transforming itself to a profit-oriented enterprise of digitalization and intelligence, innovation and enjoyment, and started cooperation with subsidiaries of Sinosteel E&T.

Deepening Business Collaboration with Strategic Investor

Jianlong Group officially became a strategic investor in Sinosteel SEPRI on June 20. Four days later, the two parties signed an agreement on deepening business collaboration for future cooperation.

According to the agreement, the two sides will give full play to their respective advantages to deepen business collaboration on technological R&D and commercialization in the fields of safety and health education and training, environmental protection, green and low-carbon technology in the metallurgical industry based on the principle of "strategic synergy and win-win cooperation".

Zhang Zhixiang, chairman of Jianlong Group, expressed appreciation for Sinosteel SEPRI's future development plan. "Sinosteel SEPRI has developed a strategic blueprint," he said. It has a large market space and significant growth potential. I hope that both parties will work together to promote the research on key common technologies of metallurgical safety and environmental protection, as well as to implement a series of related demonstration projects that can be replicated, used as a reference and promoted, thereby improving the safety and environmental protection performance of both the Group and the industry.

Joint efforts are encouraged to promote the research and application of safety intelligence, to thoroughly study and analyze the safety scenarios of steel plants and mines, and to concentrate on the development and application of intelligent safety technologies. When necessary, we can create a series of intelligent products, and jointly build laboratories and research institutes, so as to continuously improve the safety digitalization and intelligence level of steel plants, and make us the leader of the industry."

"After introducing Jianlong Group as a strategic investor, Sinosteel SEPRI will usher in greater development opportunities." said Lu Pengcheng, chairman of Sinosteel E&T. In the future, with the support of shareholders, Sinosteel SEPRI's prospects are limitless. I hope that Sinosteel SEPRI will give full play to its leading role in the "demonstration of sci-tech reform", strengthen cooperation with Jianlong in the fields of metallurgical safety, intelligent safety, green and low carbon technology, and make new contributions to the safe, green, and high-quality development of the metallurgical industry in the new era."

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"We can create a series of intelligent products, and jointly build laboratories and research institutes, so as to continuously improve the safety digitalization and intelligence level of steel plants, and make us the leader of the industry."

Lu Pengcheng and Zhang Zhixiang exchange views during the meeting

B

Successfully Delivered Twin High-Speed Bar Project

1.6mtpa

Twin high-speed bar

5,196t

Maximum daily output

7.52B¥

Annual Sales revenue (Billion Yuan)

28X

High-rigidity mill stands

On September 1, the 1.6mtpa twin high-speed bar TMCP rolling production line project of Jianlong Xigang, undertaken by Sinosteel MECC based on an EP contract, completed a production of 130,700 tons, with a maximum daily output of 5,196 tons. When the project is fully operational, it will generate an annual sales revenue of 7.52 billion yuan, with a tax of 116 million yuan and a profit of 179 million yuan.

This is Jianlong Xigang's key project for product upgrading, with a production specification of 12.0mm -16.0 mm and an annual output of 1.6 million tons. The project is aimed at cleaner production and intelligent manufacturing. As a result, Sinosteel MECC's proprietary advanced bar and wire product rolling technology of is used to facilitate the optimization of product structure, focusing on building a relatively unmanned and digital workshop:

- **Using bar rolling technology with independent intellectual property rights, with 28 high-rigidity mill stands, a high-speed steel feeding system, and other key equipment, all of which are industry leaders.**
- **Utilizing the newly upgraded TMCP and equipment exclusively owned by Sinosteel MECC to enable V-free and low-Mn production and significantly reduce the cost of steel rolling process.**
- **Using modular rolling mills, which are developed in series (230mm / 265mm / 290mm /330 mm) by Sinosteel MECC, the mill feature high accuracy, high yield, low production costs and high efficiency. The 265mm modular mill used in the project is specially designed for low-temperature rolling, allowing for low-temperature rolling of products smaller than Φ25 mm. To achieve high product accuracy and good quality, each stand is driven separately with an adjustable speed ratio.**
- **Adopting a high-speed steel feeding system developed independently by Sinosteel MECC, with a design speed of up to 50m/s, ensuring a maximum steel feeding speed of 45m/s. Among China's twin high-speed bar production lines, the integrated precision automatic control system allows for the highest daily output.**
- **China Baowu's industrial Internet platform, namely iPlat, is used. AI and big data analysis technology are fully incorporated to enable 3D plant visualization, equipment online monitoring, a single control room for a single line, automatic visual identification of cobble, unmanned traveling crane, intelligent warehouse management, intelligent train loading, etc.**

With the goal of "high yield, high quality, high efficiency, low cost, and intelligence", Sinosteel MECC completed the project in nine months despite challenges such as extremely cold weather with a minimum temperature of minus 35 °C, setting a construction record in alpine and high-altitude areas. Sinosteel MECC has been continuously adjusting the hot commissioning scheme and optimizing the process parameters for the line since March 19, with the rolling speed steadily improving. The design capacity was reached in just five months.

From BIM drawings to real-site plant

New Deal: To Build Green and Digital Traveling Grate Pelletizing Line

In February 2022, Sinosteel MECC inked a deal with Jianlong Xigang for a traveling grate pelletizing project. Sinosteel MECC won the contract thanks to its numerous successful references, low-carbon and efficient process, and good investment cost efficiency. The contract calls for Sinosteel MECC to build a 4mtpa green and low-carbon line on EPC basis. Supporting facilities include concentrate storage and belt conveyor system for feeding pellet into BF. Utility and auxiliary facilities such as power supply lines, water supply and drainage system, gas supply system, bentonite flux storage and flux preparation, and main control office are also included. By the end of 2022, the project had progressed to the stage of supplying main equipment of the indurating machine.

To meet the target of building Jianlong Xigang into an energy-saving, low-carbon, green and safe metallurgical enterprise with a garden-like environment, the pellet plant employes advanced and mature technology of traveling grate indurating machine and large-scale equipment independently developed by Sinosteel MECC. Greener, low-carbon production, smoother process flow, and more efficient and reasonable process layout are all possible with lower investment and operational expenses.

As one of the key technologies to improve the energy efficiency of traditional BF ironmaking and low-carbon production, the TFIOP technology features a process energy consumption of less than 18kgce/t during production with full magnetite, making it the cleanest pelletizing process. In addition, using it to generate pellets as a substitute for sinter offers substantial advantages in reducing pollution and carbon dioxide emissions prior to ironmaking. Carbon emissions before ironmaking will be cut by about 10% if the proportion of pellets in BF is increased from 10% to 50%.

Sinosteel MECC also makes full use of the digital ecosystem incorporating EPC + M + O in order to further decrease operating costs, and increase production efficiency, as well as product quality and the level of intelligence, with the goal of building an internationally leading digital production line. Guided by the design concept of “high quality, high efficiency, low cost and intelligence” as well as the principle of “shortest transferring duration, optimal process route and least emission”, mature and reliable information technology is used to integrate advanced intelligent equipment to form the overall design scheme.

“Creating a series of intelligent products, and jointly build laboratories and research institutes, so as to continuously improve the safety digitalization and intelligence level of steel plants, and make us the leader of the industry.”

New Client: Sinosteel MECC Awarded with EPC Contract of 3,500mm Heavy Plate Project from Jingchang Steel Products

03

Signing ceremony

Project officially kicked-off

Sinosteel MECC has developed proprietary high-efficiency long product rolling technologies, innovating and upgrading matching equipment.

Sinosteel MECC employes the Super Immediate Cooling (SUPIC) technology.

In July 2022, Sinosteel MECC signed an EPC contract with Jingchang Steel Products to build a 3,500mm heavy plate rolling plant and associated facilities with an annual output of 1.6 million tons. The engineering, procurement, construction, installation and commissioning will be completed in 17 months by Sinosteel MECC.

3500mm
Heavy Plate

1.6mtpa
Annual Output

FLUENT simulation and intelligent 3D modeling are used to achieve functionalities such as accelerated cooling control (ACC), intermittent direct quenching (IDQ) and direct quenching (DQ).

The project's automatic control system was designed entirely by Sinosteel MECC and represents the cutting-edge of hardware, software, and field bus technologies in heavy plate lines. The system integrates all hardware and software with information and intelligent systems, enabling the line to be completely IT and AI-powered in the future. A comprehensive database is also included in the sub-level system. The data therein are derived through years of production and trails, and cover the majority of steel grades and products, thus supporting project's reliable production and the development of new grades in the future.

Furthermore, Sinosteel MECC empowers the project with the Super Immediate Cooling (SUPIC) technology, which includes a super intensive cooler based on ultra-dense surface cooling and nuclear boiling jetting theories. In the research and design of core equipment, FLUENT simulation and intelligent 3D modeling are used to achieve functionalities such as accelerated cooling control (ACC), intermittent direct quenching (IDQ) and direct quenching (DQ). Sinosteel MECC uses integrated micro-structure and performance tuning technology to help produce products with high added value and strength, as well as to realize steady manufacturing.

To summarize, Sinosteel MECC will use advanced production process, equipment, and pollution control technologies to reduce pollutant discharge while increasing the project's resource utilization rate to the top of the industry.

The SUPIC technology realizes a high cooling rate with low water pressure, saving a significant amount of electricity, water, alloys and other resources. SUPIC saves at least 40% of power and 20% of water when compared to the conventional ACC and ultra-fast cooling technology.

To accomplish energy saving and consumption reduction while maintaining the greatest product quality and production, optimal rolling models, cycle control models, and control algorithms are offered.

"In recent years, Sinosteel MECC has not only developed proprietary high-efficiency long product rolling technologies, but also innovated and upgraded other technologies and equipment," said Hua Guanglin, GM of Sinosteel MECC. As a result, it has gained expertise in energy conservation, carbon reduction and automatic control systems, assisting customers in lowering costs, improving efficiency and creating value. Following the motto of "Beyond Expectations", Sinosteel MECC will work closely with the customer and execute the contract with devotion to complete the project for a win-win result."

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Sinosteel MECC Signed Contract of 2MTPA Traveling Grate Pelletizing Plant with Lu'an Steel

04

Developing the entire line's automation control system, process calculations & control models.

Sinosteel MECC has once again won the favor of Lu'an Steel by virtue of its proprietary traveling grate pelletizing technology and excellent performance. In June 2022, the two parties signed an EPC contract for the construction of a 2mtpa traveling grate pelletizing plant with environmental friendliness, high efficiency and low operating costs. It will be based on the contractor's digitalized design and proprietary technologies and equipment as one of the keys to improving the energy efficiency and reducing carbon emissions of conventional BFs.

This plant is also critical to Lu'an Steel's goal of building a modern steel city. Lu'an Steel, being the largest private steel enterprise in Anhui Province, is rated as the Provincial Green Plant and is transforming into a modern steel city that features low carbon, green production, energy conservation, intelligent network, garden style, and high-end products.

In recent years, Sinosteel MECC has cooperated closely with Lu'an Steel. The former completed two bar lines and two high-speed wire rod lines, totaling 3 million tons of annual production. Since 2019, they have been operating efficiently and stably. In 2021, Sinosteel MECC was awarded the EPC contract of Lu'an Steel's first 3,500mm heavy plate rolling plant with an output of 2.4million tons per year. The plant will be equipped with advanced technologies, equipment and control systems, including high-rigidity roughing and finishing mills, thermal zoning and regional centralized control. **Furthermore, Sinosteel MECC developed the entire line's automation control system, as well as its numerous process calculation and control models, bringing the customer more profits.** The project is currently nearing completion, and the customer appreciates Sinosteel MECC's exceptional project execution and management skills.

"The customer praises Sinosteel MECC's advanced proprietary technology and professional project management."

Project rendering

TMCP Upgrading for High-Speed Wire Rod Line of Echeng Steel

05

Empowered by digitalization design.

On November 28, 2022, Sinosteel MECC secured an EPC contract of TMCP upgrade for Echeng Steel's high-speed wire rod line. As the annual key project of Echeng Steel, it seeks to reduce energy consumption and carbon emissions while increasing the market competitiveness of the high-speed wire rod products.

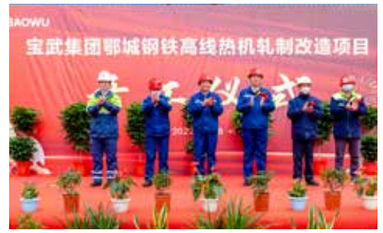
Sinosteel MECC is commissioned to upgrade the existing rolling line into an 850,000 tpa high-speed wire rod rolling line using proprietary technology, for 5.5-16.0mm plain wire rods and 6.0-12.0mm threaded wire rods. Besides, the line is capable of producing high-quality special steel. Empowered by advanced technology and equipment, the line features a higher capacity, a lower cost as well as products with a less alloy content and heavier unit weight.

The project was officially launched on December 8 and received a letter of congratulations from Lu Pengcheng, Chairman of Sinosteel E&T. "In the project Sinosteel MECC will apply its patented high-efficiency bar and wire rolling technology, the latest TMCP and core technical equipment, to reduce alloy consumption, improve product performance and capacity, and save production costs," stated Lu. Empowered by digitalized design, the project will require fewer people and expenditures while generating higher production efficiency and carbon reduction. As the EPC contractor devoted to the value of 'Beyond Expectations', Sinosteel MECC will complete the project on time and to high standards, setting a new benchmark."

Wang Huxiang, President of Echeng Steel, stated that the existing high-speed wire rod line was designed 20 years ago and can only fulfill the new national standard by adding alloy components, thus raising the overall cost of products. The upgraded line will help to minimize production costs by consuming less alloy and energy, increase product output and performance stability, and facilitate dynamic adjustment of the product mix.

A number of projects have been completed between the two companies in recent years, including a relocation project, a production line speeding-up project, and two control system upgrades.

"It is Echeng Steel's key project to reduce energy consumption, lower carbon emissions & increase market competitiveness of its high-speed wire rod products."



Opening ceremony

Efficient Utilization of Mineral Resources: Sinosteel MECC Signed EPC Contract of 2MTPA Suspension Magnetization Roasting Furnace in Shilu Iron Mine

06

2mtpa

NEW
Suspension magnetization roasting furnace

65%
62.5%

INCREASE
Grade of iron concentrates

85%
60%

RECOVERY
Recovery rate of ferrous metal

Sinosteel MECC employs world's first technology for the effective utilization of refractory iron ore.

Hainan Mining has a wealth of mineral resources, including the Shilu Iron Mine, known as "Asia's richest iron ore" due to its large reserves and high grade of rich iron ore. It does, however, face challenges such as complex mineral composition of iron ore, low purity of iron ore particles, and microfine and uneven disseminated particle sizes. To address those issues, improve iron ore grade and increase the recovery rate, Sinosteel MECC has proposed to the customer a systematic solution for the customer, proposing to renovate the original beneficiation line by building a new 2mtpa suspension magnetization roasting furnace. The EPC contract signed on December 9, 2022 marks the beginning of the two parties' collaboration. This is a key project of Hainan Mining, with great significance to the efficient utilization of refractory iron ore and the support capability of China's iron ore resources.

In the project, Sinosteel MECC will use the hydrogen-based mineral phase conversion technology developed independently by Northeastern University, the strategic partner of Sinosteel MECC. The technology is the world's first of its kind for efficient utilization of refractory iron ore.

It employs hydrogen and other reducing gases as the reducing agent to convert the weak magnetic iron minerals in the ore into strong ones, realizing the efficient utilization of refractory iron ore as well as the upgrading from low-grade ore to high-grade iron concentrates. This technology features advantages including separation of oxidation and reduction roasting, low roasting temperature, large production capacity (with a single line's production capacity up to 2.3mtpa), environmental friendliness, low production costs, high energy utilization efficiency, and a high automation level.

Upon completion of the project, the grade of iron concentrates will be increased from 62.5% to more than 65%, the recovery rate of ferrous metal from 60% to 85%. At the same time, product quality and comprehensive utilization of resources will also be improved, further enhancing competitiveness and profitability of the customer.

In the mining industry, Sinosteel MECC specializes in exploration, feasibility study, engineering design, equipment supply, general contracting, production operation for ferrous, nonferrous and non-metallic mineral resources. It offers engineering solutions for mining projects around the world. So far, Sinosteel MECC has undertaken mining projects in 12 foreign countries, ranking the top among Chinese enterprises in terms of number of countries and variety of mineral resources .

Project rendering

1mtpa Platinum ore beneficiation plant constructed by Sinosteel MECC, South Africa

Sinosteel MECC Building Green and Clean Coke Oven Project for Jindal Saw

07

Largest Chinese provider for Indian coke oven project with green solutions

In June 2022, Sinosteel MECC and Jindal Saw of India held the kick-off meeting for the 300,000tpa vertical heat-recovery coke oven project.

Jindal Saw, a subsidiary of Jindal Group, is the unchallenged market leader in the Indian pipe sector. Being one of India's largest steel pipe manufacturers, its products are widely used in the energy industry for transporting oil, natural gas, water, etc. Sinosteel MECC and Jindal Saw first collaborated in 2010, when Sinosteel MECC built a 1.2mtpa pellet plant. Since 2018, the two companies have been working on the coke oven project. After nearly four years of fierce competition, Sinosteel MECC signed the EPC contract of the 300,000tpa vertical heat-recovery coke oven project with Jindal Saw by virtue of its highly responsive scheme, smooth and efficient communication and rich experience.

The heat-recovery coke oven is also known as "the clean coke oven" because of its remarkable advantages in coke quality, energy consumption, environmental friendliness, safety, and efficiency. This coking technique has reduced the pollutants and emissions produced by conventional coke ovens.

Burning off all the volatile substances produced by coking and makes full use of heat in the high-temperature flue gas for power generation or heating, resulting in a high thermal efficiency.

Besides, it burns off all the volatile substances produced by coking and makes full use of heat in the high-temperature flue gas for power generation or heating, resulting in a high thermal efficiency. In recent years, Sinosteel MECC has been focusing on clean heat-recovery coke oven technology, and it is committed to research and innovation. Based on the experience in the heat-recovery coke ovens in oepration worldwide, Sinosteel MECC optimizes and upgrades the flue gas combustion system, suction regulation system, etc., to improve the uniformity of upward heating, increase suction regulation, and raise thermal efficiency of the coke oven.

Sinosteel MECC set foot in the Indian market in the late 1990s and has since grown into the largest Chinese contractor for Indian coke oven projects, boasting extensive project management experience, first-class service and strong technical skills. Sinosteel MECC has collaborated with many subsidiaries of the world-renowned Jindal Group, with a total capacity of coking projects in operation and under construction up to 10mtpa.

300.000

TPA
Vertical heat-recovery coke oven project.

10mtpa

Total capacity of Coke oven projects in operation and under construction with many subsidiaries of the world-renowned Jindal Group.

Sinosteel MECC to Build China's First 1MTPA-level Project to Produce Building Materials with Coal Gangue

08

Set foot in circular economy sector

Sinosteel MECC inked a framework agreement and an EPC contract with Anhui Huaihai Industrial and Central South University in September 2022 to build China's first 1mtpa-level project for generating high-value-added building materials from coal gangue.

Coal gangue is China's largest industrial solid waste because it is a by-product of coal mining and washing. Exploring its high-value-added utilization is critical to the coal industry's green and low-carbon development. As the general contractor, Sinosteel MECC is responsible for building an HH kiln, and a 118 m^3 roasting line for coal gangue decarburization. They can annually process over 1.1 million tons of coal gangue to produce high-value building materials. The Project will set a direction for extending the industrial value chain based on decarbonized coal gangue, thereby encouraging the high-value-added and large-scale utilization of coal gangue in a green and low-carbon manner.

Moreover, the three parties will form an industry-university-research innovation partnership to explore and optimize the process, equipment, and technology in such field through reasonable planning.

This contract marks that Sinosteel E&T has expanded its business into the field of circular economy. The Project was commenced in December 2022.

118m^3

Roasting line for coal gangue decarburization

1.1mtpa

Coal gangue processing

A firm handshake symboling significant cooperation

Breakthrough in Indian Market: EP+S Contract of Adani Semi-coke Project

09

A good start for building the first semi-coke project in India.

Gaining new client with new business, Sinosteel MECC made breakthrough in Indian market.

On December 12, 2022, Sinosteel MECC received the notification of award of the EP + S contract on Adani's 1.2mtpa semi-coke project, marking the first semi-coke project in India. The project plans to produce semi-coke and by-products of coal tar and gas.

Adani, India's largest infrastructure provider and a multinational conglomerate, operates in power generation and transmission, coal mining and other energy fields. It is currently expanding the markets in renewable energy, airports, data centers and national defense.

According to the notification, Sinosteel MECC is responsible for building 8 pyrolysis furnaces and supporting chemical production and utility facilities to supply raw materials for Adani's PVC plant (coal to PVC). Sinosteel MECC's proposed "low-temperature pyrolysis – internal heating furnace – hot gaseous carrier" method, which saves energy, improves efficiency and protects the environment. It boasts a higher level of technology and equipment, innovative design, environmental friendliness and energy conservation when compared to other furnace types.

Project rendering

EPC Contract on Sintering Marks the 3rd Cooperation with Fujian Sangang

10

Extensive cooperation in traveling grate pelletizing, bar rolling and sintering

The annular cooler's blast system uses less cooling air and improves waste heat utilization efficiency

In February 2022, Sinosteel MECC signed an EPC contract with Fujian Sangang Minguang to build a 360m² sintering line and renovate an existing 200m² sintering line.

Sinosteel MECC's proprietary sintering machine featuring less air leakage, a domestically leading modular annular cooler characterized by environmental friendliness and high energy efficiency, as well as an intelligent sintering control system are applied for the new 360m² sintering line with an annual output of 3.81 million tons of cold sinter.

Sinosteel MECC optimized the general layout of the narrow project site in order to position the annular cooler beneath the sintering building. Moreover, the proportioning building is the first in China to use a fully-closed and energy-efficient scraper feeder for ferrous raw materials. The annular cooler's blast system uses less cooling air and improves waste heat utilization efficiency of, and part the hot waste gas can be circulated without power to the sintering machine. In this way, both waste gas emissions and solid fuel consumption can be reduced to achieve energy conservation and emission reduction.

In terms of the intelligent sintering control system, mathematical models, knowledge bases, big data analysis and artificial neural network are applied to perform intelligent sintering process control, intelligent closed-loop quality control, and intelligent production information management, thus forming an intelligent control system that covers the whole sintering process.

The project also achieves ultra-low emissions of water gas and discharge of rainwater and sewage into respective treatment systems.

This is the third contract signed between Sinosteel MECC and Fujian Sangang. The 2 mtpa traveling grate pelletizing project of Fujian Sangang, which was undertaken by Sinosteel MECC on EPC basis and using proprietary technology, was put into operation in December 2019 and then quickly reached its designed capacity. This project was reported by CCTV and won many industry awards. In January 2021, the 1.3 mtpa high-speed bar rolling line built by Sinosteel MECC for Fujian Sangang was successfully put into operation, and its efficient operation has enhanced the value of Minguang deformed bars, Fujian's first steel brand eligible for futures delivery.

360m²
NEW
Sintering line

200m²
RENOVATE
Sintering line

3.81mt
Annual output of sinter

Fujian Sansans

Sinosteel MECC's long-standing partner

Sinosteel MECC's proprietary sintering machine featuring less air leakage, a domestically leading mo- dular annular cooler characterized by environmental friendliness and high energy efficiency, as well as an intelligent sintering control system are applied.

Ongoing Services by Sinosteel Tiancheng to Xinyu Steel: From Bag Filters to Flue Gas DeSOx and DeNOx

11

Using self-developed technology and equipment to help steel makers reaching ultra-low emission.

In 2022, Sinosteel Tiancheng signed multiple EPC contracts with Xinyu Steel to achieve ultra-low emissions in various sections. On the one hand, Sinosteel Tiancheng will upgrade the flue gas bag filters at the charge end of sintering machine No. 7 (Phase II) and sintering machine No. 6, using its proprietary bag filtering technology and equipment, with the goal of achieving an outlet dust emission concentration of no more than 10 mg/Nm^3 to make the outlet dust emission, the average filtering resistance no more than 1,000 Pa, and the equipment service life no less than 15 years, as well as achieve their 100% synchronous operation with the sintering machine. On the other hand, Sinosteel Tiancheng will renovate the flue gas desulfurization and denitration system for sintering machine No. 6 to achieve ultra-low emissions, i.e., SO_2 less than 20 mg/Nm^3, NOx less than 50 mg/Nm^3 and dust less than 5 mg/Nm^3.

Ultra-low emissions flue gas bag filters at the charge end of sintering machine upgrade

<10mg/Nm^3

Dust emission

<1,000Pa

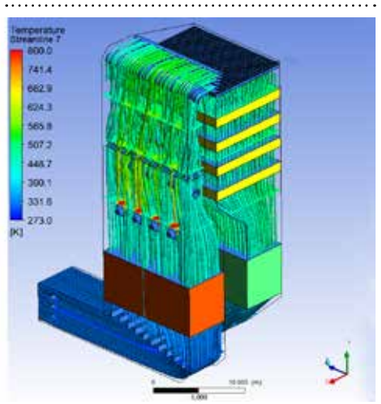
Average filtering resistance

>15yrs

Equipment service life

100%

Sychronization



Project put into operation

Flow field simulation

Market Recognition: Sinosteel Tiancheng Wins Decoking and VOCs-laden Waste Gas Treatment Projects for Delayed Coking Units

12

Effective control of VOCs, shorter construction period and better benefits

In 2022, Sinosteel Tiancheng gained additional market share in the petrochemical field thanks to its proprietary technologies. The projects signed include the petroleum refinery transformation and upgrading project of PetroChina Jilin Petrochemical, which will provide process package design and technical services for the closed decoking system of its 1mtpa delayed coking unit; and the delayed coking project of Sinopec's Jingmen Branch, to provide foundation design.

In those projects, Sinosteel Tiancheng's patented technology for the control and collaborative treatment of fugitive gas emissions from the delayed coking unit's coke storage tank is applied. With the process route of "airtight coke tank + waste gas collection and treatment + coke grabbing by intelligent crane", the effective control of fugitive gas emissions can be achieved with the minimum air flowrate, effectively resolving the problem of fugitive gas emissions to achieve acceptable gas emissions and green production and significantly improving production and surrounding environment.

In addition, the technology features less engineering transformation work and shorter construction period, lowering customer's investment.

Time saving

45/90

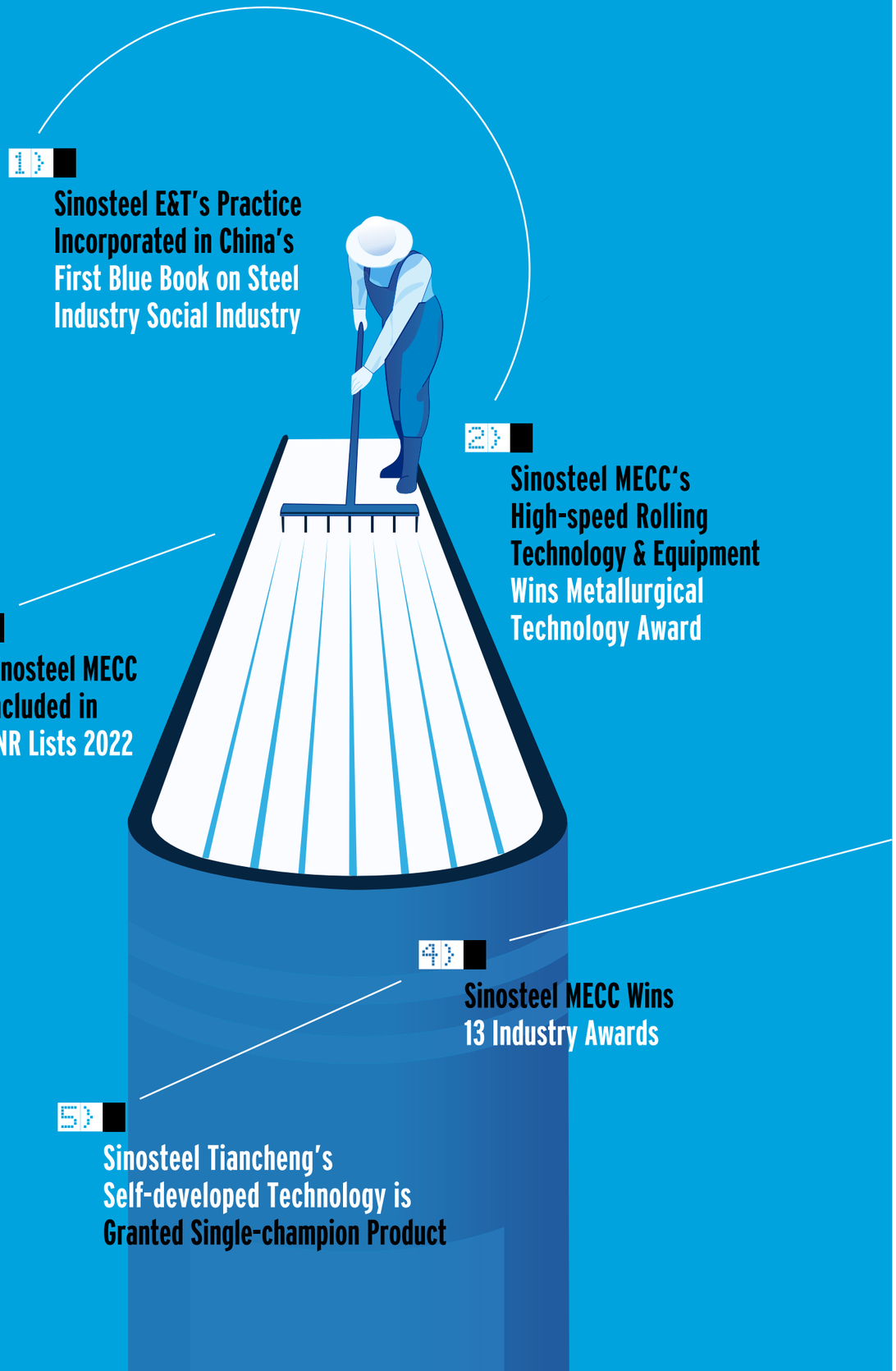
For example, in the closed decoking and VOCs-laden waste gas treatment project for the delayed coking unit of Shandong Wonfull Petrochemical, which was constructed by Sinosteel Tiancheng on EPC basis, the said technology was closely integrated into the main production unit to maintain the original production process. As a result, its downtime was only 45 days (compared to the industry's average of 3 months), greatly shortening the construction period.

Process route

Airtight coke tank

Waste gas collection and treatment

Coke grabbing by intelligent cranes



01

Sinosteel E&T's Practice Incorporated in China's First Blue Book on Steel Industry Social Industry

BLUE BOOK 2022

AWARDS & HONORS

Recently, the Blue Book on Social Responsibility of Steel Industry 2022 was officially released, which is also the first one for China's steel industry. Sinosteel E&T's excellent performance case was selected, making the company the only engineering service provider. Sinosteel E&T's practice have also been selected in the book Research Report on Overseas Social Responsibility of Central Enterprises (2022).

Offering valuable experience

He Wenbo, Executive Chairman of China Iron & Steel Association, stated that China's steel industry is at the stage of seeking high-quality development. The release of the Blue Book is not only a recorder of the industry's progress and achievements in terms of social responsibility practice, but also provides data support and decision-making reference for steel enterprises. The book is thus very important and groundbreaking to help improve the ability and effectiveness of steel companies to fulfill their social responsibility.

Including excellent practices of 20 steel enterprises in performing social responsibility, the Blue Book offers valuable experience. Sinosteel E&T: A pioneer in green development with low-carbon metallurgical services was selected.

Sinosteel E&T, adhering to the concept of green development & technological innovation, is striding forward in the R&D and application of engineering technologies for low-carbon metallurgy. As an exemplary green metallurgical engineering service provider, it has made outstanding achievements in carbon reduction of long-process metallurgy, cutting-edge hydrogen metallurgy, integration of digitalization & green technology, commercialization of low-carbon metallurgical technologies, and green capacity cooperation with the 'Belt and Road' countries, thus promoting the global environmental governance as well as the green and low-carbon transition of the metallurgical industry.

—— excerpted from the Blue Book

Sinosteel MECC's Team of Platinum ore beneficiation project, South Africa

Sinosteel MECC's High-speed Rolling Technology and Equipment Wins Metallurgical Technology Award

On August 2, 2022, Sinosteel MECC was awarded the second prize of the 2022 China Metallurgical Science and Technology Award for its proprietary "High-efficiency and high-precision control rolling equipment and key technology for twin high-speed bar rolling", released by the China Iron and Steel Association and the Chinese Society for Metals .

The Award is the highest in China's steel industry and is given to citizens and enterprises who research, develop, promote and apply advanced metallurgical sci-tech achievements. The award is reviewed and rewarded once a year. A total of 111 prizes are awarded in 2022, shared by no more than 40% of the shortlisted candidates.

For the award-winning equipment & technology, Sinosteel E&T combines the advantages of slit rolling and single bar rolling, and incorporates the proprietary low-carbon TMCP, thus realizing successful application in the twin high-speed bar rolling projects that boast large capacity, high precision and low costs. So far, 21 patents have been applied.

A Two-slit Flexible Bar Rolling

This technology can improve hourly productivity to 220 tons for Φ12 mm bars and to 280 tons for Φ14 mm.

B Low-Carbon TMCP

Sticking to the new national standard in China, Sinosteel MECC came up with the TMCP technology and proposed the "4 + 2" arrangement of modular mills in the high-speed rolling section for the first time.

Adding less alloy, the process prohibits the growth of ferrite grains and increases the strength of rebar.

By adopting the technology and equipment, micro-alloy elements such as Nb and V are no longer necessary when rolling HRB400E products. Besides, Mn's content can be lowered when rolling products of Φ12 mm, Φ14 mm, Φ16 mm, Φ18 mm and Φ20 mm. As a result, resources are saved, and carbon emissions are reduced.

E Reheating-free direct rolling technology

This technology makes direct rolling possible without a reheating furnace, and thereby reduces energy consumption as well as CO_2 emission.

C Top-crossing heavy-duty modular rolling mills of Φ265 and Φ330

The mills are designed and developed specially for TMCP of high-speed bar.

It features lower energy consumption and idle power due to MV/LV motor driving and short transmission chains, flexible pass design for different steel grades, easy maintenance and less spare part inventory because of identical roll cassettes and bevel gearboxes for all stands.

The Φ330modular mills have been applied in a high-speed bar rolling line, a bar and wire rod production line and a twin high-speed bar rolling line, all for the first time in China.

D Steel delivery system and cooling bed of double high-speed bar line

They fill the domestic gap of technology and equipment, enabling an annual output of 1.6 million tons of bars.

It ensures the smooth delivery of rolling stocks and the direct rolling rate.

Combining continuous casting and rolling, the technology simplifies the process flow, higher production capacity, lower production costs, and realizing a smart production mode with less labor.

Tang Faqi, Deputy GM of Sinosteel MECC and the person-in-charge of the technologies, expresses his pleasure and expectation:

"I feel honored and excited to win the award. It is a recognition to the whole R&D team, encouraging us to keep on technological innovation and provide customers with green manufacturing and solutions."

1

MODULAR ROLLING MILL

RVM

265mm | 330mm

TMCP of high-speed bar

2

HIGH SPEED DELIVERY SYSTEM

ø12mm 220t

ø14mm 280t

Bar Rolling hourly productivity

3

REMOTE CENTRALIZED CONTROL

4

MANUFACTURE BASE

INTERVIEW

We had a chance to sit down with Mr. Tang Faqi, Deputy GM of Sinoteel MECC for a short interview on the past, present and future of the award-wining technology.

Tang Faqi,
Deputy GM of Sinosteel MECC

Sinosteel MECC's high-efficiency long product rolling technology precisely meets the varied needs of customers, providing smooth updates, improved product performance, increased rolling speed and output, as well as cost savings.

Q1 Thank you so much for sitting down with us for the interview and congratulations on winning the award. What do you believe is the most crucial factor?

Mr.Tang: The steel market is undergoing a rapid transformation, and Sinosteel MECC has had the foresight to provide solutions that help steelmakers to meet the multitude of goals established by the government. We are immensely proud to have been honored with an award, made possible by our commitment to long-term research and development, and the critical role of technological innovation in the entire process.

China's steel industry is renowned for its high overall efficiency, boasting top-tier performance in terms of investment, infrastructure, operation and labor. This, combined with a steady and robust demand for steel products, has enabled the industry to grow exponentially, with the country's crude steel output soaring from 100 million tons in 1996 to an astonishing 1.06 billion tons in 2020, accounting for an impressive 57% of the world's total production.

In 2014, with the new national standard for rebar in draft, Sinosteel MECC seized the opportunity and concluded that a steel plant had to adopt micro-alloying process to inhibit grain growth and precipitation strengthening, enabling them to produce rebar with increased strength that meets the requirements. However, this process would incur extra costs. Thus, our goal was to help our clients meet the requirements of the new national standard, while at the same time improve product performance without raising expenditure. To achieve this, we established an R&D team to tackle these issues.

Throughout the whole process, we consistently merged engineering technology with production operations in order to cut down production costs and to develop our own technology and equioment. Even though the new national standard wasn't officially released until 2018, we held fast to our objectives, and amassed engineering expertise by participating in overseas rolling projects (such as the two twin high-speed bar production lines of Tosyali in Algeria).

Our efforts have not been in vain. We could not have earned this honor without the encouragement of Chairman Lu. Not only did he lead us in the right direction, but he also kept us motivated with his words: "Our principle is to strive for technological innovation and leadership, while reducing production costs and carbon emissions in the process."

As a result of its efforts, Sinosteel MECC has developed a hot rolling mill and water cooling device that are specifically designed for the TMCP rebar manufacturing process. These solutions offer excellent control of the rolling and cooling processes, high-speed delivery systems, single-drive modular rolling mills, and flexible water-cooling. The technology and equipment developed are not only up to the standards of the new Chinese standard, but also have the ability to refine grain size and improve product performance while reducing both production costs and energy consumption due to the lack of V and Nb and the minimal amount of Mn alloy used.

The sophisticated high-stiffness modular rolling mills, comprising RVM230, RVM265, RVM290, RVM310, RVM330 and RVM370, allow for cost-effective TMCP rolling of Φ32.0 mm rebars. Interchangeable bevel gear boxes, roll cassettes and other critical components in the front and rear units ensure the equipment is highly accurate and efficient, and produces high yields at low costs.

02 Was it challenging to introduce this revolutionary technology to the customer? How has the market developed since then?

MrTang: The pioneering Liuzhou Iron&Steel was the first customer to trust in our proprietary technology and contracted us for the double high-speed bar rolling project. This project consists of two bar lines, two high-speed lines and three high-speed wire rod lines in parallel. With a staggering annual productivity of 5.8 million tons, it is the first time ever in the metallurgical industry that seven lines were constructed simultaneously. The project went live at the end of 2020 and each line has been running smoothly and efficiently since then. For example, the maximum rolling speed of the Φ6.0 mm line reaches 110 m/s, that of the Φ8.0 mm coiled bar 95 m/s, and that of the Φ10.0 mm coiled bar 70.5 m/s. Sinosteel MECC's innovative technology has been successfully verified, delivering impressive results in the rolling of bars, high-speed bars and high-speed wire rod.

With years of innovation and research, our technology is now mature and able to meet the demands of steelmakers. Having implemented Liuzhou Steel's project with great success, we have since received orders from Valin Steel, Shenglong Metallurgical, Jianlong Xilin Steel, HBIS Tangyin Steel, Taixin Steel and more. By drawing on the experience of these projects, we continue to refine our R&D, such as creating larger and more varied models to cater to the needs of different users. From accuracy to interchangeability and versatility, our comprehensive range of modular rolling mills covers a wide range of specifications up to Φ32mm. Take the RVM330 modular mill for instance; it has been used in high-speed bar, wire rod and bar, and high-speed wire rod lines with remarkable stability, without any damage to the roll cassette, bevel gear box or roll ring.

The market is changing at an unprecedented rate, and Sinosteel MECC is rising to the challenge by constantly innovating its technology. Our R&D team has carried out extensive research and studies to gain a thorough understanding of how our technology and equipment performed across a range of projects. These studies encompass temperature range, cumulative deformation, deformation rate, and cooling temperature.

03 What benefits can steel companies expect to gain by implementing this technology?

MrTang: Sinosteel MECC is an industry leader in engineering solutions, committed to providing our customers with comprehensive services that help tackle problems and drive value. Our proprietary rolling technology boasts one of the key advantages of cost-effectiveness.

The technology can effectively control grain size and improve the strength of the reinforcing bars, thus allowing for a reduction in alloy additions and costs. By rolling HRB400E products, V, Nb and other alloying elements can be eliminated, while the Mn content can be lowered in the wire rods with diameters of Φ12 mm, Φ14 mm, Φ16 mm, Φ18 mm and Φ20mm. Furthermore, the billet can be directly fed into the rolling line without pre-heating in the furnace, thus saving energy and reducing CO2 emissions. It is estimated that this could lead to a reduction of about 100 yuan per ton of steel, representing a significant cost savings.

04 Has the technology made any significant advances since it became widely adopted in China?

MrTang: Sinosteel MECC's high-efficiency long product rolling technology precisely meets the varied needs of customers, providing smooth updates, improved product performance, increased rolling speed and output, as well as cost savings. Over the past 5 years, we have signed 46 long product rolling lines, with a total capacity of 59.5 million tons. The projects carried out for Liuzhou Iron&Steel, Valin Steel, Fujian Sansteel, Jianlong and other customers have operated smoothly, with higher efficiency and a shorter period to reach production. We are proud of these collaborations, which have strengthened the partnership between us and our customers. We are also thankful that customers put their trust in us to provide the right solution in terms of technologies to help them achieve their business goals.

As part of our R&D's philosophy, we always collect feedback from clients and actual performance indicators from our projects. Our clients' satisfaction further confirms that we have the capability to offer them the best solution. Additionally, we also draw valuable insights and inspirations from our clients.

Managing innovation is never an easy task; it requires creativity and taking risks. We must strive to push beyond our comfort zones, keep trying, and be prepared to learn from any failed attempts. The successes we have achieved will provide a strong foundation for us to make further progress. Our research and development efforts must never cease.

05 What are the future directions for this technology?

MrTang: Sinosteel MECC has initiated an R&D program referred to as "5M" (5M–Modular Mill Manufacturing Metals to 500 MPA-Strong), which is dedicated to producing HRB500 at reduced costs. Through the application and verification of certain technologies, significant results have been achieved thus far.

If we can use our self-developed technology to produce HRB500 at lower costs, we will be able to aid the steel industry in transitioning from HRB400 to HRB500 on a massive scale. This would result in a saving of more than 10% of steel, 30 million tons of construction steel, and around 50 million tons of iron ore, thus significantly reducing resource consumption and carbon emissions. This is the path we are taking and our new objective. We are committed to helping steel companies both domestically and internationally produce rebars with the desired product quality, lower costs and lower carbon emissions.

01

Sinosteel MECC
Included in ENR Lists 2022

On August 24, 2022, both of the "Top 250 International Contractors" and "Top 250 Global Contractors" lists were released by America's Engineering News Record(ENR).

Sinosteel MECC ranks 152nd and 133rd respectively by virtue of its outstanding performance in the field of engineering construction.

ENR THE TOP 250 INTERNATIONAL CONTRACTORS

The Top 250 List

#1 CHINA STATE CONSTRUCTION ENGINEERING CORP. is the first Global Top 250 list firm to break $200 billion in reported annual contracting revenue.

133	146	SINOSTEEL EQUIPMENT & ENGINEERING CO. LTD., Beijing, China	2,455.5	283

152	148	SINOSTEEL EQUIPMENT & ENGINEERING CO. LTD., Beijing, China	283.3	2,455

04

Sinosteel MECC
Wins 13 Industry Awards

The result of 2022 Metallurgical Engineering Survey and Design Achievement Evaluation shows that thirteen projects submitted by Sinosteel MECC win awards.

1 PRIZE

- **Blast furnace upgrading project of Tangshan Donghua Steel**
- **2x480m² sintering project of SDIS Laiwu**
- **Double high-speed bar line of Valin LY Steel**
- **High-speed bar and wire rod rolling project of at Fangchenggang Steel Base**
- **4mtpa traveling grate pelletizing project in Algeria**

The awards are presented once a year, aiming to promote the high-quality development of the metallurgical construction industry, advance technological innovation in engineering survey and design. Since 2011, Sinosteel MECC has been on the list for many years since its first application in 2011, and this year witnesses a breakthrough in both the number and level of the awards.

As the rule requests, "Those apply for the first prize shall have outstanding achievements in technological innovation of great significance. Its main technical achievements should reach the leading level of similar projects in the metallurgical industry, reaching or approaching the international level of the same period." The awards won by Sinosteel MECC give the credit to its devotion to and persistence on innovation.

PRIZE

- **Raw material stock yard of the Industrial Upgrading and Technology Transformation Project of Guangxi Shenglong**
- **Raw material plant of the Tai'an Special Construction Steel Project of Shiheng Special Steel**
- **2x265m² Sintering project of Tai'an Special Construction Steel Project of Shiheng Special Steel**
- **Sintering & waste heat utilization Works of the Capacity Replacement & Upgrading Project of Shanxi Jinan Steel Sintering Project of the Industrial Upgrading and Technology Transformation Project of Guangxi Shenglong**
- **230m² Sintering Project of Delong Steel Bar rolling line project at Fangchenggang Steel Base**

Taking the 1.4mtpa high-speed bar rolling line of Valin LY Steel as an example, this project marks China's first twin high-speed production project employing Sinosteel MECC's self-developed technology and equipment. Since its commissioning in June 2020, the equipment has been running stably with a low failure rate, with a maximum rolling speed of 45m/s and a stable speed of 40m/s. Various indicators have reached an advanced level in China.

Sinosteel MECC's patented technologies, which include traveling pelletizing and high-efficiency long product rolling, have been widely applied at home and abroad, assisting more steel makers in building low-cost, high-yield and superior-quality production lines.

Double high-speed bar line of Valin LY Steel

Self-developed Technology of Sinosteel Tiancheng Granted Single-champion Product

< 10 mg/m³
emission concentration

40%
energy consumption

3,516 t/y
CO_2 emissions

In December 2022, the Ministry of Industry and Information Technology and the China Federation of Industrial Economics unveiled the seventh batch of single-champion enterprises/products of the manufacturing industry. Sinosteel Tiancheng's proprietary "PM2.5 pre-charged fine particle control technology and equipment for Industrial Flue Gas Multipollutant" was rated a single-champion product.

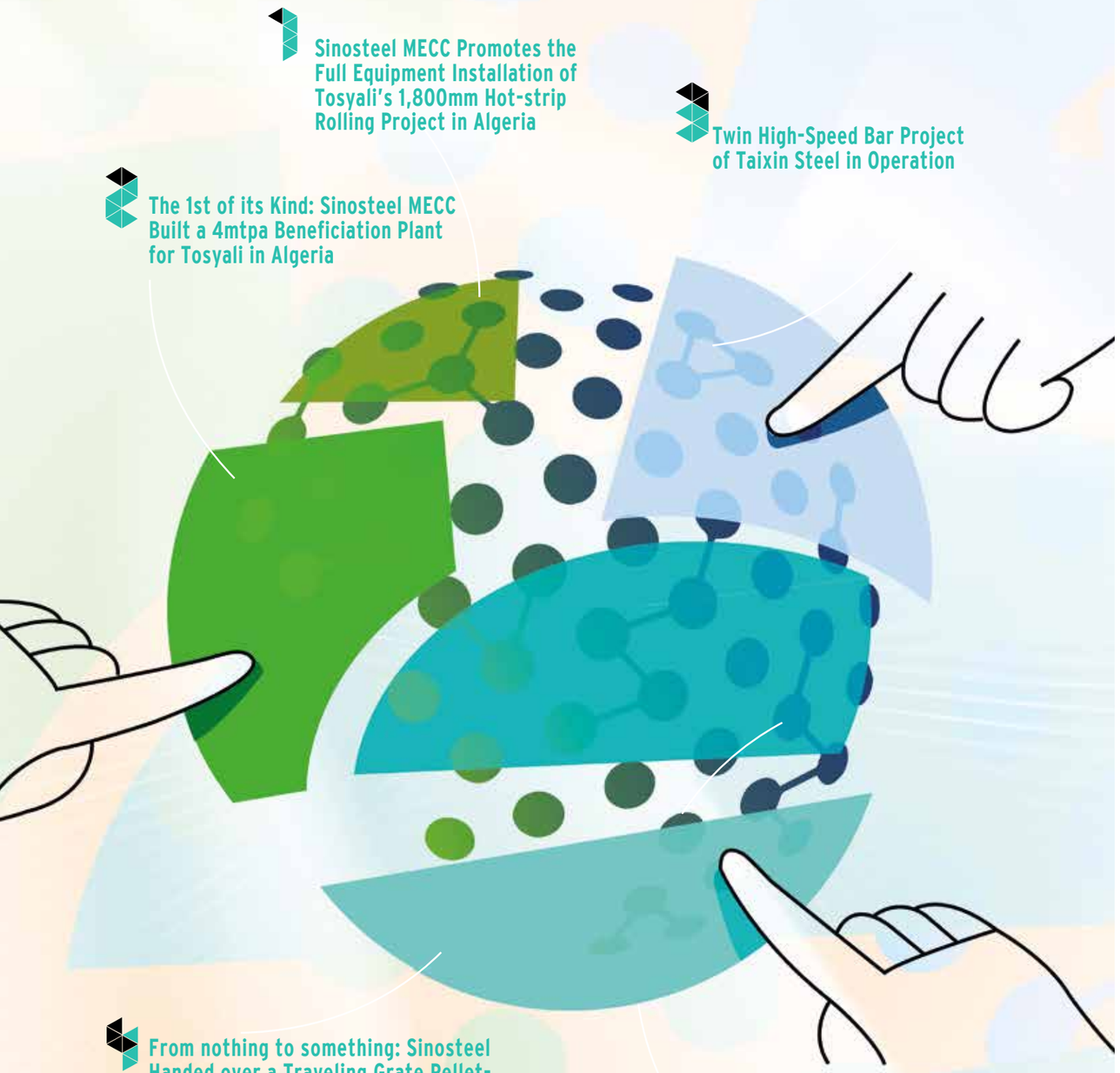
The manufacturing industry's single champions, which include both single-champion enterprises and products, are those that have long engaged in specific market segments, have world-class production technology or process, and are ranked among the best globally in terms of market share. These top Chinese manufacturing enterprises represent the highest level of development and the greatest market strength.

As a cutting-edge technology for ultra-low emissions of furnace/kiln flue gas in the steel industry, and featuring outstanding effects in multipollutant control, carbon reduction and energy saving, Sinosteel Tiancheng's technology has been applied in more than 20 large and medium-sized steel enterprises.

Sinosteel Tiancheng has developed the technology and the pre-charged bag filter based on the National 863 Program R&D Program. Its R&D achievement made its debut in the flue gas cleaning system for the 180t converter of Ansteel, helping to reduce the particulate matter emission concentration to less than 10 mg/m³. Meanwhile, it can also reduce energy consumption by 40%, and CO_2 emission by 3,516 tons per year. Reaching the state-of-the-art level, the technology features high cleaning efficiency, energy conservation and carbon reduction.

PROJECT SPOTLIGHT

Our motto, 'Beyond Expectations' reflects our commitment to our customers, for whom we strive to provide the best service.
We prioritize projects of all sizes, drawing on the expertise of our engineers, construction professionals, schedulers, document managers and risk managers. This approach enables us to complete even the most complex projects with success, even under the most challenging conditions.



Sinosteel MECC Promotes the Full Equipment Installation of Tosyali's 1,800mm Hot-strip Rolling Project in Algeria

Twin High-Speed Bar Project of Taixin Steel in Operation

The 1st of its Kind: Sinosteel MECC Built a 4mtpa Beneficiation Plant for Tosyali in Algeria

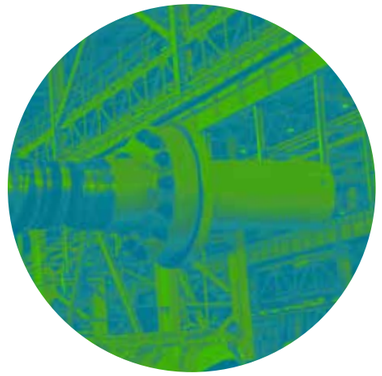
From nothing to something: Sinosteel Handed over a Traveling Grate Pelletizing Plant and a Bar Rolling Line to Kunming Steel

New Client: Kardemir No. 4 BF Started Running

A Milestone in Indian Market: Sinosteel MECC Completed the First 100,000 m^3 Dry Rubber Seal Gas Holders for BF and LD Gas

Sinosteel MECC Promotes the Full Equipment Installation of Tosyali's 1,800mm Hot-strip Rolling Project in Algeria

On December 30, 2022, the first hoisting of the steel structure of the main rolling line of Tosyali's 1,800 mm hot rolling project in Algeria, under the EPC contract awarded by Sinosteel MECC, was successfully completed in one go. The hoisting was accomplished seamlessly with the reheating furnace components being lifted effortlessly one by one. The successful hoisting signifies the commencement of the complete equipment installation.



260t

Steel structure installation of rolling area

63,734m³

Concrete pouring

1800mm

Hot Rolling Project

3.5tpa

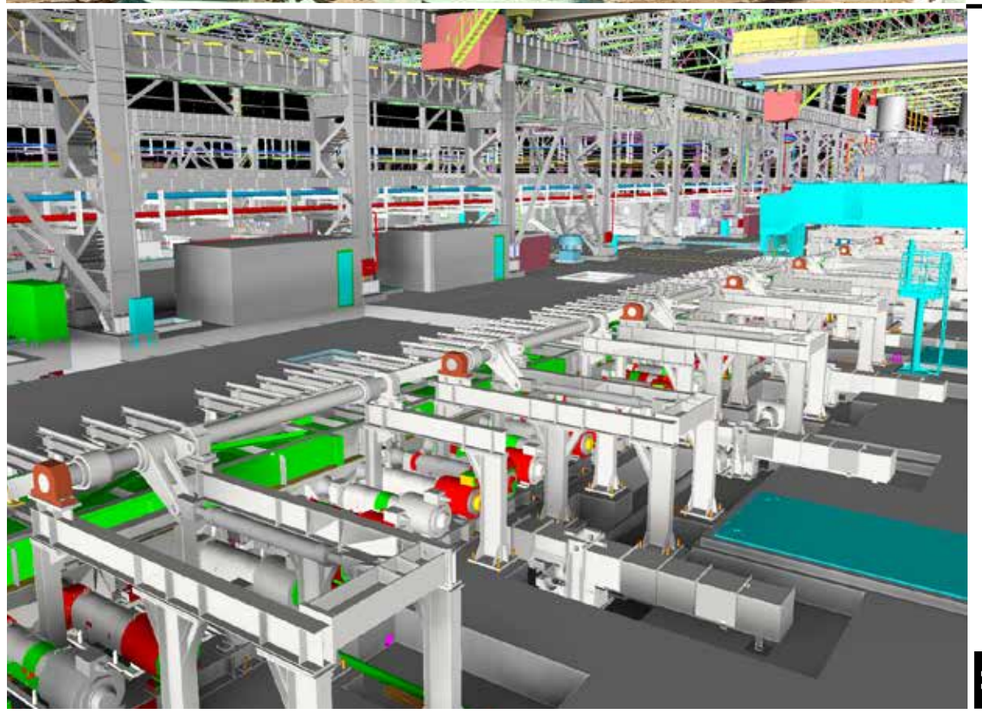
Annual production

The 1800mm hot rolling project is an essential part of Tosyali's fourth-phase DRI+EAF integrated steel plant, with an annual production capacity planned at 3.5 million tons and adoption of digital design.

The project commenced construction at the end of April 2022, and the team of Sinosteel MECC overcame adverse weather conditions such as heavy rain and sandstorms lasting more than ten days, maintaining high spirits, strict control over construction safety and quality, and steady progress in on-site execution. So far, 63,734m³ of concrete pouring has been completed, and the overall steel structure installation of the rolling area is estimated at 260 tons. The structural slabs (at the ±0.000 level) for reheating furnace and main rolling line are currently under construction.

Site construction proceeds

Project began site construction



BIM drawing

The 1st of its Kind: Sinosteel MECC Built a 4mtpa Beneficiation Plant for Tosyali in Algeria

At the end of 2018, the 2.3mtpa steel complex of Tosyali in Algeria constructed by Sinosteel MECC on an EPC basis was put into operation. The short-process green integrated steel plant which features large scale, leading technologies, green and low-carbon production, continuously produces high-quality products and provides a strong guarantee for the infrastructure of Algeria and its surrounding areas. To further complete the industrial chain, Tosyali planned to build a beneficiation plant. Based on long-lasting cooperation and strong general contracting capabilities, Sinosteel MECC was awarded the order in 2019.

With the roaring of machines and the operation of various equipment, a whole new 4mpta beneficiation plant went alive on April 24, 2022. marking the very first of its kind in Algeria.

2018

2.3mtpa

steel complex
In Operation

2022

4mtpa

beneficiation plant

Sinosteel MECC has optimized its pellet production process to enhance quality and reduce procurement costs. The company employs magnetic ore grinding and selection to improve quality, while using the grinding method without selection for hematite to adapt to various raw materials. Additionally, For the beneficiation and tailings sections, Sinosteel MECC has respectively implemented concentration and plate-and-frame filtration technology, enhancing concentrate grade and reducing silicon content. After being refined and finely ground in the beneficiation plant, various raw materials with stable quality can be provided for pellets to satisfy DRI production.

The reduction of silicon content minimizes impurity issues and reduces steel slag in subsequent ironmaking processes, resulting in energy and cost savings.

The 4mtpa iron concentrate regrinding and re-selection plant, constructed by Sinosteel MECC, has deep processing and grade improvement capabilities that provide assurance for the stable operation of subsequent pellets and DRI production, while also addressing raw material sourcing issues for customers.

The plant enables the production of concentrate fines for pellets suitable for DRI production by directly grinding coarse-grained and high-grade lateritic ore, or by improving low-grade magnetite by means of fine grinding and magnetic separation.

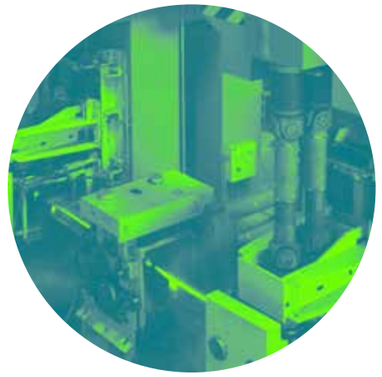
The plant enables the production of concentrate fines for pellets suitable for DRI production by directly grinding coarse-grained and high-grade lateritic ore, or by improving low-grade magnetite by means of fine grinding and magnetic separation. This innovative process allows Tosyali to select and process low-grade ores, resulting in a more stable production process. In fact, the operation of this state-of-the-art beneficiation plant has enabled Tosyali to reduce its reliance on imported raw materials, which had become a challenge due to a shortage of supply, particularly in the current international climate. As a result, Tosyali's production capacity has increased, and the quality of its iron concentrate has improved, positioning the company for sustained success in the marketplace.

Despite the numerous challenges posed by the pandemic, the Sinosteel MECC team demonstrated unparalleled professionalism and dedication throughout the project's execution. They successfully navigated the obstacles associated with personnel dispatching, equipment manufacturing and installation, and material transportation, ensuring the timely completion of the project. An executive from Tosyali expressed their sincere appreciation for the team's exceptional performance, stating,

Your unwavering commitment and resilience in the face of the pandemic is a testament to the exceptional responsibility and capability of Sinosteel MECC. We are truly grateful for your outstanding work.

Twin High-Speed Bar Project of Taixin Steel in Operation

As one enters the twin high-speed bar production line of Taixin Steel, the first thing that catches the attention is the rumbling sound of huge production machines, followed by an unending flow of steel bars produced through the reheating furnace, roughing mills, intermediate mills and finishing mills. The twin high-speed bar project was put into use on December 10, 2022, marking a significant milestone in the collaboration between Sinosteel MECC and Taixin Steel. The project has successfully addressed the challenges faced by traditional high-speed bar production lines, such as limited product specification, weak rolling capacity, and low rolling speed.



Established in July 2003, Taixin Steel has emerged as a leading green and eco-friendly steel enterprise that primarily deals with the manufacturing & distribution of deformed bars for construction & high-quality steel bars. Capitalizing on the opportunity of product transformation and upgrading, Sinosteel MECC has recently inked an EP contract with Taixin Steel in early 2022.

Sinosteel MECC applies the most advanced technology and equipment to the project to help the customer enrich the product line, achieve transformation and upgrading, and enhance competitiveness.

The contract entails the establishment of a 1.5mtpa twin high-speed bar production line, with Sinosteel MECC taking on the responsibility of project design and core equipment supply, along with the provision of the entire production line's technology. This ensures that the equipment deployed throughout the production line is not only state-of-the-art but also comprehensive and cost-effective.

The project adopts the advanced "5M" TMCP rolling technology, which boasts independent intellectual property rights of Sinosteel MECC. It encompasses the use of 330mm heavy-duty modular mill stands, the core rolling mill equipment, and key water-cooling equipment. This entire production line is characterized by its ability to reduce alloy usage, accurately control negative deviation, improve rolling rate, and reduce production costs. These advantages translate into a multi-dimensional upgrading for the customer, enabling them to stay ahead of the competition.

Advantage 1

In contrast to traditional slit-rolling techniques used for deformed bars, the project offers precise control over negative, resulting in a notable 0.5% increase in overall yield.

Advantage 2

No vanadium (V), niobium (Nb) or titanium (Ti) is needed for rolling HRB400E. The manganese content is controlled within 0.95% and 1.25% respectively for steel of Φ12 mm and Φ25 mm.

Advantage 3

The rolling mill boasts a maximum design speed of 60 m/s,, while the high-speed charging system can reach 50 m/s, with a guaranteed maximum speed of 42 m/s.

Advantage 4

The entire production line's cost has been greatly decreased to attain actual cost reduction and enhance efficiency for the customer.

In the high-speed area of the production line, the modular rolling mill has been implemented using the "2 + 4" process layout. This involves six sets of 330 mm modular mills, which have improved the quality and precision of the products while simultaneously reducing costs for the customer.

- **It is specifically developed for the TMCP rolling process for high-speed wire rods and bars.**
- **TMCP rolling is carried out at a relatively low temperature of 750 °C.**
- **The maximum speed for high-speed wire rod is 120 m/s, whereas for high-speed bar, it is 60 m/s.**
- **Medium and low voltage motors are utilized for driving purposes. The adoption of a low voltage power supply has resulted in a reduction of electrical investment.**
- **The implementation of a short transmission chain design can significantly reduce energy consumption and eliminate no-load power.**
- **The pass is designed with flexibility to accommodate various grades of steel, and requires fewer spare roll rings that are replaced only in pairs.**

The innovative approach of Sinosteel MECC is evident in their development of the "modularization" concept, which has overturned the traditional FM train with centralized transmission, and has resulted in a more efficient and cost-effective process for the customer.

Currently, the production line is maintaining stable production. Liu Shen, Deputy General Manager of Taixin Steel, said, **"With the twin high-speed bar project going alive, it can not only reduce carbon emissions and improve the quality of products, but also greatly expands the variety and specifications of our products. The new production line is expected to increase annual sales by 2 billion yuan, generate nearly 200 million yuan in profits and taxes, and create more than 200 jobs."**

6×330mm

Modular mills

+2bn¥

Annual sales increase

The high-efficiency TMCP technology

The high-efficiency TMCP technology independently developed by Sinosteel MECC can greatly reduce the alloy content while meeting the product performance, improve the product performance, enhance the automation level, and reduce the production cost for customers.

From nothing to something: Sinosteel Handed over a Traveling Grate Pelletizing Plant and a Bar Rolling Line to Kunming Steel

Kunming Steel is committed to pursuing environmentally sustainable and efficient development. As part of this mission, the company intends to establish a top-tier steel production facility, which will incorporate an 800,000 t/a bar rolling line and 2.6mtpa traveling grate pelletizing plant, all contracted by Sinosteel MECC as the EPC contractor.

45people

On-duty operators per shift

-25%

Operators reduction

Successful upgrade of the bar production line

The bar project primarily focuses on producing 25mm-50mm ribbed bars and round bars. Sinosteel MECC has undertaken a visionary approach by reserving transformation space for superior and special steel production while simultaneously ensuring the production of deformed steel. This approach guarantees that the production line can roll and manufacture superior and special steel grades such as alloy structural steel, wear-resistant steel, gear steel, titanium and titanium alloy.

In the project, we have adopted advanced and mature production technology and equipment to ensure high production efficiency, excellent performance, and low energy consumption of the rolling line. Our bipolar controlled rolling and cooling technology and equipment, which are exclusively owned by Sinosteel MECC, have significantly improved the product grain size by two grades. We have canceled or reduced the use of expensive microalloy elements such as vanadium, niobium and titanium, and have reduced the consumption of manganese alloy, resulting in cost savings for our customers. Sinosteel MECC is committed to maintaining ultra-low emission standards and adopting hot charging and hot delivery technology to achieve clean construction, sustainable production, energy conservation and consumption reduction. We source all our billets from continuous casters, and when rolling steel for construction, we use roller hot delivery and hot charging technology. This ensures that the billets are delivered individually and at a faster pace, resulting in higher and more uniform billet temperatures. Conversely, for other steel grades, we employ cold billet feeding, which seamlessly connects with steelmaking, saves energy, and reduces consumption. The head of the Sinosteel MECC team said, "we are integrating cutting-edge technologies such as the Internet of Things and artificial intelligence into the control and management of steel rolling production. We are also constructing a steel rolling centralized control center to enable our customers to achieve integrated control and intelligent monitoring of the production process." **Data shows that the number of on-duty operators required for the rod project is approximately 45 operators per shift, a reduction of 25% compared to traditional similar projects.**

> *Integrating cutting-edge technologies such as IoT and artificial intelligence into the control and management of steel rolling production. Also constructing a steel rolling centralized control center to enable our customers to achieve integrated control and intelligent monitoring of the production process.*

The construction was officially commenced on December 21, 2020, and the hot commissioning was conducted on January 13, 2022. At the completion of the project, 5mm hot-rolled ribbed steel bar were placed on the cooling bed, and the size of the steel bar met the requirements of GB/T1499.2-2018 national standard. **The production line has been operating steadily, and it has filled the gap for Kunming Steel in terms of hot-rolled ribbed steel bars of 25 mm and above. Also, it successfully optimized the product mix, enhanced the product image, and boosted market competitiveness.**

From nothing to something: Sinosteel Handed over a Traveling Grate Pelletizing Plant and a Bar Rolling Line to Kunming Steel

2

The First traveling grate pelletizing plant

Sinosteel MECC has recently completed the construction of a 2.6 mtpa traveling grate pelletizing project, by utilizing the self-developed technology and equipment, all of which have been manufactured in China. This green metallurgical technology is a key component in improving the energy efficiency of traditional blast furnace ironmaking and achieving low carbon production. It offers significant advantages in reducing pollution and carbon dioxide emissions before entering the BF. By increasing the proportion of pellets in the BF charge from 10% to 50%, carbon reduction can reach nearly 10%. The project incorporated state-of-the-art process and environmental dust removal facilities that serve to bolster our commitment to environmental preservation and mitigate carbon emissions.

7,878t

Pellet plant

CO_2 −10%

Carbon Reduction

During the project execution, Sinosteel MECC team effectively tackled the challenge of material and equipment entry and exit due to the long rainy season and the presence of dust by using excavators for traction and dragging. The team also advocated for green construction and tranportation, implementing various measures to promote waste sorting, increase the use of solar lighting facilities, and enhance the utilization of renewable resources.

The project started operation on November 25, 2022 at 11:06, and passed the performance test on December 23rd of the same year.

• Average daily output ≥ 7,878 tons, and the ambient temperature compressive strength is ≥ 2,000 N.

• Operation rate

≥90.4

• Tfe

≥±5%

• Fe

0≤1

• Dust concentration of environmental bag filter ≤ 10 mg/m³.

• Drum turning index (+6.3 mm) ≥ 92%, wear resistance index (- 0.5 mm) ≤ 4.5%, grain size of 8-16 mm ≥ 92%, grain size below 5 mm ≤ 3%.

The company has already sucessfully built 17 TGP production lines both at home and abroad; among these are:

Projects in operation

- HBIS Tangshan Steel,
- Fujian Sangang,
- Liuzhou Steel Fangchenggang Base,
- Baowu Maanshan Steel,
- Guangxi Shenglong,
- Kunming Steel
- Tosyali in Algeria

Projects in progress:

- AMKR,
- Tosyali in Algeria, Phase IV

Birdview of the pellet plant

New Client: Kardemir No. 4 BF Started Running

At 11:25 on November 25th, local time in Turkey, the No.4 blast furnace major overhaul project of Kardemir, contracted by Sinosteel MECC, successfully finished hot commissioning. At 04:00 on November 26th, the blast furnace produced its first iron, and all systems are currently operating smoothly.

> *Sinosteel MECC Expanded into new clients in Turkey, providing high-quality technology and project management services.*

Founded in 1937, Kardemir (full name: Karabük Demir Çelik Sanayi ve Ticaret A.S.) is Türkiye's sole manufacturer of railway tracks. In late 2020, after multiple rounds of on-line competition, Sinosteel MECC won the bid for the EP project of overhauling and upgrading Kardemir No. 1 blast furnace. The project was a success, with it being successfully ignited and heated up on March 14, 2022 . In September, the customer released the final acceptance certificate (FAC), marking the successful conclusion of the first collaboration between the two parties. During the No.1 blast furnace overhaul project, Sinosteel MECC team utilized the company's unique BF body overhaul technology, designed the most rational furnace profile, and achieved higher output, longer life and more stable operation.

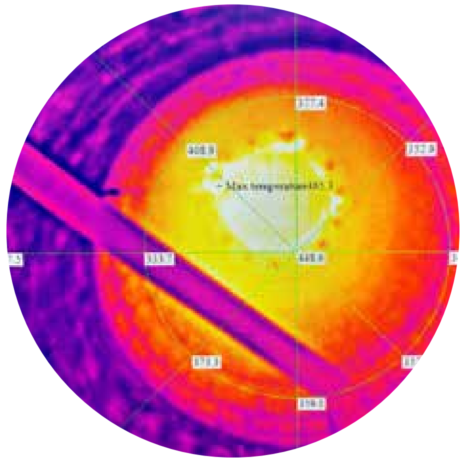
Appreciation from Kardemir


Thank You Sinosteel and Supervizors For BF-4, Order No. / CONTRACT No.: SA-01 / 6200000405-201 dated April 01, 2022

Dear Mr Zhang CHI, Mr Liu YUJUN, Mr Yuzhigun and Sinosteel.

Best regards,

Muhammet YAŞAR



Following the successful completion of the No.1 BF overhaul project, Kardemir invited Sinosteel MECC to participate in the No. 4 BF overhaul project. Urgency in resuming production of the No.4 BF and ensuring its safe and stable operation prompted Kardemir to seek assistance. On April 1, the two parties signed the EP contract for the overhaul of No. 4 BF: Sinosteel MECC is responsible for the overhaul of the BF body, the supply of furnace refractory, furnace shell, cooling stave, tuyere equipment and other key equipment, as well as the subsequent equipment installation and commissioning.


FINAL ACCEPTANCE CERTIFICATE (FAC)

DESCRIPTION AND QUANTITY OF GOODS:

APPLICANT:

BENEFICIARY:

CONTRACT NO.:

L/C REFERENCE NUMBER:

KARDEMIR KARABÜK DEMIR CELIK SANAYI VE TICARET A.S.

Control center

Two teams collaborating on-site

Sinosteel MECC team proactively planned ahead, provided detailed proposals to the customer, and delivered accurate construction design drawings in the shortest possible time. Efficient procurement and coordination of various resources, coupled with the reduction of lead time for key equipment, and timely organization of marine shipments, ensured the supply of high-quality equipment and materials. Despite the challenges posed by the pandemic, the team completed the design and order placements within a month of signing the contract, demonstrating their commitment to delivering timely and efficient service.

The high-quality and high-standard professional abilities of Sinosteel MECC have been highly recognized by the customer, with the team maintaining effective communication throughout the project. The project leader stated, "We are able to actively respond and solve any questions the customer may have in a timely manner. This is also an important aspect that ensures the steady progress of the project". Thanks to the relentless efforts of both parties, the No. 4 BF was successfully ignited and heated up at 11:25 on November 25, and hot metal being tapped at 4:00 a.m. on November 26, and key indicators meeting expectations. The head of Kardemir ironmaking process section expressed gratitude in a letter, stating that **"After nearly six months of efforts, we were deeply impressed by the professionalism, dedication, responsibility and timely response to site conditions displayed by Sinosteel MECC. We highly appreciate the cooperative spirit and on-site guidance exhibited by the team".**

In Operation

We were deeply impressed by the professionalism, dedication, responsibility and timely response to site conditions displayed by Sinosteel MECC. We highly appreciate the cooperative spirit and on-site guidance exhibited by the team.

At 04:00
on November 26th,
the blast furnace
produced
its first iron,
with all systems
operating smoothly.

Sinosteel MECC Completed a Sinter Plant, a BF and Twin High Speed Wire Rod Line for Hongda, Achieving Higher Efficiency and Greener Production

Shanxi Hongda Group celebrated the successful operation of its Five Key Projects on October 18, 2022, three of which were delivered by Sinosteel MECC on EPC basis. These projects include a 220m² sinter plant, a 1,350m³ BF and two 800,000 t/a high-speed wire rod lines.

220m²

Sintering

1300m³

BF

2×800,000t/a

high-speed wire rod

Sinter plant: incorporating multiple leading technologies and environmental-friendly innovative processes into one

The 220² sintering reduction and replacement upgrading project. It adopts various innovative technologies such as flue gas internal circulation, zero emission of waste gas, and coordinated treatment of flue gas. Among them, the flue gas internal circulation system has a a circulation wind volume of 25% of the main suction wind volume. The zero emission technology realizes the utilization of residual heat in a step-by-step manner.

The coordinated treatment technology of main suction flue gas (coal gangue power generation) can greatly reduce pollutant emissions. The plant is also equipped with an automated detection and control system, which enables the digitalization, integration, and visualization of the entire process of production.

Construction of the project began on August 23, 2021, after a successful integrated test run on July 25, 2022, the plant was officially put into operation on September 2, 2022. The plant boasts an impressive annual output of 2.93million tons of sinters and is equipped with state-of-the-art technology, achieving exceptional technical and economic indicators that set industry standards.

Sinosteel MECC will continue to design multi-module production automated management systems for clients, and will introduce a smart sintering system with proprietary intellectual property, providing projects with a "smart brain."

The energy consumption of the plant is 44.52 kgce/t-s, reaching the advanced level in China. Moreover, the plant's pollutant emissions have been significantly reduced, contributing to environmentally friendly and sustainable production practices.

Moving forward, Sinosteel MECC will continue to design multi-module production automated management systems for clients, and will introduce a smart sintering system with proprietary intellectual property, providing projects with a "smart brain."

25%

FGICS circulation wind volume

E0%

Zero Emission Technology

a 220m² sinter plant

Sinosteel MECC Completed a Sinter Plant, a BF and Twin High Speed Wire Rod Line for Hongda, Achieving Higher Efficiency and Greener Production

2

World's second BCRT: saves investment and improves energy efficiency

The 1,350m³ BF, also built by Sinosteel MECC on an EPC basis, adopts a blower and energy recovery turbine (BCRT) with both the turbine and motor located on the same axis, making it the second of its kind in the world.

The BCRT also harnesses the residual pressure and heat of blast furnace gas and converts it into mechanical force through a coaxial turbine expander that directly drives the shaft of the blower.

As the world's most complex multi-machine unit, it seamlessly integrates steam (via steam turbine), electricity (via motor) and gas (via gas turbine and air compressor) into a single system, with coordinated actions and centralized controls. The BCRT boasts a steam turbine, a motor, and a turbine that are all coaxial. In addition to its primary function of blowing air into the blast furnace, the BCRT also harnesses the residual pressure and heat of blast furnace gas and converts it into mechanical force through a coaxial turbine expander that directly drives the shaft of the blower.

This innovative approach has not only reduced motor output and aided power generation, but has also maximized energy recovery, resulting in significant improvements in energy utilization rates, reduced investment costs, and considerable economic benefits.

The BF top equalizing gas is fully recovered to further enhance energy conservation and reduce emission.

The Sinoteel MECC team has developed a BF production and management system featuring automatic control, digital measurement and intelligent management. An intelligent combustion system, which utilizes the proportional extreme value method, has been implemented for the hot blast stove to ensure optimal combustion conditions are maintained for the majority of the time.

The project commenced construction on August 1, 2021, started up on October 6, 2022, produced hot metal on October 7, 2022. The turbine unit was put into operation on October 9, 2022, followed by the steam turbine on October 18, 2022. At present, the project is running smoothly.

Birdview of the blast furnace

Sinosteel MECC Completed a Sinter Plant, a BF and Twin High Speed Wire Rod Line for Hongda, Achieving Higher Efficiency and Greener Production

Twin high speed wire rod lines: application of proprietary technology and equipment

The twin 800,000 t/a high speed wire rod lines were constructed by Sinosteel MECC on an EPC basis. These lines are currently the most advanced in China and represent the first time Hongda has adopted direct rolling technology and TMCP technology.

The project produces round steel with specifications ranging from Φ5.5 mm to Φ16 mm, as well as hot rolled ribbed bars with specifications ranging from Φ6 mm to Φ12 mm. It incorporates several mature and reliable technologies and equipment from Sinosteel MECC, all of which have independent intellectual property rights. **These include direct rolling technology for continuous casting billets, controlled rolling and cooling technology, modular precision rolling, and an intelligent centralized control system, and seamless rolling.**

The entire production line consists of five rolling mill units and a total of 28 mill stands. The use of modular rolling mills, in combination with individually-driven sizing mills further enhances the project's efficiency and energy-saving effects.

It also utilizes a non-heating direct rolling technology, which optimizes the direct rolling path to ensure swift and smooth billet delivery. Since its inception, the project has achieved a direct rolling rate of over 80% and an approximately 0.5% increase in yield rate.

Tang Faqi, Deputy GM of Sinosteel MECC, delivered a speech during the ceremony.

5X

Rolling Mill Units

28X

Mill Stands

+0.5%

Yield Rate for < 80% Direct Rolling Rate

- **The modular rolling mills and reducing have effectively increased the utilization rate of rollers, while reducing electricity consumption and roller wear.**
- **In addition, by controlling the rolling temperature and deformation of each unit through the controlled water tank before and after, the grain size can be refined, and the goal of improving the strength of the steel can be achieved. This eliminates the need to add alloys such as Mn, and eliminates microalloys such as vanadium (V) and niobium (Nb), thereby improving product performance and reducing costs for customers.**
- **The project significantly reduces fuel consumption in reheating furnaces, thereby reducing particulate emissions and making the project more environmentally friendly and low carbon.**
- **The electrical control system is well-designed, enabling continuous & automated control, significantly reducing the need for manual intervention & increasing productivity.**

Construction started on July 1, 2021 , with Line A becoming operational on August 10, 2022, and Line B becoming operational on August 25, 2022. Since their launch, both production lines have maintained stable operation, and their rolling speeds have received high praise from customers.

- **For Φ10mm: the fastest rolling speed reaches 70m/s, while the stable rolling speed is 65m/s.**
- **For Φ8 mm: the fastest rolling speed reaches 108m/s, while the stable rolling speed is 98m/s.**
- **The fastest rolling cycle archived is 40s, and the daily output reaches 6,000 tons.**

During the commissioning ceremony, Tang Faqi, Deputy General Manager of Sinosteel MECC, stated that, " Since Sinosteel E&T and Hongda Group upgraded to a strategic partnership in 2020, both parties have maintained close communication and cooperation. Sinosteel E&T always adheres to the concept of 'Beyond Expectations' and has successfully completed the construction tasks for various main processes, making the customer's process flow more reasonable, equipment more advanced, energy consumption lower, and production more environmentally friendly. We have delivered a high-standard, environmentally-friendly, and high-quality engineering project, truly fulfilling our promise that 'choosing Sinosteel E&T is choosing a reliable and trusted partner."

A Milestone in Indian Market: Sinosteel MECC Completed the First 100,000 m³ Dry Rubber Seal Gas Holders for BF and LD Gas

In August 2022, a dry rubber seal gas holder, constructed on an EPC basis by Sinosteel MECC, was successfully put into operation at JSW Steel Limited in India. Following the successful operation of one 100,000 m³ BF gas holder and one 100,000 m³ LD gas holder, Sinosteel MECC has set a new record as the first Chinese enterprise to complete gas holders for BF and LD Gas in India.

100,000m³

China-made dry rubber seal gas holders

These gas holders offer excellent performance, simple operation, stable conditions and easy maintenance.

Jindal SAW Ltd., is the flagship company of O.P. Jindal Group in India. The company is in a commanding position in India's tubular market, being the undisputed leader with a turnover in excess of USD 1.5 Billion. It is one of the country's largest producers of Large Diameter Pipes –SAW & SPIRAL, Seamless Tubes and Ductile Iron Spun Pipes, which are widely used in the energy sector for the transportation of oil & gas and water, sewage etc.

Since the first contract in the Indian market in 2005, Sinosteel MECC has maintained a long-term and friendly cooperation with JSW in India. The projects that have been constructed and put into production include the JSW Salem 0.5mtpa heat recovery coke oven project, the JSW Vijayanagar 1.5mtpa and 1.9mtpa stamp charging coke oven and by-product recovery project, the JSW Dolvi 1mtpa, 5.5-meter stamp charging coke oven and supporting 140t/h dry quenching project, and the JSW Vijayanagar 3mtpa, 6.25-meter stamp charging coke oven and supporting 2 sets of 190t/h dry quenching project, which is currently under construction. After successful cooperation in multiple projects, Sinosteel MECC has become a stable contractor and spare parts supplier for JSW in India.

In March 2018, after intense competition, Sinosteel MECC won the EPC general contracting project for the 100,000m³ BF gas holder and 100,000m³ LD gas holder for JSW DOLVI, defeating several strong domestic and foreign competitors. This was also the first BF gas holder and LD gas holder for JSW DOLVI. Recalling the fierce bidding competition, the project leader of Sinosteel MECC said, "Although the customer requested the use of membrane materials from European manufacturers, we took a huge risk and proposed the use of domestically produced membranes. This not only came from our realistic judgment of our own capabilities, but also our determination to promote domestic design and manufacturing overseas."

To achieve this, Sinosteel MECC provided a large number of detailed explanatory documents and, through patient communication and negotiation, ultimately dispelled the customer's doubts.

Both gas holders are China-made, and feature energy-saving, large-capacity designs with a single stage and a rubber membrane seal. The membranes used in the single stage are also produced domestically, marking the first time this has been done. These gas holders offer excellent performance, simple operation, stable conditions and easy maintenance. Compared to thin oil sealed gas holders, they save more than 50% on operating costs per year and recycle gas energy to create value. This dry rubber seal gas holder technology is a well-deserved leader and plays a crucial role in improving production efficiency, enhancing energy conservation, and protecting the environment.

20m

Membrane Height

2000Pa
~~3000Pa~~

Gas Holder
Lowered working presssure

Membranes manufacturing with a membrane height of 20 meters, the 100,000 m3 gas holders are on at the upper limit of single-stage membrane gas holder designs. This height not only results in high production costs, but also places extremely high demandes on the quality of the membranes.

Working pressure and piston: The working pressure of the gas holders is about 2,000 Pa, which is much lower than the minimum working pressure of 3,000Pa in China.Reducing working pressure presents a subversive challenge to the design and subsequent operation system.Lower working pressure also challenges the strength of piston. A lighter piston is required for lower working pressure, but it must also be strong enough to resist compression.Therefore, a balance must be found between weight and strength.

However, the use of a dry rubber seal gas holder also represents challenges, particularly for a scale of 100,000 m³. After repeated research and meticulous design, the project team of Sinosteel MECC and the manufacturing plant worked together to effectively solve the above challenges. The membranes arrived on-site in August 2019 and have now been in operation for three years, enduring the high temperatures of India and maintaining a good sealing state throughout. The team leader said, "The stable operation of gas holders is the best proof of Chinese technology and quality."

The project commenced construction on November 6, 2018. On November 27, 2019, mechanical completion of gas holder body was achieved, and pressure tests proved successful. Despite the impact of COVID-19, both parties continued construction through remote means and commissioned the gas holders for trial operation. On August 30, 2021, the BF gas holder was put into operation, and, on August 13, 2022, the LD Converter gas holder was put into operation. The gas holders serve to stabilize the pressure and flow rate of the gas pipeline network, laying a solid foundation for the rational use of energy throughout the plant.

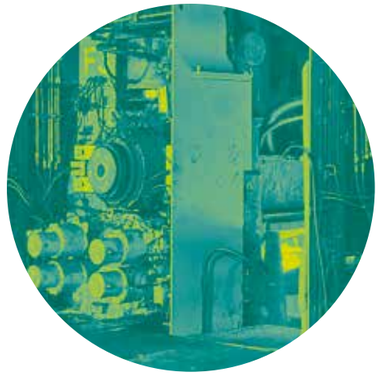
Sinosteel MECC completed the 100,000m³ BF and LD converter gas holder project with high quality and on schedule, breaking the monopoly of European companies in this field in the Indian market. The project team won the customer's appreciation with their high efficiency and flexible construction organization and process. The customer even awarded the project team the "Best Safety Conscious Employee" prize.

Sinosteel MECC Upgraded
950mm Hot Rolling Line for Tosyali

On April 7, 2022, Sinosteel MECC successfully completed the renovation and upgrade project for the 950mm hot strip rolling line for Tosyali in Turkey, and the customer representatives expressed their great satisfaction with the results.

V.2.0

Entering Phase



Sinosteel MECC successful handed over the 950 mm hot rolling line : Finishing mill tands passed t esting & hot commissioning qualifications. The reassembly of the motors for roughing mill, cold com-missioning of the whole line complete and ready for production resumption.

In November 2009, the 950mm hot strip rolling project for Tosyali, which was undertaken by Sinosteel MECC as an EP contractor, was successfully hot commissioned, giving the customer the first hot strip rolling production line in Turkey. This was the first complete hot strip rolling project exported by China overseas, and it has been running smoothly for more than 10 years, entering into the 2.0 phase of the project. Sinosteel MECC successfully won the bid for the renovation and upgrade of the project and signed contract for the supply and on-site technical services of the rough rolling lower roll DC motor armature, R1, R2, F2, F6 main transmission system expansion, and the finishing mill bending and shifting roll transformation.

1

Replacement and upgrading of roll bending and shifting device of the finishing mill

The work roll bending and shifting device is commonly used in hot rolling line to control and improve the strip profile. As one of the core components of the four-roller hot rolling mill, its structural rationality has a crucial impact on production pace, equipment maintenance and product quality. The bending and shifting device, which is the core equipment in the FM train of the hot rolling line, has no previous examples of renovation for hot rolling production lines below 1000mm in China. A new shifting structure and a special fixing mode of roll bending block are adopted for the new roll bending and shifting device, which satisfies functional demand of the customer and construction standards. The specially designed fixed block type bending and shifting structure boasts outstanding advantages.

- A simple structure, fewer fitting surfaces, few wearing parts & good overall stability, which are conducive to the rolling of thin strips.
- Fewer spare parts & lower maintain costs.
- Easier to achieve fully automatic roll changing, reducing the time required for roll change.
- The new structure of bending and shifting device is located on the outside of the rolling mill, with better working conditions & longer lifespan.

2

Expansion of main drive system

The main drive cabinet in the original electrical room has been in operation for over 10 years since the plant was built. To avoid frequent equipment breakdowns during the future production, the customer selectively replaced the main drive cabinet. The newly expanded R1, R2, F2 and F6 main drive systems have the following advantages:

- The new cabinet has a higher power rating compared to the original cabinet, and can support a rated current of up to 8,000 A.
- The new cabinet uses heat pipe heat dissipation technology, which is more advanced compared to the traditional aluminum heat sink used in the original cabinet, resulting in better cooling performance.
- The power unit of the new cabinet is designed with a modular structure, resulting in a clear layout and making it easier to replace power devices.
- The latest Siemens 6RA80 controller adopted.

3

Replacement of DC motor armature for the bottom roll in the roughing mill

The armature of the DC motor for the bottom roll in the rough rolling process has been replaced with a new one, which improves the production process while ensuring smoother operation and lower sparking at the commutator. However, due to the weight of a single armature being as heavy as 53 tons, lifting work is very difficult and requires extended adjustment to ensure safety. After installation, the armature must be perfectly matched with the original stator to ensure smooth motor operation.

- In the early morning of April 7, the rolling was successfully completed in one go, and the renovation was completed ahead of schedule.

The team of Sinosteel MECC successfully handed over the "Plus version" of the 950 mm hot rolling line to the customer and received high recognition and praised.

Reached Design Capacity upon Operation: Sinosteel MECC Handed over Sintering and BF Projects to Tiangang Steel

On October 27, 2022, Sinosteel MECC successfully put into operation the 1,250m^3 BF of Tiangang United Special Steel, reaching its design capacity. The day prior, the 230m^2 sintering plant started operation and attained its design capacity. **A number of independent technologies were applied to further strengthen energy conservation and carbon reduction.**

The energy consumption of the sintering project has attained an advanced level within the industry

In accordance with the principles of energy conservation, environmental protection and low carbon emissions, the 230^2 sintering project has achieved optimized process flow and layout, as well as advanced and reliable process, equipment and automatic control technologies, making the overall level of its technical equipment, as well as its key technical and economic indicators, reach the advanced level of similar projects in China.

By utilizing multiple technologies, we can further enhance energy conservation and reduce carbon emissions.

Advantages

First application of oxygen-enriched ignition technology

Oxygen-enriched ignition technology is applied for the first time, and hot air from the annular cooler is used to preheat the BF stock house. Additional technologies such as hot-air sintering, 920mm super-thick material layer sintering process, sintering waste heat recovery (SHRT process), variable frequency drive of fans, high efficiency sealing of annular cooler, zero discharge of annular cooler, and large flue waste heat recovery are all adopted to strengthen the energy conservation and carbon reduction effect of the project.

The energy consumption of the sintering project has reached an advanced level in the industry, and the pollutant emissions have met the ultra-low requirements of environmental protection.

Sinosteel team praised by the customer

2

The BF has been upgraded and numerous independent technologies have been implemented

The 1,250m³ BF upgrading project, completed on October 27, 2022, has been upgraded with the implementation of numerous independent technologies. The system is operating smoothly, with the main technical and economic indicators and equipment level reaching an advanced level compared to similar projects in China. The BF has been built based on the concept of "green, low-carbon, and intelligent development", with the adoption of advanced smelting processes and technical equipment such as concentrate charging, high blast temperature, high top pressure, and oxygen-enriched coal injection. This allows for the construction of a safe, green, intelligent, and efficient modern BF.

Application of numerous independent technologies

Sinosteel MECC has successfully applied several of its patented technologies, such as the "drying system of wet coke in coke bin", "full recovery system of top equalizing gas", and "top suction dedusting facilities of cast house", to this blast furnace.

Full recovery process of equalizing gas

A full recovery process for equalizing gas is adopted for the pressure equalization of top hoppers and gas bleeding, leading to reduced dust emissions from the top of the furnace and complete gas recovery.

3

An intelligent management system acts as a "security guard" for project construction

Sinosteel MECC project team has implemented intelligent site management in the construction process of sintering and BF projects for the first time.

The intelligent management system enables 24/7 monitoring of the project throughout the year, with videos being transmitted directly to the project department and the customer's engineering department for anytime and anywhere viewing. Additionally, the system is able to effectively detect illegal operations and give timely alerts, thereby significantly reducing the risk of safety incidents and ensuring the safe completion of the project.

The Sintering and BF projects were both constructed on the former plant site, which had been demolished. Despite the difficult tasks and tight schedule, the project team from Sinosteel MECC rose to the challenge and communicated with the customer proactively, showcasing their leading role in design and professional project management. Executives from Tiangang United Special Steel expressed their gratitude to the project team from Sinosteel MECC.

03 Birdview of the blast furnace

04 Intelligent management system

New Practice by Self-developed Technology: Sinosteel Tiancheng as Green Promoter

In June, 2022, Sinosteel Tiancheng successfully completed the construction of bag filters for the 4002 large-scale sintering machine charge end of Laigang Yinshan, under an EPC contract. **The bag filter system operates stably with particle concentration at the outlet far lower than the ultra-low emission limit.**

5mg/m³

600Pa -900Pa

reduces energy consumption and carbon emissions.

Two ESPs, installed in 2009 with a design emission index of 50 mg/m³, had become inefficient in dedusting due to aging and increasing rust corrosion. This directly impacted the normal operation of desulfurization and denitration equipment and posed a challenge in meeting stricter environmental protection standards. To address this problem, Laigang Yinshan and Sinosteel Tiancheng entered into an EPC contract in March 2022, authorizing Sinosteel Tiancheng to demolish the two ESPs and build two new bag filters (capacity of 2x144,000 m³/h) to satisfy ultra-low emission requirements, with the main exhaust fan to be reused.

Sinosteel Tiancheng recently completed the second industrial practice of its self-developed technology and equipment. This technology is highly efficient, and features low emissions, low resistance and energy saving, as well as stable, safe and reliable operation. It enables ultra-low PM2.5 emissions from the sintering machine, and also prevents downstream desulfurization and denitration equipment from scaling and blocking, reduces wear on the main exhaust fan, and minimizes the frequency of sintering machine shutdowns for maintenance. This allows for stable ultra-low emissions from the desulfurization and denitration system, and helps the sintering machine to maintain a higher yield and improve both quality and efficiency.

Given the need to construct two bag filters during the BF overhaul, numerous works had to be completed in a highly compressed timeline on a limited site under tight conditions. Compared to the southern region, the lower local temperatures posed additional challenges with regards to the anti-condensation and anti-corrosion of the filtering media, while also resulting in highly unstable fume conditions at the sintering machine charge end and great fluctuations of fume temperature. To prevent the potential risks, Sinosteel Tiancheng implemented preventive measures in both technology and equipment to ensure the safe and stable operation of the system.

With a strong sense of responsibility, Sinosteel Tiancheng completed the design, manufacturing, installation, and commissioning of the project in the shortest time frame, achieving the project target by May 25, 2022. Currently, the bag filters are operating stably and have succeeded in meeting the main performance index.

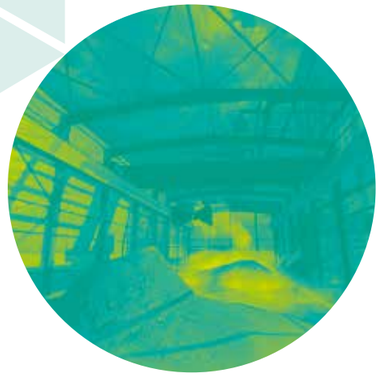
Successful application of bag filters for sintering machine

Having been applied into the 3602 sintering machine of Xinyu Steel and Laigang Yinshan, it has been proven that the original technology and equipment is capable of adapting to both hot, cold, and damp environments.

- **Emission concentration from filters is about 5 mg/Nm³.**
- **Pressure difference between filter inlet and outlet ranges from 600Pa to 900Pa.**
- **Its synchronization rate of 100% does not affect the sintering machine's production, and significantly reduces operating energy consumption and carbon emissions.**

Sinosteel Tiancheng's Independent Technology Helps Control VOCs in the Closed Decoking for Delayed Coking Units of SINOPEC Qilu

The 1.4 million tonne per annum project at SINOPEC Qilu's refinery complex is a highly desirable location. Under the guidance of Sinosteel Tiancheng, the transformation and upgrading of the closed coke storage tank, intelligent coke grabbing crane, waste gas collection and collaborative treatment links have been implemented in order to treat VOCs odors, sulfur and dust-containing waste gas and protect the environment.



"The system's stable operation, made possible through both digitalization and Sinosteel Tiancheng's patented technology and epuipment, greatly improved efficiency and working environment."

In December 2021, Sinosteel Tiancheng and their partner signed a contract for process package preparation and technology license, as well as a contract for key equipment supply. This marks the first cooperation between the two parties. As part of the project, Sinosteel Tiancheng applied their independently developed technology to transform the coke storage tank into an enclosed one, making use of hydraulic decoking. This allowed for the hot coke to take a large amount of water vapor and volatile gas away during discharge. The volatile gas from the coke accumulated in the open coke tank, and the openings of cold coke water tank and the cut coke water tank of the second delayed coking unit were all fugitive emissions, which posed a risk of pollution to the atmosphere. The transformation into an enclosed tank addressed these issues, ensuring emissions were up to standard and tackling fugitive emissions, volatilization, and odor of harmful gases, thus creating a good working environment for operators.

Sinosteel Tiancheng team optimized and upgraded the process details according to the actual situation:

- **The transformed site composition is evident in the increased safety of the workspace due to the enclosing of decoking areas, remote control of cranes and loading trucks. This has significantly improved the working environment.**
- **Volatile Organic Compounds (VOCs) can be effectively managed to ensure that the emitted waste gas is purified and meets the established emission standards, thereby providing significant environmental benefits.**

The project began on January 5, 2022, and was completed on March 31. On May 31, Sinosteel Tiancheng obtained two sets of installation, supervision, and inspection certificates for intelligent overhead cranes. The operation results and data indicate that the emission index is much lower than the relevant national and local standards. Furthermore, the fugitive emissions of waste gas from the delayed coking unit were successfully limited to H2S levels no greater than 10ppm and particulate matter no greater than 10mg/Nm^3.

<10ppm

H_2S Levels

<10mg/Nm^3

Particulate Matter

The system's stable operation, made possible through the use of Sinosteel Tiancheng's patented technology and equipment, has earned high praise from the customer for its improved working environment, "The equipment has been updated and the working environment has improved, making us feel comfortable."

Such a control and collaborative treatment technology for fugitive emissions from the coke tanks of delayed coking units signifies a major advancement in VOCs control. It has been highly praised by many customers, and has been instrumental in the operation of four projects and the signing of five new ones. It is of great significance for promoting environmental protection, transforming towards greener and low-carbon production, and making remarkable strides in pollution and carbon reduction. The technology was first applied at the closed decoking and VOCs-laden waste gas treatment project for the delayed coking unit of Shandong Wonfull in November 2021.

Smart Security "Guard": Sinosteel SEPRI Built Integrated Management and Control System for Safety, Environmental Protection, and Emergency

In November 2022, Sinosteel SEPRI successfully established an integrated management and control system for safety, environmental protection, and emergency response in Gong'an County's chemical park in Jingzhou City, Hubei Province. This system is a smart safety fence, optimizing the performance of the park's intelligent facilities.

Sinosteel SEPRI has focused on the prevention and resolution of major security risks, integrating isolated islands of information through multi-system linkage with access to monitoring data for safety, environmental protection, emergency and closed-off management. This has enabled the park to benefit from intelligent monitoring, early warning and governance through four functional modules (i.e. intelligent safety, environmental protection, emergency and closed-off management) and consequently improved the level of safety and environmental protection governance.

1

Digitalized smart security

Utilizing the industrial Internet + digital twin platform, a 3D geographical engine and 3D oblique photography, a geographic information model of the park is created. This model integrates basic safety management, major hazard safety management, dual prevention mechanisms, special operation management and other application systems. As a result, multi-form, multi-mode, and multi-dimensional visual monitoring and early warning, statistical analysis and intelligent control and dispatch are achieved in regard to the park's basic information of enterprises, risk zoning, major hazard sources, hidden dangers, alarm distribution, and special operations.

By utilizing informationized, visualized, and highly efficient methods, the physical distance barrier between units is eliminated, allowing for unified and centralized management of park security. Through accessing the data of the intelligent management and control platform for the safety risk of hazardous chemical enterprises, as well as collecting existing monitoring and control data of major hazard sources, this project is aimed at solving the problem of unclear responsibilities of major hazard sources, and difficulty in their situation tracking and risk control.

2

Life-cycle intelligent environmental protection

By leveraging the big data of environmental protection in the park, the environmental monitoring system can be improved to facilitate closed-loop management of the entire process, from monitoring and identifying issues to managing, analyzing causes and resolving them.

The digital twin map highlights the location and real-time status of various monitoring points within the park, with different icons representing the different monitoring types. This serves to visually display the status and distribution of environmental quality and pollution in the park.

The enhanced monitoring and early warning system, with its proactive emergency response, not only facilitates better decision-making for daily environmental management and emergency disposal, but also boosts efficiency in environmental remediation and controls pollution emissions and comprehensive treatment throughout the process.

3

Agile, fast and accurate response to emergency

By leveraging big data-backed visual management of safety, environmental protection and emergency in the park, data is collected in a multi-dimensional, comprehensive manner and the management dynamics are presented in an intuitive, visual way. This provides technical support in the event of an accident, and assists the park in responding to emergencies swiftly, accurately and scientifically. The upgraded intelligent emergency response system is divided into two statuses to facilitate targeted management.

Non-emergency monitoring and warning, as well as emergency duty, are essential to ensure accurate submission and timely processing of duty information to meet the emergency command center's business requirements. Digital management of all emergency plans, resources, and command systems at all levels are in place so that in the event of an accident, the corresponding emergency plans and response measures can be quickly linked to the type and hazard of the accident.

The second feature of this system is "Emergency" Auxiliary Decision-Making and Command & Dispatching. It allows for one-button distribution of command & dispatch information, tracking & positioning of emergency resources, and task tracking & feedback. Its resource demand analysis model and accident analysis model enable accident simulation analysis and optimized resource allocation.

By constructing a secure management system in the park, comprising integrated checkpoints and high-altitude video surveillance, dynamic monitoring of the entire process can be achieved, providing standardization and optimization of the flow of people, goods, and vehicles. This will effectively isolate regional security risks and prevent external risks from entering the area.

The system integrates panoramic shooting with safety and environmental protection data, enabling the real-time presentation of on-line monitoring and early warning information regarding safety and environmental protection in parking areas for hazardous chemical vehicles. The system is designed to address the high dynamic risks of operation and the difficulties in managing hazardous chemical vehicles during closed-off management.

> *The system is designed to address the high dynamic risks of operation and the difficulties in managing hazardous chemical vehicles during closed-off management.*

4

Closed-off management to secure firm firewall

SEPRI > SMART SECURITY GUARDIAN

The Integrated Management and Control System for Safety, Environmental Protection and Emergency is a smart safety fence, optimizing the performance of the park's intelligent facilities.

PREVIEW

EVENTS & FAIRS

Find us at the heart of the trade fair

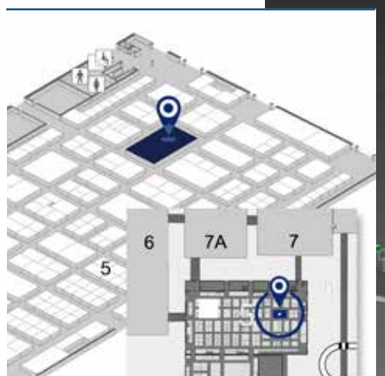
METEC, held every four years together with International Trade Fair for Foundry, Foundry Technology and Melting Furnace (GIFA), International Therm Process Summit and NEWCAST Casting Trade Fair, is the most influential and largest international casting and metallurgy exhibition in the world. Under the theme of The Bright World of Metals, METEC 2023 emphasized the concepts of intelligent manufacturing (industry 4.0), ecological metals, sustainable development as well as the integration of traditional industries with new technologies and concepts, to keep abreast with the times while being mankind oriented.

METEC 2023 covers a total area of more than 40,000 square meters and is expected to bring together more than 2,000 exhibiting companies from 120 countries and attract more than 78,000 professionals around the globe.

At our 180-square-meter stand, we present our latest innovations and developments and will be discussing with our guests solutions and suggestions on how to deal with current challenges. Also this time, in the "Leading Technology Talks", best-practice solutions and insights on carbon cutting will be shared by our specialists, covering both thin strip casting and rolling as well as the hydrogen-enriched carbon cycle and oxygen (HyCROF) blast furnace. Of course, inspiring discussions after the presentations are among the things we have missed most.

Sinosteel E&T participated in METEC 2019, demonstrating its metallurgical full-process engineering technology and services. During the exhibition, a team of experts also joined in the European Steel Technology and Application Days (ESTAD), presenting its self-developed technology on TGIOP & TMCP and attracting great attention.

Hall 5 / C15



+tech talks,

EVENTS & FAIRS

Focusing on

new tech of:

HyCROF & Baostrip Thin-strip casting and rolling

Two highly self-developed, targeting to cut carbon emission,

with one in short-process (casting & rolling matching EAF)

and

the other in conventional long-process (blast furnace)

01 Baostrip, A revolutionary casting technology and solution

Twin roll strip casting and rolling is one of typical near net shape steel manufacture process. Baostrip® for low carbon steel have made breakthrough progress and achieved remarkable results during past 20 years. Baostrip® has gone through two stages. The first phase, which took more than 10 years, involved understanding the effects of the process parameters, chemical composition, and inclusion of steel on the initial heat transfer, sub-rapid solidification, castability, phase transformation, structure, and mechanical performance. A pilot plant equipped with 1200-mm-wide twin-roll caster was built for developing side dam, nozzle, and casting roll. The liquid steel is supplied by a 15t electric arc furnace, ladle furnace and Vacuum Oxygen Degass. More than 300 heats were trialed and more data, experience, and knowledge were obtained.

A variety of steel grades such as silicon steel, low-carbon steel, high-strength low-alloy steel, medium-carbon steel, and medium-Mn steel were successively trialed. A series of models were built to control the uniform solidification on the casting-roll surface and uniform wear of the side dam, as well as to minimize fluctuation of the casting pool level and stabilize the separation forces.The second phase commenced in 2012. An industrial demonstration production line was put into operation in 2014, and has made remarkable achievements. Last year, Baostrip® obtained the first construction contract of commercial strip casting and rolling plant. This paper summarizes the results we obtained in the industrialized demonstration plant, and introduces the new project, and analyses development direction and ways of strip casting and rolling technology in future.

1200mm
wide twin-roll caster

15tons
electric arc furnace

+300x
heats trialed and increased database & knowhow

Baostrip®-the new strip casting & rolling process developed by Baowu Group

carrousel coiler

Control Room of NBS

02 HyCROF, leading the way to green blast furnace

According to the International Energy Agency, global energy-related CO_2 emissions in 2019 were about 33 billion tonnes, of which nearly 14% were generated by the iron and steel industry, while the energy consumption and emissions of the iron and steelmaking system accounted for about 70% of the total energy consumption and emissions of the whole iron and steel process, and the development of low-carbon iron and steelmaking technology is an effective way for the iron and steel industry to achieve low-carbon development and green and sustainable development.

Sinosteel actively practices the low-carbon and green development strategy. In July 2022, the hydrogen-rich carbon cycle oxygen blast furnace pilot project was successfully put into production, and in the subsequent experiments, key technologies such as 1200°C gas heating technology, gas CO_2 removal technology, hydrogen-rich gas/decarbon gas heating and blowing were realized one after another, and the 1200°C high temperature gas self-circulation blowing and hydrogen-rich smelting were carried out under oxyfuel smelting working conditions The industrialization test of the hydrogen-rich carbon cycle oxygen blast furnace (HyCROF) process has been completed. A milestone of 30% reduction in solid fuel consumption and 21% carbon reduction has been achieved (as of November 2022). The new process is safe, stable, smooth and efficient, with strong resistance to fluctuations, low manufacturing costs and good compatibility with traditional manufacturing processes.

1200°C
gas heating technology

-30%
solid fuel consumption

-21%
carbon reduction

HyCROF, leading the way to green blast furnace - a new low carbon emission iron making process and its engineering practice milestones with a view to providing a reference for the industry

Sinosteel Engineering &Technology Co., Ltd.

Sinosteel Equipment & Engineering Co., Ltd. Headquarters
8 Haidian Street, Haidian District
Beijing, 100080, P.R.China

Tel: (8610) 6268 8188
Fax: (8610) 6268 8098
pr@mecc.sinosteel.com

Sinosteel Tiancheng Environmental Protection & Technology Co., Ltd Headquarters

Tel: (8627) 5990 8230
Fax: (8627) 5990 8230
xuyao@mecc.sinosteel.com
wangjintiancheng@mecc.sinosteel.com

Sinosteel Wuhan Safety & Environmental Protection Research Institute Co., Ltd Headquarters

Tel: (8627) 8653 2698
Fax: (8627) 8653 2698
zgsepri@163.com

Sinosteel E&T Departments

Low-carbon Metallurgy & Energy Department
low-carbon@mecc.sinosteel.com

Mining Department
yuhaien@mecc.sinosteel.com

Mineral Processing Department
caopengfei@mecc.sinosteel.com

Coke Oven & By-product Department
xuweixun@mecc.sinosteel.com

Iron Making Department
zhangkaijun@mecc.sinosteel.com

Steel Making & Rolling Department
fangzhenzheng@mecc.sinosteel.com

Equipment & Spare Parts Department
zhouxiaoyu@mecc.sinosteel.com

Technical Support Department
lixinyong@mecc.sinosteel.com

Sinosteel E&T Worldwide Offices

International Marketing Dept.
global@mecc.sinosteel.com

Sinosteel Germany
luy@sinosteel.de

Sinosteel Indonesia
fengyilun@mecc.sinosteel.com

Sinosteel Brazil
chenzhihong@mecc.sinosteel.com

Sinosteel Bolivia
renjianhui@mecc.sinosteel.com

Sinosteel Russia
yuhaien@mecc.sinosteel.com

Sinosteel Turkey
lisong@mecc.sinosteel.com

Sinosteel Saudi Arabia
bailong@mecc.sinosteel.com

Sinosteel India
chenci@mecc.sinosteel.com

Sinosteel Malaysia
yundong@mecc.sinosteel.com

Sinosteel Pakistan
lilonggang@mecc.sinosteel.com

Sinosteel Ukraine
caopengfei@mecc.sinosteel.com
zhuqingnian@mecc.sinosteel.com

Sinosteel Magnitogorsk(Russia)
yuhaien@mecc.sinosteel.com

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