

首钢国际工程公司是由原北京首钢设计院改制成立、首钢集团相对控股的国际型工程公司，是北京市首家获得工程设计综合甲级资质的市属企业。公司可承揽各行业、各等级的所有工程设计，同时可提供规划咨询、设备成套、工程总承包等技术服务。公司在钢铁厂总体规划设计，炼铁、炼钢、轧钢、烧结、球团、焦化、工业炉单项设计，冶金设备成套等方面具有独到优势和丰富业绩。

公司业绩遍布国内70余家钢铁企业，以及巴西、印度、马来西亚、越南、孟加拉、菲律宾、津巴布韦、安哥拉、秘鲁、沙特等多个国家。

公司是北京市高新技术企业，获得国家科学技术奖和全国优秀设计奖等30余项、冶金行业和北京市优秀设计及科技成果奖等近300项，拥有数百项专利技术，多个项目创中国企业新纪录。

BSIET is an international engineering company established through reorganization of Beijing Shougang Design Institute. It is invested by Shougang Group who takes relative majority of the share.

BSIET has the Engineering Design Integrated Qualification Class A issued by the State. It is the first unit of Beijing municipal enterprises awarded this Qualification and is able to undertake engineering design for all industries and all grades. Meanwhile, it can provide technical services such as planning consultation, equipment integration and general contracting. BSIET owns unique technology and rich practical experience in overall design of iron and steel plants, individual design for iron making, steel making, steel rolling, sintering, pelletizing, coking, industrial furnace and integration of metallurgical equipment.

BSIET has served more than 70 iron and steel enterprises in China, and has its achievements in more than 20 countries such as India, Malaysia, Brazil, Viet Nam, Bangladesh, the Philippines, Zimbabwe, Angola, Peru and Saudi Arabia, etc.

BSIET is Hi-tech Enterprise of Beijing City, and has been awarded with 30-odd national science & technology prizes and national excellent design prizes, nearly 300 metallurgical industry and Beijing city excellent design and achievement prizes, and hundreds of national patents. Dozens of projects have created the new records of the Chinese enterprises.



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钢铁厂余热利用及发电工程与技术

WASTE HEAT UTILIZATION AND POWER GENERATION FOR IRON & STEEL PLANT



源自百年首钢 服务世界钢铁
Expertise from hundred-year Shougang



北京首钢国际工程技术有限公司

BEIJING SHOUGANG INTERNATIONAL ENGINEERING TECHNOLOGY CO.,LTD.

随着钢铁企业对节能环保的日益重视，各企业都在努力进行生产工序的余热回收，并加以积极利用。首钢国际工程公司在余热回收及发电工程方面，拥有丰富的业绩和经验，能够承担以下各类工程的咨询、设计、设备成套及总承包：

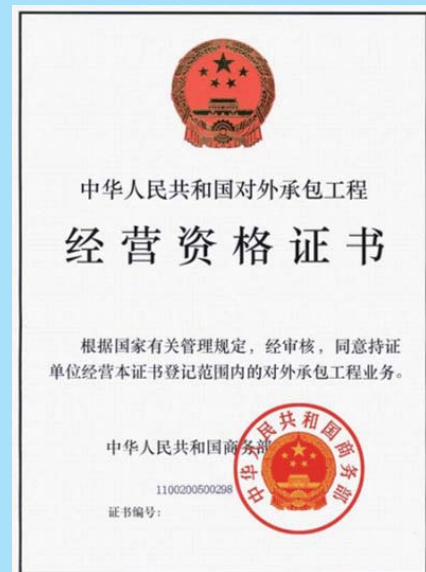
- ★ 干熄焦余热锅炉发电
- ★ 烧结机环冷余热发电
- ★ 高炉煤气锅炉发电
- ★ 燃气-蒸汽联合循环发电 (CCPP)
- ★ 炼钢转炉汽化冷却压差发电
- ★ 利用全厂富余低压饱和蒸汽发电
- ★ 为满足RH真空炉用汽要求的蒸汽过热器

With the increasing attention on energy saving and environment protection by iron and steel enterprises, each enterprise puts efforts on waste heat utilization of various production procedures, and take them into active use. BSIET owns rich achievements and experiences in waste heat recovery and power generation engineering, can undertake consultation, engineering, integration of equipment and EPC of the following projects:

- ★ CDQ waste heat boiler power generation
- ★ Waste heat power generation of sintering annular cooler
- ★ BFG boiler power generation
- ★ Gas - steam combined circulating power plant (CCPP)
- ★ Power generation by differential pressure in steel making converter vaporization cooling
- ★ The abundant low-pressure saturated steam in the plant is used for power generation
- ★ Steam superheater which can meet the steam consuming requirement for RH vacuum furnace



工程设计综合甲级资质
Engineering Design Integrated Qualification Class-A



对外承包工程经营资格
Qualification certificate for operation of overseas project



压力管道设计许可
Licence of pressure pipe design



压力容器设计许可
License of pressure container design

干熄焦余热锅炉发电技术 CDQ waste heat boiler power generation

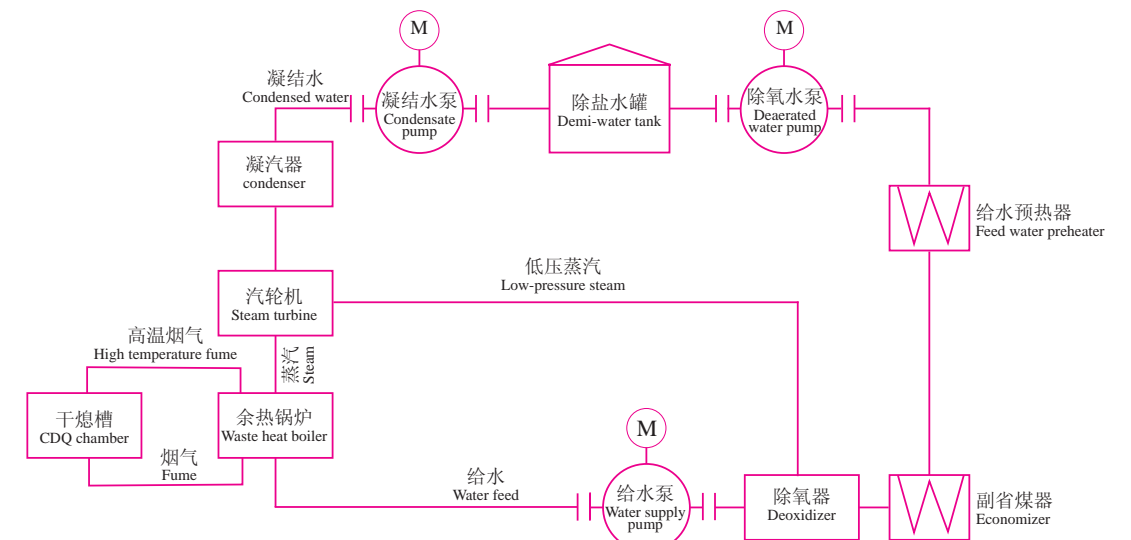
从2003年起，首钢国际工程公司与日本新日铁公司合作在国内推广干熄焦及配套的余热锅炉发电技术，在国内钢铁行业中拥有领先的市场份额。首钢国际工程公司的干熄焦余热锅炉发电技术，在应用效果方面具有明显优势。

技术原理

干熄焦是一种对焦炭进行冷却的新技术，惰性气体经过高温的焦炭，将焦炭的热量带走，高温的烟气送入余热锅炉与锅炉中的高低压水换热，产生的高低压蒸汽送入蒸汽轮机，驱动发电机发电。

技术特点

- ◎ 根据干熄焦焦炭的产量，设置不同能力的余热锅炉、蒸汽轮机和发电机；
- ◎ 余热锅炉采用膜式水冷壁，热效率明显提高；
- ◎ 余热利用产生的电能提供给工厂，降低工厂运行成本；
- ◎ 先进的自动化系统实现计算机集中控制。



干熄焦余热锅炉发电工艺流程图
Process flow chart of CDQ waste heat boiler power generation

Since 2003, BSIET and Nippon Steel cooperated to promote CDQ and waste heat boiler power generation technology in China, and it owns a leading market share in iron and steel industry. CDQ waste heat boiler power generation technology of BSIET has obviously superiority in aspect of application result.

Technical principle

CDQ is a new technology of coke cooling. Inert gas is used to cool high temperature coke and takes out heat from the coke. High temperature fume is taken into the waste heat boiler, and exchanges heat with high and low pressure water in the boiler to produce high and low pressure steam, and then the high and low pressure steam is sent to the steam turbine in order to drive power generator.

Technical features

- ◎ In accordance with output of CDQ, waste heat boiler, steam turbine and power generator with different capacities are provided;
- ◎ The waste heat boiler adopts membrane type water-cooling wall to increase the thermal efficiency;
- ◎ Electric energy produced by waste heat is applied to the plant so as to reduce the operation cost of the plant;
- ◎ An advanced automation system is adopted to realize a centralized control of computer network.

应用业绩 Applications

序号 Serial No.	项目名称 Project name	规模 Scale	完成方式 Service	完成时间 Completion time
1	济南信赢煤焦化公司150t/h干熄焦发电 Power Generation by 150t/h CDQ of Jinan Xinying Coal Coking Co. Ltd.	25MW	总承包 EPC	2006
2	包钢125t/h干熄焦发电 Power Generation by 125t/h CDQ of Baogang	18MW	总承包 EPC	2006
3	武钢140t/h干熄焦发电 Power Generation by 140t/h CDQ of WISCO	6MW	总承包 EPC	2006
4	迁安中化煤化工公司二期工程 2X140t/h干熄焦发电 Power Generation by 2X140t/h CDQ in Phase II of Qian'an Zhonghua Coal Chemical Co. Ltd.	2X12MW	总承包 EPC	2007
5	新余钢铁155t/h干熄焦发电 Power Generation by 155t/h CDQ of Xinyu Steel Works	20MW	总承包 EPC	2009
6	新余钢铁2X90t/h干熄焦发电 Power Generation by 2X90t/h CDQ of Xinyu Steel Works	1X25MW	总承包 EPC	2009
7	首钢京唐260t/h干熄焦发电 Power Generation by 260t/h CDQ of Shougang Jingtang	25MW	总承包 EPC	2010
8	迁安中化煤化工公司三期工程 2X140t/h干熄焦发电 Power Generation by 2X140t/h CDQ in Phase III of Qian'an Zhonghua Coal Chemical Co. Ltd.	1X18MW	总承包 EPC	2010
9	景德镇开门子分公司140t/h干熄焦发电 Power Generation by 120t/h CDQ of Jingdezhen Kaimenzi	15MW	总承包 EPC	2011
10	唐山达丰140t/h干熄焦发电 Power Generation by 140t/h CDQ of Tangshan Fengda	20MW	总承包 EPC	2011
11	唐山达丰90t/h干熄焦发电 Power Generation by 90t/h CDQ of Tangshan Fengda	12MW	总承包 EPC	2011
12	邢台钢铁公司焦化厂125t/h干熄焦发电 Power Generation by 125t/h CDQ of Coking Plant of Xingtai Iron & Steel Co.Ltd.	18MW	总承包 EPC	2011
13	首钢水钢140t/h干熄焦发电 Power Generation by 140t/h CDQ of Shougang Shuigang	18MW	总承包 EPC	建设中 Under construction
14	内蒙古黄河工贸千里山焦化 170t/h干熄焦发电 Power Generation by 170t/h CDQ of Inner Mongolia Huanghe Industry & Trade Qianlishan coking	20MW	总承包 EPC	建设中 Under construction
15	陕西龙门焦化公司160t/h干熄焦发电 Power Generation by 160t/h CDQ of Shanxi Longmen Coal Coking Co. Ltd.	15MW	总承包 EPC	建设中 Under construction
16	印度JSW公司焦化厂锅炉 Boiler of Coking plant, Indian JSW Co.	72t/h	总承包 EPC	建设中 Under construction

典型工程：济南信赢煤焦化公司150t/h干熄焦发电工程

Typical project: Power Generation by 150t/h CDQ of Jinan Xinying Coal Coking Co. Ltd.

该项目与150t/h干熄焦装置配套建设一台25MW的汽轮发电机组。干熄焦余热锅炉额定产汽量86.3t/h，正常产汽量79t/h。产汽压力9.5MPa，温度540℃。该项目于2006年投产，运行良好。

A 25MW turbine generator set is installed necessarily for the 150t/h CDQ device in this project. The rated steam production of the CDQ waste heat boiler is 86.3t/h and the normal steam production is 79t/h. Steam pressure is 9.5MPa, and temperature is 540℃. This project is put into production in 2006 with good operation condition.



烧结机环冷余热发电技术

Waste heat power generation of sintering annular cooler

烧结工程是首钢国际工程公司的传统优势领域。公司在国内率先开展烧结机环冷余热发电技术的研发与应用，目前已经积累了一定的技术优势。

技术原理

环冷机是冷却烧结矿的重要设备，高温的烧结矿经台车输入环冷机，环冷机的风机送入冷空气对烧结矿冷却，被加热的空气经余热锅炉与水进行换热，产生的蒸汽进入蒸汽轮机，驱动发电机发电。

技术特点

- ◎ 根据环冷机产生的热风量，设置不同能力的余热锅炉、蒸汽轮机和发电机；
- ◎ 采用补燃系统稳定蒸汽参数；
- ◎ 采用闪蒸汽，大幅度提高烟气余热的回收利用率；
- ◎ 先进的自动化系统实现计算机集中控制。



Sintering engineering is BSIET's domain with traditional advantage. BSIET has been in leading position in research, development and application of waste heat power generation technology with sintering machine and annular cooler in China and has accumulated a certain technical advantages.

Technical principle

Annular cooler is the critical equipment for sinter cooling. High temperature sinter is sent to the annular cooler via the pallet, and the fan of the annular cooler takes cold air to the sinter for cooling purpose. The air heated is carried out with heat exchange via the waste heat boiler and water to produce steam and then the steam enters the steam turbine so as to drive the power generator for power generation.

Technical features

- ◎ In accordance with hot wind volume produced by the annular cooler, waste heat boiler, steam turbine and power generator with different capacities are provided;
- ◎ Secondary combustion system is applied to stabilize steam parameters;
- ◎ Flash steam is applied to improve reutilization of fume waste heat greatly;
- ◎ An advanced automation system is adopted to realize a centralized control of computer network.



立式凝结水泵
Vertical condensate pump



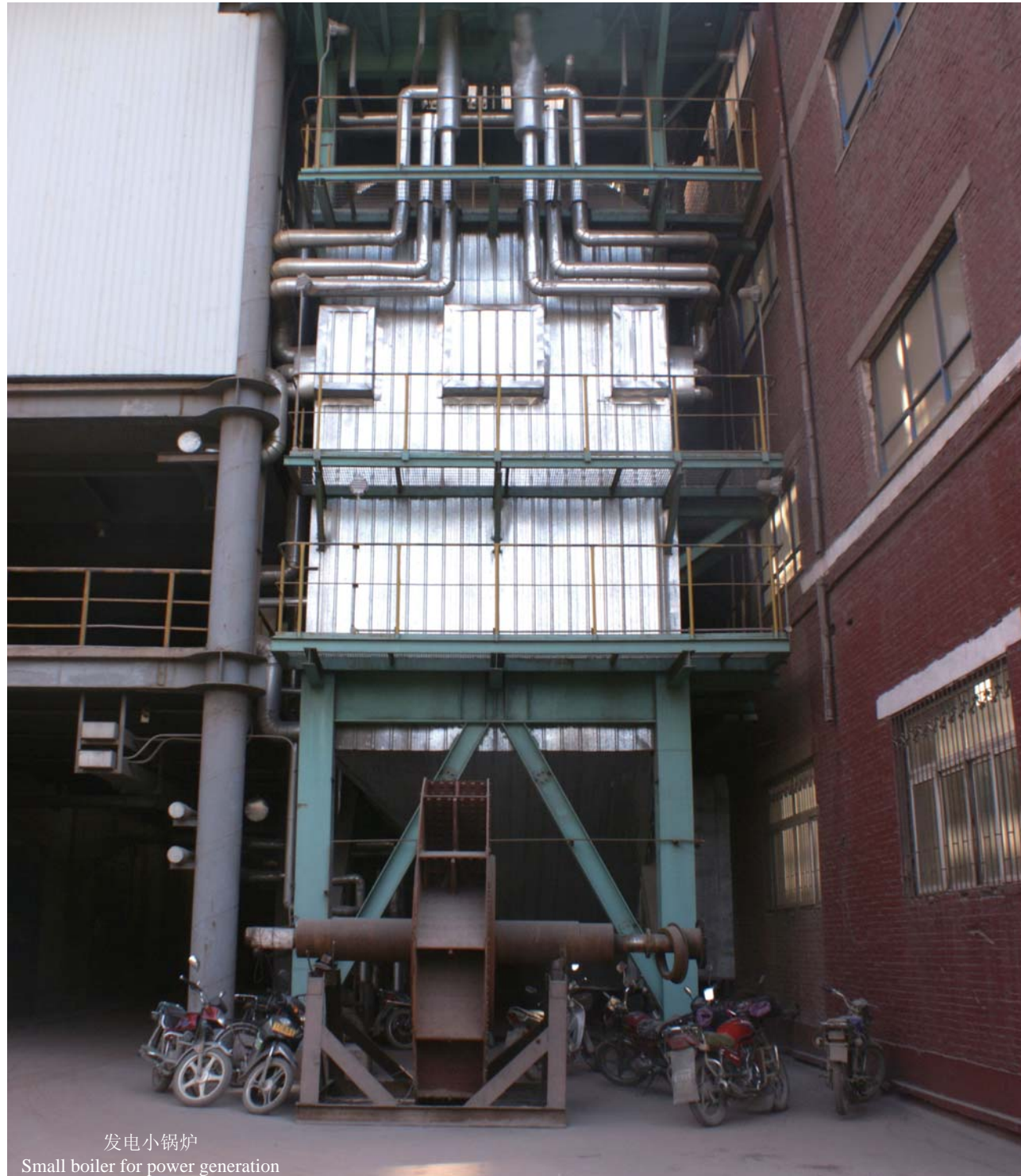
防护罩内汽机
Steam turbine inside the protection hood

典型工程：迁安矿业公司烧结机环冷余热发电工程

Typical project: Waste heat power generation of sintering annular cooler of Qian'an Mining Co. Ltd.

该项目建设1台50t/h锅炉和6台10t/h锅炉，并配套1台25MW纯凝式汽轮发电机组，解决了1台360m²烧结机和6台99m²烧结机的余热利用问题，同时还承担着60t/h冬季采暖供热。该项目于2010年投产，目前运行良好。

This project was built with one 50t/h boiler and six 10t/h boilers, and one 25MW pure condensation type steam turbine power generation set in order to solve the waste heat utilization of the one 360m² sinter machine and the six 99m² sintering machines, and undertakes the 60t/h heating capacity in winter. This project is put into production in 2010 with good operation condition.



发电小锅炉

Small boiler for power generation

高炉煤气锅炉发电技术 BFG boiler power generation

在高炉煤气发电领域，首钢国际工程公司拥有10t/h、35t/h、75t/h、130t/h及220t/h等各类不同规模高炉煤气锅炉的工程业绩，锅炉压力包括低压、中温中压、次高压及高温高压等各种压力，配套的发电能力覆盖15MW~50MW的各个系列。

首钢国际工程公司自主研发的全烧高炉煤气高压锅炉获国际专利。

In the field of power generation by blast furnace gas, BSIET owns many engineering achievements with different scales of BFG boiler such as 10t/h, 35t/h, 75t/h, 130t/h, 220t/h and so on. Boiler pressure includes various pressures like low pressure, medium temperature and medium pressure, secondary high pressure, high temperature and high pressure, etc. with various power generation capacities in the range of 15MW~50MW.

The high pressure boiler with BFG only self developed by BSIET has been honoured with the international patent.

应用业绩 Applications

序号 Serial No.	项目名称 Project name	规模 Scale	完成方式 Service	完成时间 Completion time
1	首钢50MW自备电站 Shougang 50MW captive power plant	50MW	设计 Engineering	1996
2	上海威钢50MW自备电站 Shanghai Weigang 50MW captive power plant	50MW	设计 Engineering	2000
3	首钢迁钢2x25MW自备电站 Shougang Qiangang 2 X 25MW captive power plant	25MW	设计 Engineering	2004
4	马钢13#锅炉 Magang 13# boiler	280t/h	设计 Engineering	2005
5	马钢6#锅炉 Magang 6# boiler	220t/h	设计 Engineering	2006
6	马钢13#汽机 Magang 13# steam turbine	50MW	设计 Engineering	2006
7	首钢京唐启动锅炉 Shougang Jingtang starting boiler	2x35t/h	设计 Engineering	2008
8	马钢50MW自备电站 Magang 50MW captive power plant	50MW	设计 Engineering	2011
9	首钢京唐海水淡化发电 Power generation of Shougang Jingtang sea water desalination	2X25MW	总承包 EPC	2011
10	首钢长钢2x15MW自备电站 Shougang Changgang 2 X 25MW captive power plant	15MW	设计 Engineering	2011
11	首钢迁钢15MW背压发电机组 Shougang Qiangang 15MW back-pressure steam turbine power generation unit	15MW	设计 Engineering	2011

典型工程：首钢迁钢2x25MW自备电站工程

Typical project: Shougang Qiangang 2 X 25MW captive power plant

该项目建有2台130t/h的次高压高炉煤气锅炉，并配套2台25MW抽凝式汽轮发电机组，解决了全厂富余煤气的放散问题，同时还承担着全厂的冬季采暖供热。此外，自备电站还具有向炼钢RH真空炉提供混汽用过热汽源的功能。

该项目于2004年顺利投产，运行良好，荣获冶金行业全国优秀工程设计一等奖。

This project newly built two 130t/h secondary high pressure BFG boilers with two 25MW extraction condensing turbine generator units to solve bleeding issue of abundant gas of the plant; meanwhile, it also undertakes heating system in winter in the plant. In addition, the captive power plant also serves the function of supplying steelmaking RH vacuum furnace with overheat steam for gas mixing.

This project was put into production in 2004 smoothly. It runs very well at present, and was awarded as the first prize of the national excellent project design in the metallurgical industry.



首钢迁钢2x25MW发电机组主厂房
Main building of Shougang Qiangang 2 x 25MW power generator unit



高炉煤气燃烧锅炉
BFG combustion boiler

燃气—蒸汽联合循环发电（CCPP）技术 Gas - steam combined circulating power plant (CCPP)

首钢国际工程公司在国内钢铁行业率先开展燃气—蒸汽联合循环发电技术的研发与应用，是国内第一家能够自主设计燃气—蒸汽联合循环发电站的公司，具有明显的技术优势。

技术原理

通过压气机涡轮将空气压缩，高压空气在燃烧室与燃料混合燃烧，使空气急剧膨胀做功，推动动力涡轮旋转做功驱动发电机发电。其产生的高温烟气温度高达450℃~550℃，可以通过余热锅炉再次回收热能转换成蒸汽，驱动蒸汽轮机再发一次电，从而形成燃气轮机—蒸汽轮机联合循环发电。

BSIET is the first company for research, development and application of gas-steam combined circulating power station in iron and steel industry in china, and has obvious technical superiority.

Technical principle

Compressor and turbine is used to compress air. High pressure air is mixed and combusted with fuel in the combustion chamber, and make the air rapid expansion and action in order to promote power turbine rotating and acting so as to drive the power generator for power generation. High temperature fume produced can reach to 450℃~550℃, and the waste heat boiler is used again to recovery the heat energy and converter to steam. The steam turbine is driven for power generation again. So that the gas turbine - steam turbine combined circulating power generation process is formed.



CCPP配套锅炉（建设中）
CCPP boiler (under construction)

技术特点 Technical features

- ◎ 比常规高炉煤气发电效率更高;
- ◎ 利用钢铁厂富余的低热值高炉煤气, 满足节能降耗、低碳环保的要求;
- ◎ 掺入少量焦炉煤气, 有效解决低热值高炉煤气燃烧不稳定的问题;
- ◎ 先进的自动化系统实现计算机集中控制。
- ◎ Efficiency of the BFG power generator is higher than that of the conventional one;
- ◎ Abundant low calorific value BFG in iron and steel plant is utilized to meet the requirement of energy saving, consumption reducing and low carbon environment protection;
- ◎ Few COG is mixed so that the issue on unstable combustion with low calorific value BFG is efficiently solved;
- ◎ An advanced automation system is adopted to realize a centralized control of computer network.

应用业绩 Applications

序号 Serial No.	项目名称 Project name	规模 Scale	完成方式 Service	完成时间 Completion time
1	首钢迁钢150MW燃气-蒸汽联合循环发电工程 Shougang Qiangang 150MW gas -steam combined circulating power plant	150MW	设计 Engineering	2010
2	首钢迁钢2X50MW燃气-蒸汽联合循环发电工程 Shougang Qiangang 2X50MW gas -steam combined circulating power plant	2X50MW	设计 Engineering	建设中 Under construction



CCPP主要设备
Main equipment of CCPP



迁钢CCPP主控室
Qiangang CCPP main control room



迁钢CCPP煤气冷却器
Qiangang CCPP gas cooler

典型工程: 迁钢150MW燃气-蒸汽联合循环发电工程 Typical project: Qiangang 150MW gas - steam combined circulating power plant

该项目建设一台150MW燃气-蒸汽联合循环发电 (CCPP) 机组。其发电能耗为0.292kg标准煤/kWh, 年回收高炉煤气17.44亿立方米, 年回收焦炉煤气1.95亿立方米, 年发电量为10.57亿度, 年节省标准煤36.75万吨, 年创造利润3.08亿元。

该项目于2010年投产, 运行良好。

This project is built with one 150MW gas - steam combined circulating power generation (CCPP) unit. Its energy consumption for power generation is 0.292kg standard coal/kWh, annual BFG recovery 1.744 billion m³, annual COG recovery 195 million m³, annual electricity output is 1.057 billion kWh, annual standard coal saving 367500t, and annual profit 308 million RMB.

This project is put into production in 2010 with good operation condition.

迁钢CCPP工程全景
A panoramic view of Qiangang CCPP project



炼钢转炉汽化冷却压差发电技术

Power generation by differential pressure in steel making converter vaporization cooling

首钢国际工程公司在螺杆式低压蒸汽压差发电技术的应用方面一直走在行业前列，创新利用螺杆发电机代替减压装置，该技术在低品质蒸汽利用方面具有突出优势。

技术原理

转炉汽化冷却产生的低压蒸汽送入螺杆式发电机进行发电，发出的低压电供生产单位使用。螺杆式发电机能够实现真正低温余热利用，将低品质的蒸汽充分利用，降低工厂生产成本。

技术特点

- ◎ 充分利用低品质余热，更好地实现节能降耗；
- ◎ 螺杆式发电机可以快速启停，无需暖机，能够高效、安全运行；
- ◎ 螺杆式发电机产生的低压电，能够满足生产单位的照明使用需求，降低运行成本。

典型工程：迁钢炼钢转炉汽化冷却压差发电工程

该项目建设1套250kW螺杆式发电机，转炉汽化冷却产生的高压蒸汽通过螺杆式发电机发电，低压蒸汽送入低压蒸汽管网，既满足了蒸汽减压，也产生了电能。该项目于2008年投产，运行良好。

BSIET is always in the leading position in aspect of application of screw type differential pressure power generation technology with low pressure steam, and creatively replaced pressure reduction device with the screw type power generator. This technology has outstanding advantage in aspect of low quality steam utilization.

Technical principle

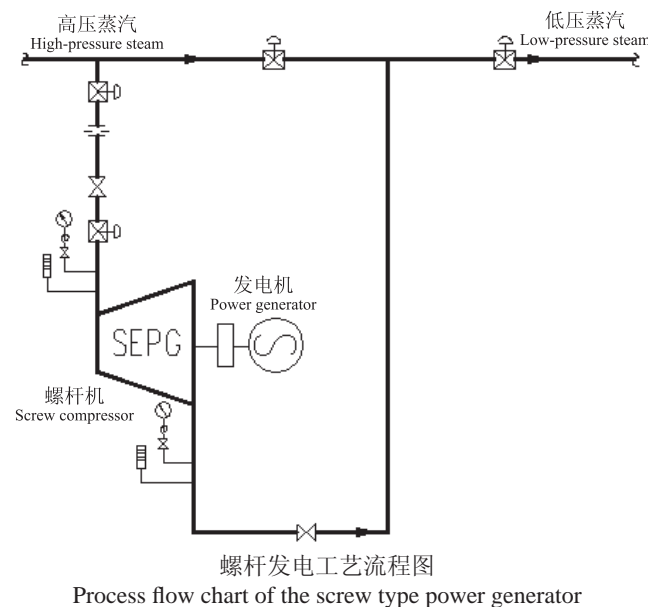
Low pressure steam produced by the evaporative cooling of converter is sent to the screw type power generator for power generation and the low voltage electricity produced is used for production. The screw type power generator can realize low temperature waste heat utilization, and make sufficient use of low quality steam and reduce production cost of the plant.

Technical features

- ◎ Low quality waste heat is sufficiently used for better realization of energy saving and consumption reduction;
- ◎ The screw type power generator can be start/stop rapidly without heating up, and it can run in high sufficient and safe way;
- ◎ The low voltage electricity generated by the screw type power generator can meet the demand of illumination of the production company and reduce operation cost.

Typical project: Power generation by differential pressure in Qiangang steel-making converter evaporation cooling

This project is built with one set of 250kW screw type power generator. The high pressure steam produced from the converter evaporation cooling is used to the screw type power generator for power generation. The low pressure steam is sent to the low pressure steam pipeline network for satisfactory of steam pressure relief and production of electricity energy. This project is put into production in 2008 with good operation condition.



炼钢转炉汽化冷却余热回收技术

Residual heat recovery for evaporative cooling of steel making converter

首钢国际工程公司致力于炼钢转炉汽化冷却余热回收技术研发与实践应用，率先设计了炼钢转炉全自动给水系统，并将转炉汽化冷却自产蒸汽供真空精炼炉真空泵使用。

技术原理

汽包中的欠饱和水通过烟道水冷壁冷却构件，吸收转炉烟道传给的热量，变为饱和的汽水混合物回到汽包，汽水混合物在汽包中被分离为水和蒸汽，蒸汽引出送至蓄热器后引至用户。

技术特点

- ◎ 充分回收炉气中的热量，降低炉气温度以利于除尘；
- ◎ 采用全自动给水系统，使汽包水位变化适应转炉生产特点，杜绝误操作，安全可靠；
- ◎ 将转炉汽化冷却自产蒸汽供真空精炼炉真空泵使用，工艺简单，安全可靠，并且节省投资，大大降低生产运行成本。

BSIET is devoted to development, research and application in practice of residual heat recovery technology for evaporative cooling of steel making converter, and is the first to design the full automatic water supply system for steel making converter, and provide steam generated from evaporative cooling of converter to vacuum pump of VOD.

Technical principle

The unsaturated water in steam drum absorbs, through cooling members of flue water wall, the heat conducted by converter flue and returns to steam drum as the saturated mixture of water and steam which will be separated into water and steam in steam drum, the steam will be sent to accumulator and then to the user.

Technical features

- ◎ Fully recovers the heat in converter fume and reduces the temperature of converter fume to facilitate dedusting;
- ◎ Full automatic water supply system will adapts the variation of water level in steam drum to characteristics of converter operation to preclude mis-operation, which is safe and reliable;
- ◎ Provide steam generated from converter evaporative cooling to the vacuum pump of VOD, which has a simple process and is safe and reliable, and saves investment and greatly reduces and operation cost.

应用业绩 Applications

序号 Serial No.	项目名称 Project name	转炉公称容量 Nominal volume	完成方式 Service	完成时间 Completion time
1	内蒙古包钢二炼钢210t转炉汽化冷却工程 Baogang No.2 Steelmaking Plant evaporative cooling of 210t converter	210t	总承包 EPC	2001
2	首钢迁钢一炼钢汽化冷却工程 Shougang Qiangang No.1 Steelmaking Plant evaporative cooling of converter	3X210t	设计 Engineering	2004
3	首秦100t转炉汽化冷却工程 Shouqin evaporative cooling of 100t converter	2X100t	设计 Engineering	2004
4	首秦转炉二期汽化冷却工程 Shouqin evaporative cooling of converter (Phase II)	100t	设计 Engineering	2005
5	首钢迁钢配套完善项目炼钢转炉汽化冷却工程 Qiangang modification project, evaporative cooling of converter	2X210t	设计 Engineering	2008

轧钢加热炉汽化冷却余热回收技术

Residual heat recovery for evaporative cooling of reheating furnace for rolling mill

首钢国际工程公司在轧钢加热炉汽化冷却余热回收的系统优化、技术集成创新、高效节能设备等方面，具有丰富的经验和独特的技术优势。

技术原理

汽包中的欠饱和水通过炉底水管，吸收加热炉传给的热量，变为饱和的汽水混合物回到汽包，汽水混合物在汽包中被分离为水和蒸汽，蒸汽引出送至用户。

技术特点

- ◎ 利用循环冷却水变成蒸汽时吸收大量的汽化潜热，使冷却构件得到充分的冷却；
- ◎ 使用蒸汽驱动给水泵，节省汽化冷却系统电能消耗；在停电或电路故障的情况下，气动给水泵仍可工作，防止加热炉因缺水造成的事故发生；
- ◎ 针对工艺设备布置紧张的实际情况，创新地使用低位热力除氧器，并通过设置在除氧器出口的水-水换热器，提高除氧器给水水温，降低除氧耗蒸汽量，解决给水泵的汽蚀问题。

BSIET has abundant experience and unique technology in system optimization, integration and innovation of technology and high efficiency equipment of residual heat recovery for evaporative cooling of reheating furnace for rolling mill.

Technical principle

The unsaturated water in steam drum absorbs, through water tube at furnace bottom, the heat conducted by reheating furnace and returns to steam drum as the saturated mixture of water and steam which will be separated into water and steam in steam drum, the steam will be sent to the user.

Technical features

- ◎ The cooling member will be fully cooled by the absorption of huge amount of evaporative latent heat when the circulating water turns to the steam;
- ◎ The steam is used to drive water supply pump to save electricity consumption of evaporative cooling system; during power off or power failure, steam-driven pump can still operate to prevent the reheating furnace from fault due to lack of water;
- ◎ For limited space for the layout of process equipment, low level thermal deaerator is innovatively used, water supply temperature of the deaerator is increased, steam consumption for deaeration is reduced and cavitation of water supply pump is solved through the water-water heat exchanger installed at the outlet of deaerator.

应用业绩 Applications

序号 Serial No.	项目名称 Project name	规模 Scale	完成方式 Service	完成时间 Completion time
1	首钢精品棒材车间加热炉汽化冷却工程 Shougang high quality bar mill plant evaporative cooling of reheating furnace	140t/h	设计 Engineering	2005
2	首钢第一线材厂二车间加热炉汽化冷却工程 Shougang No.1 wire rod mill plant evaporative cooling of reheating furnace	120t/h	设计 Engineering	2005
3	首钢迁钢2160mm热轧加热炉汽化冷却工程 Shougang Qiangang 2160mm hot strip mill evaporative cooling of reheating furnace	250t/h	设计 Engineering	2006
4	山西中阳高速线材加热炉汽化冷却工程 Zhongyang high speed wire rod mill evaporative cooling of reheating furnace	120t/h	设计 Engineering	2007
5	首钢迁钢1580mm热轧加热炉汽化冷却工程 Shougang Qiangang 1580mm hot strip mill evaporative cooling of reheating furnace	170t/h	设计 Engineering	2010

蒸汽过热技术

Steam superheating

首钢国际工程公司自主研发的蒸汽过热技术，通过精密的控制系统，能够很好地满足钢铁厂各工艺所需的蒸汽品质要求，适用于炼钢RH炉及所有需要进行蒸汽加热的领域。

技术原理

根据生产工艺要求，将饱和蒸汽或温度相对较低的蒸汽加热到工艺生产所需的蒸汽温度。

技术特点

- ◎ 利用钢铁厂中富余的焦炉煤气（COG）对蒸汽加热，满足节能降耗的要求；
- ◎ 能够解决钢铁厂无法提供满足生产工艺所需的高温蒸汽的问题；
- ◎ 蒸汽过热器占地小，运行及控制简单；
- ◎ 通过调节焦炉煤气燃烧器流量，来满足蒸汽过热器不同的负荷要求。

BSIET self researched and developed steam superheating technology. Precise control system is used for better satisfactory of steam quality requirement for various processes of iron and steel plant. It is popularly used in steel making RH furnace and the field of steam which requires for heating.

Technical principle

In accordance with production process requirement, the saturated steam or low temperature steam is heated to the temperature demanded for process production.

Technical features

- ◎ Abundant COG in iron and steel plant is used to heat steam so as to meet requirement of energy saving and consumption reducing;
- ◎ It can solve problem of high temperature steam which is difficult to meet the requirement of production process in iron and steel plant;
- ◎ The steam superheater takes less occupied land with characteristics of easy operation and simple control;
- ◎ COG burner flow is adjusted to meet different load requirement of steam superheater.



首钢迁钢CCPP启动蒸汽过热装置
Starting device with steam superheating for Shougang CCPP

应用业绩 Applications

序号 Serial No.	项目名称 Project name	规模 Scale	完成方式 Service	完成时间 Completion time
1	首钢迁钢CCPP工程启动蒸汽过热装置 Starting device with steam superheating of Shougang Qiangang CCPP project	0~40t/h	设计 Engineering	2010
2	首钢迁钢RH炉蒸汽改造工程蒸汽过热装置 Steam superheating device of Shougang Qiangang RH steam renovation project	0~60t/h	总承包 EPC	2011

典型工程：首钢迁钢CCPP启动蒸汽过热装置

Typical project: Starting device with steam superheating for Shougang CCPP

该项目建设1套40t/h启动蒸汽过热装置，以满足迁钢CCPP热态快速启动的要求。蒸汽过热器的设置满足了CCPP机组稳态和热态启动的条件。

该项目于2011年投产，运行良好。

This project is built with one set of 40t/h starting device with steam superheating in order to meet requirement of rapid starting of Qiangang CCPP in hot status. Configuration of the steam superheater meets the starting condition in stable status and hot status of the CCPP unit.

This project is put into production in 2011 with good operation condition.



蒸汽过热设备
Steam superheating equipment

饱和蒸汽发电技术 Saturated steam power generation

首钢国际工程公司致力于低压饱和蒸汽发电技术的跟踪与应用，并在首钢迁钢2×6MW、长钢6MW饱和蒸汽发电项目中得到成功应用。

BSIET dedicates to tracking and application of technology of power generation with low pressure saturated steam, and is successfully applied in Shougang Qiangang 2x6MW and Changgang 6MW power generation projects with saturated steam.

典型工程：首钢迁钢2X6MW饱和蒸汽发电工程

Typical project: Shougang Qiangang 2X6MW saturated steam power generation

该项目建设2台N6.5-1.0型纯凝式汽轮发电机组，额定工况如下：

This project is built with two N6.5-1.0 type pure condensing turbine power units with rated working condition as follows:

进汽压力 Inlet steam pressure	1.0 ± 0.2 MPa (A)	冷却水清洁系数 Cleanness coefficient of cooling water	0.8
排汽压力 Outlet steam pressure	0.01Mpa (A)	汽耗 Steam consumption	6.928 kg/kw.h
进汽温度 Inlet steam temperature	饱和温度 Saturated temperature	热耗 Heat consumption	17957 KJ/kw.h
进汽流量 Inlet steam flow	45t/h	循环水量 Circulating water flow	3400t/h
循环水温度 Circulating water temp.	33℃	发电机功率 Power of the generator	6495 kW

该项目于2010年投产，运行良好。

This project is put into production in 2010 with good operation condition.



首钢迁钢2X6MW饱和蒸汽发电主厂房
Main building of Shougang Qiangang 2X6MW saturated steam power generation