

A 3D rendering of various industrial machinery components, including large cylindrical tanks, conveyor belts, and structural frames, set against a blue background.

恩菲装备

INTELLIGENT PROCESSING EQUIPMENT WITH CUSTOMIZED
SYSTEM SOLUTION — EQUIPMENT & SYSTEM

ENFI 中国恩菲

装备承载技术 品牌提升价值

EQUIPMENT CARRYING TECHNOLOGY
BRAND PROMOTING VALUE

中国恩菲工程技术有限公司（简称“中国恩菲”），其前身是中国有色工程设计研究总院，成立于1953年，现隶属于世界500强企业——中国冶金科工集团有限公司。

中国恩菲立足于有色行业和大环保领域，在“一室、一院、三站、九中心”的科技创新平台上，以自主研发、技术创新为核心，拥有500多项专利（发明专利近300项），11大核心专长技术，10大核心装备，可为全球客户提供采矿、选矿、冶炼、余热利用、烟气处理、电气及自动化、索道、光伏发电、垃圾焚烧发电、污水处理等领域的成套装备和系统解决方案。

中国恩菲秉承“诚信社会为本、客户满意为荣”的经营理念，坚持以“专长技术+核心装备”为核心竞争力的工程一体化业务模式，为客户创造价值，与合作伙伴共享双赢。中国恩菲将以先进的理念、领先的技术和开放的胸怀站在国家推进“中国制造2025”和“一带一路”战略行动的高点上，引领提升行业装备水平，实现工艺技术、机械技术和信息技术的深度融合，为行业的智能化、生态化发展贡献力量。

ENFI, formerly known as China Nonferrous Engineering and Research Institute, established in 1953, is a wholly-owned subsidiary of China Metallurgical Group Corp. – a world Top 500 enterprise.

ENFI based on non-ferrous industry and environmental protection, in "one national laboratory, one tech institute, three science workstations, nine engineering centers" of science and technology innovation platform, with independent research and development, technology innovation as the core, with multiple patents (nearly 300 invention patents), 11 large core technology, 10 core equipment, can provide the global customers with mining, mineral processing, smelting, waste heat utilization, off-gas cleaning, electrical and automation, ropeway, photovoltaic material, photovoltaic power generation, urban waste incineration power generation, sewage treatment in areas such as complete sets of equipment and system solutions.

In "corporate integrity and customer's satisfaction" business philosophy that ENFI adhere to the "expertise technology + core equipment" as the core competitiveness, create value for customers and share a win-win situation with the partners. ENFI will be stand on advanced concept, leading technology and open mind to achieve "made in China 2025" and "OBOR" of national strategic, lead and enhance the level of industry equipment technology, integrating the technology of processing and equipment, contribute to intelligent and ecological development for industry.

湿法冶金装备 Hydrometallurgy Equipment

- 高温压力浸出系统*
High Temperature and Pressure Leaching System
- 多介质混合喷管
Hydrometallurgy Lance
- 尾气洗涤装置
Vent Gas Treatment System
- 核液位计保护套管
Nuclear Source Protection Pipe

智能设备及控制系统 Intelligent Equipment with Control System

- 井下提升机电控系统
Underground Hoist Electric Control System
- 装备成套控制系统
Complete Equipment Control System
- 弹性振打清灰装置控制系统
Spring Hammer Control System

化工环保 Chemical Environmental Protection

- 多功能复合滤料
Multifunctional Composite Filter Material
- 可再生脱硫剂（高分子有机脱硫剂）
Renewable Desulfurizer (polymer organic desulfurize)

索道 Ropeway

- 索道定制装备
Ropeway Customized Equipment
- 客运索道
Passenger Ropeway
- 货运索道
Cargo Ropeway

矿山装备 Mining Equipment

- 矿山高浓度膏体充填工艺装备及控制系统*
Mining High Concentrated Paste Filling Process Equipment with Control System
- 井下无人驾驶电机车全自动远程控制系统*
Underground Un-manned Driving Electric Locomotive and Automatic Remote Control System
- 底侧卸式矿车及卸载站
Bottom Side Dumping Mine Car and Unloading Station

火法冶金装备 Pyrometallurgy Equipment

- 氧气底吹炉工艺装备及控制系统*
Oxygen Bottom Blowing Furnace Process Equipment and Control System
- 大功率电炉工艺装备及控制系统*
High Power Electric Furnace Process Equipment and Control System
- 氧枪
Oxygen Lance
- 自焙电极装备
Self-baking Electrode Equipment
- 超大型侧吹炉工艺装备及控制系统
Ultra Large-scale Side Blowing Furnace and Control System
- 阳极炉工艺装备
Anode Furnace Process Equipment
- 热料输送系统
Hot Calcine Transfer System
- 直线分格式铸渣机
Linear Slag Casting Machine
- 大型高效自调节圆盘制粒机
Large-scale High Efficiency Self-adjusting Disc Pelletizer
- 圆盘浇铸机
Disk Casting Machine
- 加料口清理机
Cleaning Machine of the Feeding Port

热能装备 Thermal Engineering Equipment

- 冶炼余热锅炉*
Smelting Waste-Heat Boiler (WHB)
- 弹性振打清灰装置
Spring Hammer
- 垃圾焚烧飞灰中二噁英脱除装备系统
Pollutant Removal System of Garbage Incineration Fly Ash

ENFI
中国恩菲

矿山装备篇 Mining Equipment



矿山高浓度膏体充填工艺装备及控制系统

中国恩菲自主开发的专利产品，适用于全尾砂、分级尾砂的浓缩，可满足各种浓度的尾砂浓缩贮存。获国家科技进步二等奖，2015 年被国家安监总局列入第一批《金属非金属矿山新型适用安全技术及装备推广目录》。

Mining High Concentrated Paste Filling Process Equipment with Control System

The patented product independently developed by China ENFI is applicable to whole tailings and classified tailings concentration, and also suitable for tailings concentration storage devices of various high concentrated tailings filling and paste filling. The technology is honored with Second Prize of National Scientific and Technical Progress, and identified as the international advanced one. It is listed in the first lot of <Metals and Non-metals Mines New Applicable Safety Technology and Equipment Promoted Directory> by State Administration of Work Safety in 2015.



井下无人驾驶电机车全自动远程控制系统

中国恩菲自主开发的专利产品，由电机车自动运行控制系统 (ATO)、电机车运行保护系统(ATP)、编组调度指挥系统(ATS)、巷道无线通讯系统及辅助系统等构成。适用于大型矿山，特别是大水、高岩爆、高海拔的特殊矿山地下开采，2015 年被国家安监总局列入第一批《金属非金属矿山新型适用安全技术及装备推广目录》。

Underground un-manned driving electric locomotive and automatic remote control system

The China ENFI independently developed patented product is composed of electric locomotive automatic operation control system (ATO), electric locomotive operation and protection system (ATP), marshaling scheduling command system (ATS), drift wireless communication system and auxiliary system. It is applicable to large-scaled mines, especially the special mine underground mining with abundant water, high possibility of rock burst, and high altitude. It is listed in the first lot of <Metals and Non-metals Mines New Applicable Safety Technology and Equipment Promoted Directory> by State Administration of Work Safety in 2015.



底侧卸式矿车及卸载站

中国恩菲自主开发的专利产品，广泛应用于井下金属矿山有轨运输。能提供各种不同规格尺寸的矿车和卸载站。

Bottom side dumping mine car and unloading station

The China ENFI independently developed patented product is widely applied in high efficient transportation equipment of underground metal mines track transportation with different sizes and specifications of mining cars and unloading stations.

火法冶金装备篇 Pyrometallurgy Equipment

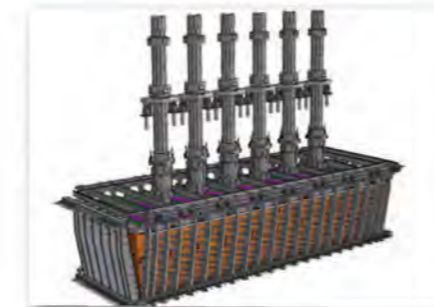


氧气底吹炉工艺装备及控制系统

中国恩菲自主开发专利产品，主要应用于炼铜、炼铅工艺，被英国《金属导报》评价为“技术指明了金属冶炼行业乃至多个领域未来十年、数十年，乃至上百年的发展方向”。目前世界最大底吹炉(卧式回转炉)即出自中国恩菲，处理能力达 150 万吨精矿/年。

Oxygen Bottom Blowing Furnace Process Equipment and Control System

Bottom blowing furnace is initially created by China ENFI, and is mainly applied in Copper and Lead smelting process. It is evaluated by famous <Metals Bulletin> of Great Britain as "the technology indicates the development direction for metal metallurgy industry and many other fields in the coming ten years, decades and even hundred years." The largest bottom blowing furnace (horizontal rotary furnace) in the world up to now is developed in China ENFI with the capacity of concentrate throughput 1.5Mt/a.



大功率电炉工艺装备及控制系统

中国恩菲自主开发的专利产品，由倒梯形炉体结构、整体弹性骨架及电极装置组成，RKEF 火法炼镍铁的核心设备。中国恩菲设计并供货的 72000kVA 镍铁电炉是目前国内自主设计的最大镍铁电炉。

High Power Ferro-Nickel Electric Furnace Process Equipment and Control System

The patented product independently developed by China ENFI consists of inverted trapezoidal furnace body structure, overall elastic skeleton and electrode device, and it is the core equipment for RKEF pyrometallurgical Ferro-Nickel smelting. 72000kVA ferro-nickel electric furnace designed and supplied by China ENFI is the largest self-designed one in China at present.



氧枪

中国恩菲自主开发的专利产品，为底吹炉供氧专用设备，由特种耐热材料加工而成，通过调节供氧使底吹炉达到最佳工作状态。

Oxygen lance

The patented product independently developed by China ENFI is specially applied to bottom blowing furnace for oxygen supply manufactured by special heat-resistant material. The bottom blowing furnace can achieve the best working condition by adjusting oxygen provision.



自焙电极装备

中国恩菲自主开发的专利产品，由极壳、升降装置、压放装置、上下抱闸、导电装置、密封装置组成，专用于电炉供电。

Self-baking Electrode Equipment

The patented product independently developed by China ENFI is comprised of electrode shell, hoisting gear, slipping device, up and down brake, conductive device and sealing device, which is specially applied to supply power for electric furnace.

火法冶金装备篇

Pyrometallurgy Equipment



超大型侧吹炉工艺装备及控制系统

中国恩菲自主开发的专利产品，在炉内将富氧空气和燃料，通过炉子两侧的喷枪直接喷入到高温熔融渣层中进行浸没燃烧，主要应用于热态高铅渣直接还原和再生铅领域。

Ultra large -scale side blowing furnace equipment and control system

The patented product independently developed by China ENFI, which the oxygen-enriched and fuel ejected by the lance on both sides of the furnace to high temperature molten slag, is mainly used in the process of high lead slag and secondary lead smelting.



阳极炉工艺装备

采用氧气燃烧、透气砖和滑板放出口等先进技术，其中滑板放出口是国内首次采用，解决了“放出口铜水落差大、温降大影响阳极板质量，喷溅损失大”的难题。

Anode Furnace Process Equipment

It is applied such advanced techniques as oxygen combustion, permeable bricks and sliding plate discharging port in the anode furnace designed and supplied by China ENFI, among which the sliding plate discharging port is the first time adopted in China, and solved the problem of big drop of copper smelting water at discharging port, impact on anode plate quality due to large temperature drop and great loss of spatter.



热料输送系统

中国恩菲自主开发机电一体化系统产品，用于颗粒、粉状热料的输送，应用于镍铁冶炼、电石等领域，可根据工艺特点定制。

Hot Calcine Transfer System

Full-automatic hot calcine transfer and its mechanical-electrical integration system with the intellectual property by China ENFI, is used for granular and powder materials transfer. This international advanced and domestic leading system is mainly used in the field of Ferro-Nickel smelting and calcium-carbide processing.



直线分格式铸渣机

中国恩菲自主开发的专利产品，技术成熟，易于维护。应用于铅氧化渣的连续铸锭。

Linear slag casting machine

The patented product independently developed by China ENFI with the mature technology and easy maintenance characteristics used for continuous oxidized lead slag casting.



大型高效自调节圆盘制粒机

中国恩菲自主开发产品，能将细粒度粉状物制成粒度符合工序要求的球粒状物料。该产品结构先进、性能可靠、制粒效果好、低能耗、耐磨损、运行平稳、易于维护。

Large-scale high efficiency self-adjusting disc pelletizer

The patented product independently developed by China ENFI can make the fine particle powders into the particle size in accordance with process requirement. It has the advantage of reliable performance, advanced structure, good efficiency of pelletizing, low energy consumption, durable, running smoothly and easy maintenance.



圆盘浇铸机

中国恩菲自主开发产品，由传动装置、圆盘、锭模等组成，能将熔炼炉放出的高温熔融粗铅浇铸成约 2t/ 块的铅锭。

Disk casting machine

The patented product independently developed by China ENFI is composed of actuator, disk, ingot mould etc. and can cast the high temperature molten lead bullion into the big lead ingots with the weight of 2tons for each.



加料口清理机

中国恩菲自主开发产品，由移动小车、捅打装置、升降装置、轨道等组成，针对冶金炉加料口堵塞或粘接情况进行清理的自动化机械设备，可适应冶金炉具有多个加料口的情形。

Cleaning machine of the feeding port

The patented product independently developed by China ENFI is composed of trolley, punching device, lifting device and orbit. The machine is applied for automatically cleaning of material blocking and adhesion at the multiple feeding ports.

湿法冶金装备篇

Hydrometallurgy equipment



高温压力浸出系统

中国恩菲自主开发的加压浸出技术专利产品,包括预热器、加压釜、闪蒸装置等核心关键装备,广泛应用于国内外大型红土镍矿、硫化矿(钴、铜、镍等)、难处理金精矿、赤铁矿除铁、铜阳极泥、氧化铝等冶炼项目,为不同客户提供加压浸出技术及关键装备方面的专业化服务。

High Temperature and Pressure Leaching System

The patented product independently developed by China ENFI is composed of preheater, autoclave, flashing system and is widely applied to the process of large-scale laterite ore, sulphide ore (including cobalt, copper and nickel), refractory gold concentrate, hematite iron removal, copper anode slime and aluminum oxide etc.. The excellent quality and stable performance of the equipment has won the customer affirm and trust. Uphold the concept of Safe, Stable and Efficient, replying on the strong technical strength, China ENFI will provide different customers with professional services in the field of pressure leaching technology and equipment.



多介质混合喷管

中国恩菲自主开发的多介质混合喷管应用于加压浸出系统,选用特种材料加工而成,用于各类介质的加入,保障物料顺利通入有效混合区域内,达到最佳的混合及反应效果。

Hydrometallurgy lance

China ENFI self-developed sparge pipe is made of special material, which is used to join various materials and ensure the material via effective mixing area smoothly for achieving optimum mixing and reaction effect.



尾气洗涤装置

中国恩菲自主开发的尾气洗涤装置,应用于处理加压浸出系统以及闪蒸槽等系统的排汽,可有效洗涤有害物质,定制化处理不同流量、成分尾气,使其达到环保节能要求。

Vent gas treatment system

The self-developed vent gas treatment system by China ENFI is applied for pressure leaching system exhausting gas to reach environmental standards.



核液位计保护套管

中国恩菲自主开发的核液位计保护套管可对恶劣工况条件下的核仪表进行全面保护。

Nuclear source protection pipe

China ENFI self-developed nuclear source protection pipe is used to supply comprehensive protection in the harsh working conditions.

热能装备篇

Thermal Engineering Equipment



冶炼余热锅炉

拥有多项专利技术的核心技术装备,由膜式水冷壁、对流管束、汽包、振打装置等组成,是实现烟气余热回收的关键设备。

Smelting waste heat boiler (WHB)

Core technical equipment of China ENFI, with a number of patented technologies, by membrane wall, convection bank, steam drum, vibration device and other components, and is the key equipment of waste heat recovery of flue gas.



弹性振打清灰装置

中国恩菲专利技术产品,能在工况复杂、环境恶劣的条件下有效清除各种锅炉积灰,实现锅炉的长效、清洁运行。截止目前,已在有色冶金行业近 60 个项目、130 多台锅炉中使用,销量超过 3000 台。

Spring Hammer

Spring hammer is China ENFI's patented technology product, and can effectively remove various boiler ash in complex working condition and harsh environmental condition to achieve long term and clean operation of boiler. Up to now, spring hammer of ENFI has used for around 60 non-ferrous metallurgy projects and more than 130 boilers. The total sales is more than 3,000.



垃圾焚烧飞灰中二噁英脱除装备系统

拥有多项专利技术,国家 863 计划(2012AA062801)研发成果的工业化应用。系统由加热系统、进料系统、冷却系统和控制系统组成,能够在中低温度的情况下,有效脱除垃圾焚烧飞灰中二噁英。二噁英最高脱除率可达到 99%,满足进入卫生填埋场的标准要求,填补了国内垃圾焚烧中二噁英处理工艺装备的空白。

Dioxin Removal System Of Garbage Incineration Fly Ash

Dioxin removal system contains a number of patented technologies and is the industrialized application of national 863 program (2012AA062801) R&D results. The system is composed of heating system, feeding system and control system, and can effectively remove fly ash of garbage incineration in the case of low and medium temperature. Dioxin highest removal rate can reach 99% which can meet the requirement of the sanitary landfill site. This system fills the blank of domestic dioxin treatment process equipment of garbage incineration.

化工环保篇

Chemical Environmental Protection



多功能复合滤料

中国恩菲自主开发高科技产品，适用于冶炼的多种工况烟气除尘。

Multifunctional Composite Filter Material

Multifunctional composite filter material is independently developed high technological product by China ENFI, and can be used for flue gas removal of various working condition in metallurgy.



可再生脱硫剂（高分子有机脱硫剂）

中国恩菲自主开发的专利产品，是一种烟气高效脱硫溶剂，能富集烟气中的二氧化硫，可循环使用，具有吸收速率快，脱硫效率高，可循环使用等特点。

Renewable desulfurizer (polymer organic desulfurizer)

Renewable desulfurizer is independently developed patented product by China ENFI, and is a high efficient flue gas desulfurizer. The desulfurizer can enrich sulfur dioxide in flue gas and be used circularly. The desulfurizer has a fast absorption rate, high desulfurization efficiency, and can be used circularly, etc.

针对化工环保专业，还有转化器滑动底座、骤冷回收 As_2O_3 装备系统、二氧化硫制硫磺装备等。

For chemical environmental protection, there is reformer slide base, quench recovery system of As_2O_3 , sulfur dioxide system for making sulfur, etc.

智能设备及控制系统篇

Intelligent Equipment with Control System

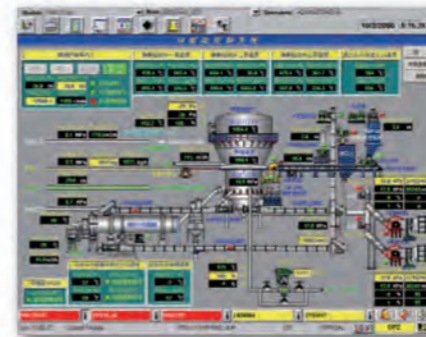


井下提升机电控系统

中国恩菲作为国内提升机电控技术的先行者，掌握多项专利，在国内外矿山领域拥有卓越的业绩，多次获省部级科技进步奖。

Underground Hoist Electric Control System

China ENFI is the domestic forerunner of the hoist electronic control technology, has a number of patents and outstanding performance in the field of mine at home and abroad, and won the provincial and ministerial scientific and technological progress award for many times.



装备成套控制系统

提供装备机电一体化、全厂 DCS 控制系统及自控仪表成套服务。提供电炉供电与自控系统、顶吹炉自控系统、焙烧炉自控系统、转炉传动电控系统、低压智能配电系统等供货和服务。

Complete Equipment Control System

China ENFI can supply service packages of mechanotronics complete equipment, including equipment supply and services for power supply and automatic control system of electric furnace, automatic control system of top-blown furnace, automatic control system of roaster, electronic control system of convertor, low voltage distribution system, etc.

索道篇

Ropeway



索道定制装备

中国恩菲自主开发索道定制装备，拥有 7 项发明专利，3 项实用新型专利。产品主要包括往复式客运索道、单线循环固定抱索器吊椅（吊篮、吊厢）式客运索道、单线脉动循环固定抱索器吊厢组式客运索道、货运索道、专项用途索道等类型。

Ropeway Customized Equipment

China ENFI has independently developed ropeway customized equipment, and achieved 7 invention patents and 3 practical new patents. The products of China ENFI ropeway are comprised of reversible passenger ropeway, mono-cable circulating with fixed detachable grip chairlift (bucket, cabin) passenger ropeway, mono-cable pulsatile circulating cabin-group passenger ropeway, cargo ropeway and special purposed ropeway.

恩菲装备里程碑

Milestone of ENFI Equipment

核心专长设备

Core technical equipment

- 氧气底吹炉 (氧气底吹炼铅炉、氧气底吹炼铜炉)
Oxygen Bottom Blowing Furnace Process Equipment (Lead Smelting & Copper Smelting)
- 大功率镍铁电炉
High Power Ferro-Nickel Electric Furnace Process Equipment
- 高温压力浸出系统
High Temperature and Pressure Leaching System
- 冶金余热锅炉
Smelting waste heat boiler (WHB)
- 矿山高浓度膏体充填工艺装备
Mining High Concentrated Paste Filling Process Equipment
- 无人驾驶电机车全自动控制系统
Underground un-manned driving electric locomotive and automatic remote control system

1953

重工业部有色金属管理局设计公司

Heavy Industry Ministry Non-ferrous Metal Administration Bureau Engineering Company

1978

北京有色金属设计研究总院

- 开创国内有色金属冶炼设计和机械制造先河

Metallurgy Ministry Beijing Non-ferrous Engineering Institute

- Creating a pioneer of domestic non-ferrous metal metallurgical design and machine manufacture

1990

北京有色金属设计研究总院

- 自主研发和制造出多种国内首创，国际先进的装备产品；
- 代表性装备：冶金炉、有色工艺非标设备、磁静电复印机生产线、货运索道。

Beijing Non-ferrous Engineering Institute
Independently researched and developed various equipment products which are first emerged at home and also advanced at abroad.
Representative: metallurgical furnace, non-ferrous process non-standard equipment, Selenium electrostatic copying machine production line, and cargo ropeway.

1998

北京有色金属设计研究总院

- 有色工艺装备、工业炉设计和制造成为国内排头兵，引领行业发展；
- 首创多功能舞台机械设备、大型游艺设备、自动化停车设备、客用索道等填补国内空白；拥有国家级大型游艺设备监测中心、采育机械制造加工基地。

Beijing Non-ferrous Engineering Institute
The design and manufacturing of non-ferrous process equipment and industrial furnace is as the pioneer domestically and leads the industry development;
The initial creation of multi-purposed stage machinery equipment, large amusement equipment, automatic parking equipment and passenger ropeway filled the industry gap in China; the company has the state large amusement equipment monitoring center and Caiyu machinery manufacture processing base.

2002

中国有色工程设计研究总院

- 装备业务迅速扩张，10 多家装备公司，涉猎国内多个领域；
- 以有色工艺装备、工业炉、矿机为代表的专利和专有技术产品在行业内大放异彩；装备业务扩大至大型水处理装备、热能装备、电气自控设备等。

China Non-ferrous Engineering Institute
Rapid expansion of equipment business with over 10 equipment companies covering various fields at home;
Patent and self-owned technique product featured with non-ferrous process equipment, industrial furnace, and mining machine achieved a good result within the industry, and equipment business stretches to large water treatment equipment, heat energy equipment and electric automatic control equipment and etc.

2006

中国恩菲工程技术有限公司

- 恩菲装备业务伴随共和国有色金属工业的发展逐渐壮大；
- 机械装备不断创新新发展，自控和自动化装备份额逐年增加，业务呈现多元化发展。

China ENFI Engineering Corporation
ENFI equipment business grown up with the development of state non-ferrous industry;
Machinery equipment with a continuous creative development, share of automatic control and automatic equipment increase year by year, and diversification development of business presentation.

2015

恩菲装备公司

- 重新整合装备业务，涉及矿山、火法冶金、湿法冶金、热工、化工环保、自动化、索道等七大业务领域，30 余项核心装备与产品，50 余项研发产品；与 Outotec、MSS、FLUOR、bhpbillion 等国际知名公司合作；
- 装备远销印度、巴基斯坦、赞比亚、刚果（金）、刚果（布）、缅甸、老挝、越南、巴布亚新几内亚、埃及、纳米比亚、朝鲜等国。

ENFI Equipment Company
Reintegration of equipment business including mining, pyrometallurgy, hydro-metallurgy, thermal engineering, chemical and environment protection, automatics and ropeway, totally 7 business fields, about 30 core equipment and products and over 50 research and development products;
Cooperation with famous international company such as Outotec, MSS, Fluor, and BHP billion;
Equipment supplied to India, Pakistan, Zambia, DRC, Republic of Congo, Myanmar, Laos, Vietnam, PNG, Egypt, Namibia, DPRK, etc.

矿山高浓度膏体充填 工艺装备及控制系统

中国恩菲自主开发的专利产品，适用于全尾砂、分级尾砂的浓缩，可满足各种浓度的尾砂浓缩贮存。获国家科技进步二等奖，2015 年被国家安监总局列入第一批《金属非金属矿山新型适用安全技术及装备推广目录》。

尾砂浓缩贮存装置，可以边给料边放砂，尾砂浓缩费用也大幅降低，放砂性能大大提高。通过特殊的放砂设施，利用控压助流技术经过高效沉淀、澄清脱水，活化造浆提高和稳定了浓缩设备或装置的底流浓度，直接低成本地制备出高浓度细尾砂充填料浆或膏体。

底流尾砂浓度为 72%~80%；流量可达到 50~200m³/h。

通过采用中国恩菲的专利脱水装置或采用分级脱水技术和深锥浓密机脱水充填工艺技术，将（细粒级）尾砂直接低成本地制备成高浓度（72%以上）料浆或膏体，能从脱水装置底部排出，可以再适当添加水泥、粉煤灰、炉渣等，搅拌混合均匀后，通过管道自流或泵送设备输送至井下采空区或地表尾矿堆场。可提高采矿回收率和资源综合利用率。

该产品可满足各种高浓度尾砂充填，甚至膏体充填的需要，能实现井下少脱水或不脱水，改善井下的作业环境，减少排泥费用。自动化控制系统可有效控制物料比、膏体料浆浓度等重要指标，保证生产过程的高效、稳定运行。

产品成功应用于冬瓜山铜矿、崇礼紫金矿业、香炉山钨矿、会宝岭铁矿、铜绿山铜矿、铜山口铜矿、白象山铁矿、会泽铅锌矿、谦比希铜矿、萨热克铜矿、大冶铁矿等项目。

Mining High Concentrated Paste Filling Process Equipment with Control System

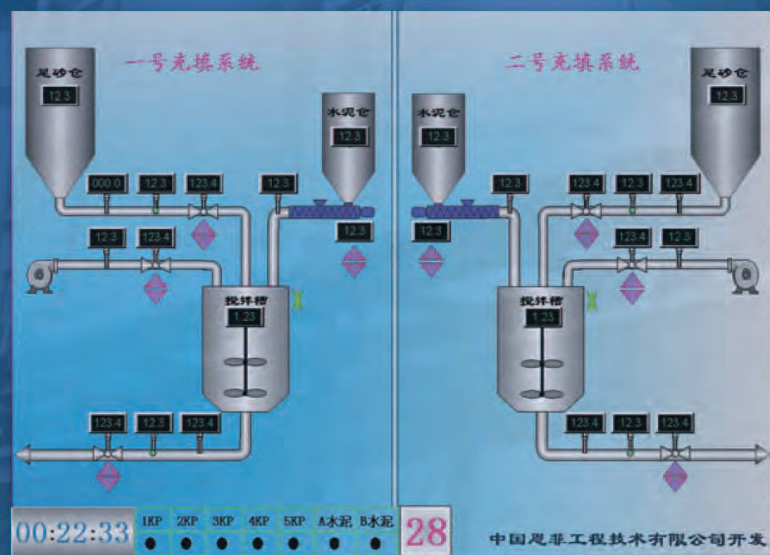
The patented product independently developed by China ENFI is applicable to whole tailings and classified tailings concentration, and also suitable for tailings concentration storage devices of various high concentrated tailings filling and paste filling. The technology is honored with Second Prize of National Scientific and Technical Progress, and identified as the international advanced one. It is listed in the first lot of <Metals and Non-metals Mines New Applicable Safety Technology and Equipment Promoted Directory> by State Administration of Work Safety in 2015.

It is possible for tailings concentration storage device to feed the material as well as discharge the tailings at the same time, for which the cost of tailings concentration is significantly reduced and tailings discharging performance is improved at most. By special tailings discharging facility and the technology of pressure control and flow-aiding, the activated slurry making is up-graded after high efficient precipitation and clarification and dehydration, and underflow density of concentration equipment and device is stabilized, by which the high concentrated fine tailings fillings slurry or paste can be prepared directly and economically. Underflow tailings concentration is 72%~80%, and rate of flow is up to 50~200m³/h.

The mining recovery and resource comprehensive utilization can be increased through applying China ENFI patented dehydration device or classified dehydration technique and deep cone thickener dehydration filling process technique, preparing high concentrated (over 72%) slurry or paste from fine tailings directly and economically and discharging from bottom of the dehydration device, adding cement, coal ash, slag appropriately and mixing properly, flowing automatically by pipe or being delivered to underground mined-out area or surface tailings stockpiling by pumping equipment.

The product is applicable to whole tailings and classified tailings concentration, and also satisfied to the requirements of various high concentrated tailings filling and even for paste filling. It is possible that underground less dehydration or non-dehydration can be realized, for which underground working environment is improved and sludge discharging cost is decreased. The equipment automatic control system can effectively control the material ratio, paste slurry concentration, and other important indicators, guarantee efficient and stable operation of the production process.

It is successfully applied to the projects of Dongguashan Copper Mine, Project of Chongli Zinjin Mines Company Limited, Xianglushan Tungsten Mine, Huibaoling Iron Mine, Tonglvshan Copper Mine, Tongshankou Copper Mine, Baixiangshan Iron Mine, Huize Lead and Zinc Mine, Chambishi Copper Mine, Sareke Copper Mine and Daye Iron Mine.



矿山装备篇

Mining Equipment

矿山高浓度膏体充填 工艺装备及控制系统

Mining High Concentrated Paste Filling Process Equipment with Control System

矿山装备篇

Mining Equipment

井下无人驾驶电机车
全自动远程控制系统

Underground Un-manned Driving
Electric Locomotive and Automatic
Remote Control System

井下无人驾驶电机车全自动远程控制系统

中国恩菲自主开发的专利产品，由电机车自动运行控制系统（ATO）、电机车运行保护系统（ATP）、编组调度指挥系统（ATS）、巷道无线通讯系统及辅助系统等构成。适用于大型矿山，特别是大水、高岩爆、高海拔的特殊矿山地下开采，2015年被国家安监总局列入第一批《金属非金属矿山新型适用安全技术及装备推广目录》。

无人驾驶电机车运输电控系统适用于多列编组、多机传动、多弯道岔道等复杂工况条件，比传统运输方式提高至少 25% 工作效率，实现设备预维护，大量减少岗位工人和技术员，降低人员伤害风险，做到运输环节人员的本质安全。

成功用于铜陵有色金属集团冬瓜山铜矿，填补了亚洲地下矿无人驾驶电机车运输领域的空白。

Underground Un-manned Driving Electric Locomotive and Automatic Remote Control System

The China ENFI independently developed patented product is composed of electric locomotive automatic operation control system (ATO), electric locomotive operation and protection system (ATP), marshaling scheduling command system (ATS), drift wireless communication system and auxiliary system. It is applicable to large-scaled mines, especially the special mine underground mining with abundant water, high possibility of rock burst, and high altitude. It is listed in the first lot of <Metals and Non-metals Mines New Applicable Safety Technology and Equipment Promoted Directory> by State Administration of Work Safety in 2015.

Un-manned driving electric locomotive transportation electric control system is applicable to the complicated working conditions with multiple columns marshaling, multiple motors drive, and many curves and crossways. It can increase at least 25% working efficiency compared with traditional transportation ways, realize pre-maintenance of equipment, reduce the on-post workers and technicians, and minimize the risk of labors injured to ensure the essential safety of personnel in the transportation.

The products are successfully used in Dongguashan copper mine, Tongling nonferrous metals group filled in the underground mine in Asia unmanned blank in the field of electric locomotive transportation.

矿山装备篇

Mining Equipment

底侧卸式矿车及卸载站

Bottom Side Dumping Mine Car and Unloading Station

底侧卸式矿车及卸载站

中国恩菲自主开发的专利产品，广泛应用于井下金属矿山有轨运输。

中国恩菲提供各种不同规格尺寸的矿车和卸载站：包括2、4、6、10、20m³全套技术。

矿车结构先进、采用特种钢材、坚固耐用；卸载站卸载原理精巧、卸载曲轨采用匀角速度空间曲线，列车卸载平稳，冲击小，矿车与卸载站配合好、寿命长。

成功应用于安徽冬瓜山铜矿、赞比亚谦比西铜矿、甘肃金川有色集团公司二矿区等项目。

Bottom Side Dumping Mine Car and Unloading Station

The China ENFI independently developed patented product is widely applied in high efficient transportation equipment of underground metal mines track transportation.

China ENFI provides various size of mine Car and unloading station: including 2, 4, 6, 10 and 20m³with full set of technology.

The mining car is advanced in structure, using quality steel materials and strong and durable. The unloading station is with delicate unloading principle, and unloading curved rail is applied homogeneous angular speed space curve which results with stable train unloading, little shock, good cooperation of mining car with unloading station and a long life of the facility.

It is successfully applied to the projects of Dongguashan Copper Mine in Anhui, Chambishi Copper Mine in Zambia, and Mine No.2 of JNMC in Gansu.

底吹炉是中国恩菲自主开发专利产品，主要应用于炼铜、炼铅工艺，被英国《金属导报》评价为“技术指明了金属冶炼行业乃至多个领域未来十年、数十年，乃至上百年的发展方向”。目前世界最大底吹炉（卧式回转炉）即出自中国恩菲，处理能力达150万吨精矿/年。

氧气底吹炼铅：中国恩菲自主知识产权的先进技术，具有对原料适应性强、有价元素回收率高、能耗低、环保好、作业率高、操作简单、炉寿命长、投资少等突出优点。中国恩菲开发设计了Φ3.8×11.5m、Φ4.1×14m、Φ4.4×16.5m等多规格的氧气底吹炼铅炉，已投产了40多台，分布在国内众多炼铅厂。中国恩菲还设计并制造了Φ3.8×17.5m、Φ4.1×17.5m、Φ4.1×18.5m各种规格的底吹还原炉，保证了底吹连续炼铅工艺的实现。

获国家科技进步二等奖、部级科技进步一等奖、部级优秀设计金奖等多个奖项。底吹炼铅法被中国九部委联合发文指定为我国首选炼铅工艺。已成功应用于印度底吹炼铅厂，正进一步向墨西哥、澳大利亚等国家推广。

规模能力：铅冶炼适应3万吨/5万吨/8万吨，最大至25万吨/年粗铅产能。

氧气底吹炼铜：中国恩菲自主知识产权的先进技术，具有环保好，铜回收率高，操作安全，炉寿命长，投资省等突出优点。第一台Φ3.1×11m工业规模的氧气底吹铜熔炼炉于2008年在越南生权建成投产；Φ4.4×16.5m底吹炼铜炉相继在东营、恒邦建成投产；Φ4.8×20m铜底吹炉在垣曲投产；完成了Φ5.5×27.5m和Φ5.8×30m的大型底吹炼铜炉的设计和供货。其中Φ5.8×30m底吹熔炼炉是目前世界上最大的卧式回转炉。

正在研发底吹连续炼铜技术（国家863项目），即将底吹熔炼—底吹吹炼—粗铜精炼相串联，实现连续炼铜。第一台Φ4.4×18m连续吹炼炉已在豫光建成投产，第一期炉寿达16个月，已达产达标。

获部级科技进步一等奖、部级优秀工程设计一等奖。正在向智利、印尼等国家推广。

规模能力：铜冶炼适应5~8万吨；30万吨；50~60万吨；80~100万吨，最高至150万吨/年铜精矿处理量。

序号	项目名称	底吹炉供货	状态
1	蒙自治冶有限责任公司60kt/a铅冶炼技改扩建EPC项目	底吹电热熔还原炉、氧气底吹熔炼炉	已投产
2	赤峰山金银铅有限公司10万吨/年电铅工程	氧气底吹熔炼炉、底吹电热熔还原炉	已投产
3	山东恒邦冶炼股份有限公司提金尾渣综合利用	氧气底吹熔炼炉、底吹电热熔还原炉	已投产
4	河南济源金利冶炼公司铅冶炼二期工程熔炼车间成套设备供货及安装	氧气底吹熔炼炉	已投产

氧气底吹炼铅

Bottom blowing furnace is initially created by China ENFI, and is mainly applied in Copper and Lead smelting process. It is evaluated by famous <Metals Bulletin> of Great Britain as "the technology indicates the development direction for metal metallurgy industry and many other fields in the coming ten years, decades and even hundred years." The largest bottom blowing furnace (horizontal rotary furnace) in the world up to now is developed in China ENFI with the capacity of concentrate throughput 1.5Mt/a.

Oxygen bottom blowing for Lead Smelting: It is self-owned patent advanced technology developed by China ENFI with outstanding advantages such as flexible adaptability on materials, high recovery of valuable element, less energy consumption, friendly environment protection, good efficiency of working rate, simple operation requirements, long life of the equipment, and economical on investment. China ENFI has developed and designed various sized oxygen bottom blowing Lead smelting furnace of Φ3.8×11.5m, Φ4.1×14m, Φ4.4×16.5m, among which more than 40 furnaces have been into operation already in different Lead smelters at home and abroad. Moreover, China ENFI has also designed and manufactured various sized bottom blowing reduction furnace of Φ3.8×17.5m, Φ4.1×17.5m, Φ4.1×18.5m to ensure the bottom blowing consecutive Lead smelting process realized.

It is honored with Second Prize of National Scientific and Technical Progress, First Prize of Ministerial Scientific and Technical Progress, Ministerial Excellent Design Gold Prize and many other Prizes. Bottom blowing Lead smelting method is designated as the first Lead smelting process in China through 9 National Ministries and Committees jointed issuance of document.

It has been successfully applied in the Lead Smelter in India, and on the way further popularizing in Mexico and Australia.

Oxygen bottom blowing for Copper Smelting: It is self-owned patent advanced technology developed by China ENFI with outstanding advantages such as good environment protection, high rate of copper recovery, safe operation, long life of equipment and less investment. The first industrial oxygen bottom blowing copper smelting furnace of Φ3.1×11m is built and put into operation in Sin Quen of Vietnam in 2008; Φ4.4×16.5m bottom blowing copper smelting furnace has been built and put into operation in Dongying and Hengbang in succession; Φ4.8×20m has been run into operation in Yuanqu. It is completed design and supply of Φ5.5×27.5m and Φ5.8×30m large bottom blowing copper smelting furnace. The Φ5.8×30m bottom blowing smelting furnace is the largest horizontal rotary furnace in the world.

It is being researched and developed currently bottom blowing consecutive copper smelting technology (National 863 Project), which is to link bottom blowing smelting—bottom blowing converting—blister copper refining and realize the process of consecutive copper smelting. The first consecutive converting furnace of Φ4.4×18m has been put into operation in Yuguang, furnace life in the first period amounts to 16 months and the operation index has been also achieved.

The technology is honored with First Prize of Ministerial Scientific and Technical Progress, Ministerial Excellent Engineering Design First Prize, and it is now on the way further popularizing in Chile and Indonesia.

Capacity: Copper smelting is adaptable to 50,000-60,000t/a, 300,000t/a, 500,000-600,000t/a, 800,000-1,000,000t/a and 1,500,000t/a at most of copper concentrate throughput.

No	Name of Project	Equipment Supplied	Status
1	Mengzi Mine and Metallurgy Company 60kt/a Lead Smelting technical transformation and expansion EPC project	Bottom blowing electric melting reduction furnace\Oxygen bottom blowing smelting furnace	Operated
2	Chifengshan Au-Ag-Pb Company 100,000t/a Lead project	Oxygen bottom blowing smelting furnace, Bottom blowing electric melting reduction furnace	Operated
3	Shandong Hengbang Smelting Company Ltd Gold Extraction tailings comprehensive recovery and utilization Project	Oxygen bottom blowing smelting furnace, Bottom blowing electric melting reduction	Operated
4	Henan Jiyuan Jinli Smelting Company Lead smelting Phase III smelting workshop complete equipment supply and installation	Oxygen bottom blowing smelting furnace	Operated

Oxygen bottom blowing for Lead Smelting

序号	工程/企业	熔炼炉大小 (m)	吹炼炉规格 (m)	处理精矿量 (万 t/a)	铜产量 (万 t/a)	状态
1	水口山试验炉	Φ2,234*7.98	--	1.5	0.3	--
2	越南生权	Φ 3.1*11	2台 ps 转炉 Φ2.4*5.2	4-8	1.0	已投产
3	东营方圆一期	Φ4.4*16.5	3台 ps 转炉 Φ 3.6*8.1	50	10	已投产
4	山东恒邦	Φ4.4*16.5	3台 ps 转炉 Φ3.6*7.5	45	6.0	已投产
5	包头华鼎	Φ3.8*13.5	2台 ps 转炉 Φ3.6*8.1	45	7-8	已投产
6	山西垣曲冶炼厂	Φ4.8*20	3台 ps 转炉 Φ3.6*8.8	50	10	已投产
7	河南豫光金铅	Φ4.4*18	1台底吹连吹炉 Φ4.1*18	40-50	8-10	已投产
8	东营方圆二期	Φ5.5*27.5	2台底吹连吹炉 Φ4.6*23	100	20-22	2015年
9	中原黄金冶炼厂	Φ5.8*30	1台悬浮吹炼炉	150	20-22	试运行
10	五矿金铜项目	Φ4.8*20	3台 ps 转炉 Φ4.0*11.7	50	10.0	正在建设
11	河南灵宝金城冶炼	Φ4.8*22	1台底吹连吹炉 Φ4.4*20	66	10.0	正在设计

氧气底吹炼铜

No.	Project/Enterprise	Smelting Furnace Size (m)	Converting furnace size(m)	Concentrate throughput (10thousand t/a)	Copper production (10thousand t/a)	Status
1	Shuikoushan Test furnace	Φ2,234*7.98m	--	1.5	0.3	--
2	Sin Quen in Vietnam	Φ3.1*11m	2*PS rotary furnaceΦ2.4*5.2m	4-8	1.0	Operated
3	Dongying Fangyuan Phase I	Φ4.4*16.5m	3*PS rotary furnaceΦ3.6*8.1m	50	10	Operated
4	Shandong Hengbang	Φ4.4*16.5m	3*PS rotary furnaceΦ3.6*7.5m	45	6.0	Operated
5	Baotou Huading	Φ3.8*13.5m	2*PS rotary furnaceΦ3.6*8.1m	45	7-8	Operated
6	Yuanqu Smelter in Shanxi	Φ4.8*20m	3*PS rotary furnaceΦ3.6*8.8m	50	10	Operated
7	Henan Yuanguang Au and Pb	Φ4.4*18m	1*bottom blowing consecutive converting furnaceΦ4.1*18m	40-50	8-10	Operated
8	Dongying Fangyuan Phase II	Φ5.5*27.5m	2*bottom blowing consecutive converting furnaceΦ4.6*23m	100	20-22	Expected completed in 2015
9	Zhongyuan Gold Smelter	Φ5.8*30m	1*suspension converting furnace	150	20-22	Under test
10	Minmetals Au and Cu Project	Φ4.8*20m	3*PS rotary furnaceΦ4.0*11.7m	50	10	Under construction
11	Lingbao Jincheng Smelter in Henan	Φ4.8*22m	1*bottom blowing consecutive converting furnaceΦ4.4*20m	66	10	Under design

Oxygen bottom blowing for Copper Smelting

火法冶金装备篇

Pyrometallurgy Equipment

大功率电炉工艺
装备及控制系统

High Power Electric Furnace
Process Equipment and
Control System

大功率电炉工艺装备 及控制系统

中国恩菲自主开发的专利产品，由倒梯形炉体结构、整体弹性骨架及电极装置组成，RKEF火法炼镍铁的核心设备。

恩菲电炉是最早在国内使用的大型化电炉。目前已在国内福建福安、广西防城港，以及缅甸达贡山等多个项目上得到应用。随着红土矿冶炼技术飞速发展，RKEF（回转窑-电炉）镍铁冶炼工艺越来越多的在国内外得到应用。矩形电炉更易于大型化，具有结构稳定、炉体寿命长、电耗低、回收率高的特点。

系列产品：72000kVA、36000kVA、33000kVA。

缅甸达贡山镍矿项目是中缅两国矿业领域最大的合作项目，也是中国政府“十一五”境外资源开发的五个重点项目之一，总投资8.2亿美元。

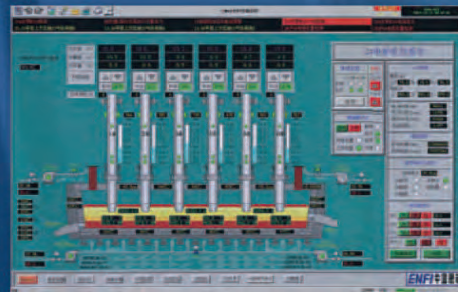
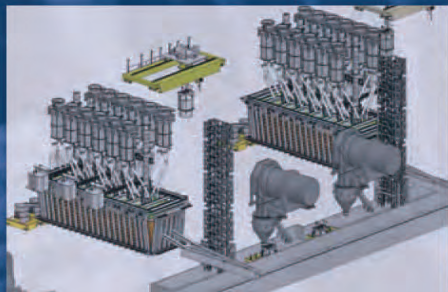
High Power Electric Furnace Process Equipment and Control System

The patented product independently developed by China ENFI consists of inverted trapezoidal furnace body structure, overall elastic skeleton and electrode device, and it is the core equipment for RKEF pyro-metallurgical Ferro-Nickel smelting.

Ferro-Nickel electric furnace of China ENFI is the earliest large ferro-nickel electric furnace used in China. At the present time it has been applied in Fu'an of Fujian, Fangchenggang of Guangxi, Taguang Taung of Myanmar and many other projects. With the rapid development of laterite smelting technology, RKEF (Rotary kiln—electric furnace) ferro-nickel smelting technique will be applied in domestic and overseas projects more and more. Rectangle ferro-nickel electric furnace is easier to be manufactured in large size with the characteristics of stable structure, long life of furnace body, low consumption of electricity and high recovery.

Specification: 72000kVA, 36000kVA, 33000kVA

Taguang Taung Nickel project is the biggest cooperation between China and Myanmar in mining field, and is also one of five important overseas resource development projects of China government in the "Eleventh Five Year" planning with the total investment of USD 0.82 billion. ENFI provide the 72000 kVA nickel iron electric furnace is the largest independent design, currently running in good condition.



氧枪

中国恩菲自主开发的专利产品，为底吹炉供氧专用设备，由特种耐热材料加工而成，通过调节供氧使底吹炉达到最佳工作状态。可与底吹炉成套或单独供货，专业团队可提供定制化配件方案。

该产品喷出的气流气泡直径小、弥散度高、搅拌力强、传热传质效果好，喷溅小，熔池面平稳呈粥状，使用寿命长，可使底吹炉达到熔炼和吹炼的最佳状态。

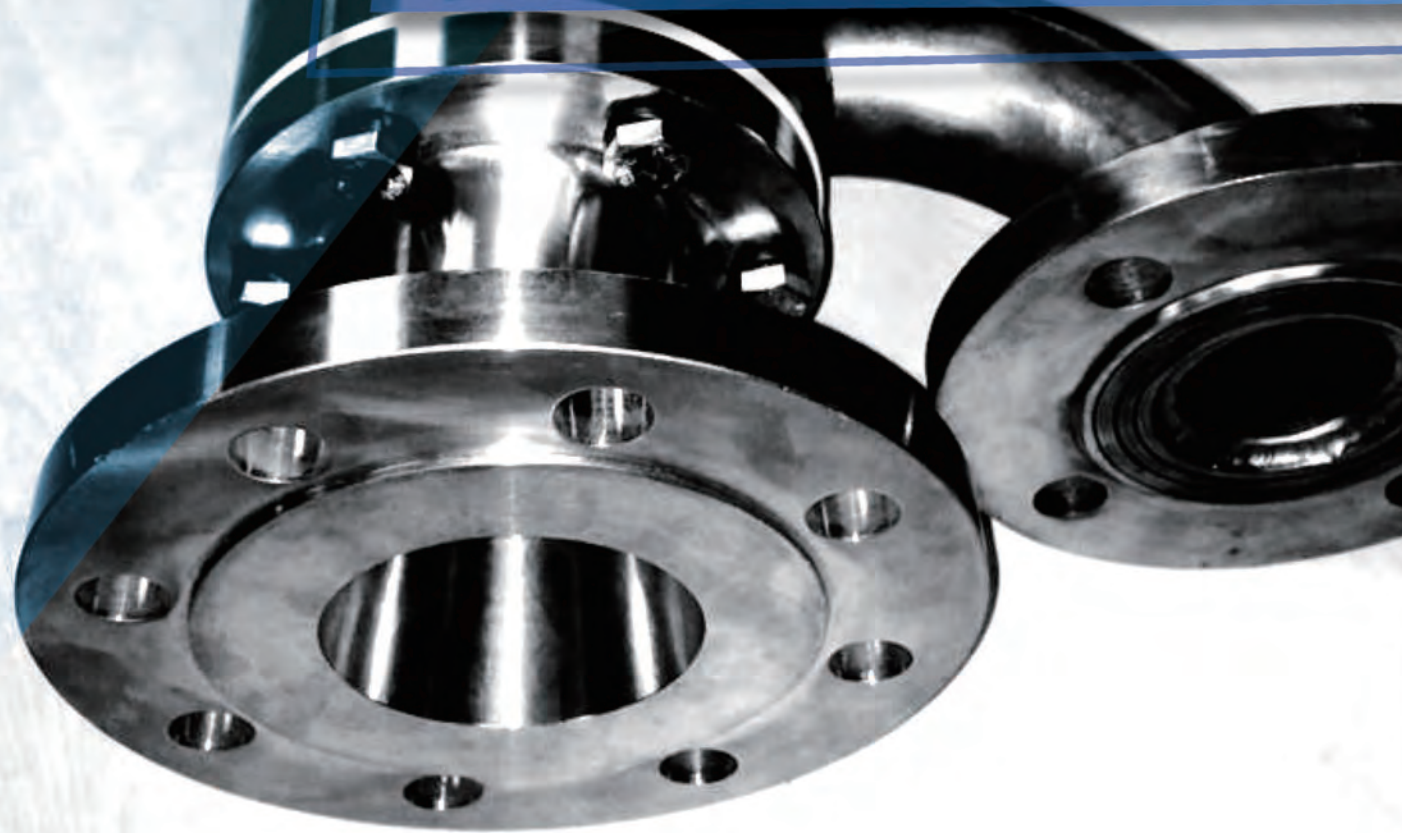
成功应用于水口山、恒邦、华鼎、东营、中原黄金、印度、蒙自、沙甸、赤峰山金、豫光、垣曲等项目。

Oxygen Lance

The patented product independently developed by China ENFI is specially applied to bottom blowing furnace for oxygen supply manufactured by special heat-resistant material. The bottom blowing furnace can achieve the best working condition by adjusting oxygen provision. It can be supplied completely with bottom blowing furnace or separately to provide improved supporting accessories scheme.

The product has such advantages as injected airflow bubble with small diameter, high degree of dispersion, strong agitation, perfect performance of heat and mass transmission, little splashing, smelting bath surface stable and mushy and long life, which enable the bottom blowing furnace get to a good situation of smelting and converting.

It has been successfully applied in the projects of Shuikoushan, Hengbang, Huading, Dongying, Zhongyuan Gold, India, Mengzi, Shadian, Chifengshanjin, Yuguang and Yuanqu.



火法冶金装备篇

Pyrometallurgy Equipment

氧枪

Oxygen Lance

* 设备图片均为现场实拍

* Real shot



自焙电极装备

中国恩菲自主开发的专利产品，由极壳、升降装置、压放装置、上下抱闸、导电装置、密封装置组成，专用于电炉供电。

规格：Φ800mm、Φ900mm、Φ1000mm、Φ1200mm、Φ1400mm。

电极升降采用两个液压升降油缸，升降速度可调。电极压放由升降油缸和上下抱闸共同完成，抱闸采用碟形弹簧闸块式抱闸，这种抱闸使用可靠、易于维修。电极的升降与压放装置能够实现计算机程序控制自动化操作，电极升降幅度小，速度变化平稳，能有效地降低工人的作业强度和增加电热效率。

电极导电装置的设计具有结构紧凑、方便炉顶作业、电流分布均匀、压降损失小、功率因数高等优点。

成功应用于金川、吉镍、大冶、福安、金源镍业、缅甸达贡山、攀枝花、赞比亚等项目。

Self-baking Electrode Equipment

The patented product independently developed by China ENFI is comprised of electrode shell, hoisting gear, slipping device, up and down brake, conductive device and sealing device, which is specially applied to supply power for electric furnace.

Specification: Φ800mm, Φ900mm, Φ1000mm, Φ1200mm, Φ1400mm

Two hydraulic lift cylinders are applied to electrode hoisting, and the lift speed is adjustable. Electrode slipping device is completed by lift cylinders and up-and-down brake together, and the brake is in the type of disc spring block brake, which is reliable and easy for maintenance. Computer program control automatic operation can be implemented by electrode hoisting and slipping device with small range of electrode hoisting and smooth change of velocity, which can cut down workers' operating strength and increase the efficiency of electric heating significantly.

The design of electrode conductive device has such advantages as compact structure, accessible and easy working on the top of furnace, evenly distributed current, little loss of voltage drop-down and high power factor.

It is successfully applied in the projects of Jimchuan, J'ien Nickel, Daye, Fu'an, Jinyuan Nickel, Taguang Taung in Myanmar, Panzhihua and Zambia.

火法冶金装备篇

Pyrometallurgy Equipment

自焙电极装备 Self-baking Electrode Equipment



热料输送系统

中国恩菲自主研发机电一体化系统产品，用于颗粒、粉状热料的输送，应用于镍铁冶炼、电石等领域，可根据工艺特点定制。

在金属冶炼中，该系统可保证在热损失少的前提下，将不大于950℃的高温热焙砂按照工艺流程的要求，周期性定量地加入到电炉料仓内，保证电炉熔炼的顺利进行。

热料输送系统包括机械部分和电气、仪表控制部分。

机械部分包括料罐、料罐运输车、液压校位装置、料罐起重机、料钟装料装置、提升导向塔架等单体的机械设备。

电气、仪表控制部分包括电控柜、变频装置、称量装置等硬件和与之相匹配的控制软件等，为一套独立的计算机控制系统，可完成热料输送机械设备的逻辑联锁控制，并能与电炉控制系统等其它系统友好通讯。

热焙砂温度： > 950℃
额定输送能力： 92t/h
最大输送能力： 109.5t/h

成功应用于缅甸贡山镍矿工程、福建鼎信实业公司福安镍铁项目、广西金源镍业防城港镍合金项目、内蒙古和谊镍铬复合材料工程等项目。

Hot Calcine Transfer System

Full-automatic hot calcine transfer and its mechanical-electrical integration system with the intellectual property by China ENFI, is used for granular and powder materials transfer. This international advanced and domestic leading system is mainly used in the field of Ferro-Nickel smelting and calcium-carbide processing.

In smelting process, the hot calcine over 950℃ is periodically transferred to the electric furnace via the calcine transfer system, which can reduce the heat loss of the hot calcine.

Hot Calcine Transfer System is composed of mechanical equipment, electrical and instrument control.

The single-unit mechanical equipment includes calcine container, hydraulic adjusting device, electric hoist, bell charging device and lifting tower etc..

The electric and instrument control system includes electrical control box, frequency device, weighing device and related PC control software. It is an independent and interlocking PC system for controlling hot calcine transfer equipment, as well as friendly communication with electric furnace and other associated system.

Technical specification:

Hot calcine temperature: > 950℃
Rated transfer capacity: 92t/h
Maximum transfer capacity: 109.5t/h

The calcine transfer system is successfully adopted in Myanmar Tagaung Taung Ferro-Nickel Project, Fuan Ferro-Nickel Project, Jinyuan Nickel Alloy Project in Guangxi, Heyi Nickel-chrome alloy project in Inner Mongolia, etc.

火法冶金装备篇

Pyrometallurgy Equipment

热料输送系统

Hot Calcine Transfer System

直线分格式铸渣机

中国恩菲自主开发的专利产品，技术成熟，易于维护。应用于铅氧化渣的连续铸锭。

驱动装置带动链条和铸模缓慢、平稳移动，液态渣由熔炼炉流入角度可调的尾部溜槽，经过溜槽连续、均匀地注入铸渣模中。渣锭经冷却后，在直线铸渣机头部轮处从铸渣模中脱出。铸渣机设置有冷却水喷淋装置，可通过喷水来强化渣锭的冷却过程。每一个喷嘴都设置有球阀控制，可方便地控制喷淋范围。

长度规格：29m、39.5m、47m、66m、76m、98m。

角度规格：0°、3°、4°。

电机功率范围：30Kw至55Kw。

成功应用于印度德里巴、山东恒邦、湖南贵阳银星、赤峰山金等项目。

Linear Slag Casting Machine

The patented product independently developed by China ENFI with the mature technology and easy maintenance characteristics used for continuous oxidized lead slag casting.

The driving device drives the chain and casting mold to move slowly and stably. The molten slag from smelting furnace is continuously and evenly fed into the casting mould via adjustable chute. After cooling, the slag ingot will be demoulded from the casting machine. The casting machine

Length: 29m, 39.5m, 47m, 66m, 76m, 98m;

Angle: 0°, 3°, 4°;

Motor power range: 30Kw-55Kw;

This machine is successfully adopted by India Dariba Lead Smelter Project, Shandong Humon Copper Smelter Project, Hunan Guiyang Yinxing nonferrous smelting projects and Chifeng Shanjin smelting projects etc.

火法冶金装备篇

Pyrometallurgy Equipment

直线分格式铸渣机 Linear Slag Casting Machine

超大型侧吹炉 工艺装备及控制系统

Ultra Large-scale Side Blowing Furnace and Control System

中国恩菲自主开发的专利产品，在炉内将富氧空气和燃料，通过炉子两侧的喷枪直接喷入到高温熔融渣层中进行浸没燃烧，主要应用于热态高铅渣直接还原和再生铅领域。

The patented product independently developed by China ENFI, which the oxygen-enriched and fuel ejected by the lance on both sides of the furnace to high temperature molten slag, is mainly used in the process of high lead slag and secondary lead smelting.

侧吹熔融还原炉（高铅渣热态还原炉）主要技术参数：

	项目一	项目二
炉床面积(m ²)	18	18
熔池深度(mm)	1700~1800	1600~1700
喷枪数量(支)	16	16
发生炉煤气压力(MPa)	0.12~0.14	~0.23
发生炉煤气量(Nm ³ /h)	~3500	~3800
富氧空气压力(MPa)	0.14~0.16	~0.24
富氧空气量(Nm ³ /h)	~1100	~1300
富氧浓度	~70%	~60%
产铅量(t/d)	~210	~160
渣含铅	<2%	<2%

The specification of side blowing furnace(high lead slag reduction furnace):

	Project I	Project II
Hearth area (m ²)	18	18
Bath depth(mm)	1700~1800	1600~1700
Lance quantity(piece)	16	16
Gas pressure of the reacting furnace (MPa)	0.12~0.14	~0.23
Gas quantity of the reacting furnace (Nm ³ /h)	~3500	~3800
Oxygen-enriched air pressure (MPa)	0.14~0.16	~0.24
Oxygen-enriched air volume (Nm ³ /h)	~1100	~1300
oxygen enriched air concentration	~70%	~60%
Lead production quantity (t/d)	~210	~160
Lead in slag	<2%	<2%

主要用于热态高铅渣的直接还原及铅膏还原，可推广应用到以下方面：锌浸渣及二次含锌物料、氧化铅矿及二次含铅物料、红土镍矿、锑精矿、锑氧烟尘、铜精矿以及各种炉渣的贫化。

It is mainly used in molten high lead slag directly reduction and lead plaster reduction process, and also expanded to cleaning furnace processing of zinc leaching slag, secondary zinc content materials, lead oxide, laterite ore, antimony concentrate, antimony oxide dust, copper concentrate and various kinds of furnace slag.

该产品具有作业率高、安全性好、热利用率高、氧枪寿命长、烟尘率低、环保好、有价值金属综合回收率高等特点。

The side blowing furnace developed by China ENFI has the advantages of high operational rate, safety, good efficiency of heat utilization, long service life of oxygen lance, low dust rate, friendly environmental, high recovery rate of valuable metals etc.

成功应用于湖北金洋、湖南华信、驰宏会泽冶炼厂以及济源金利等。

It is successfully applied to the Hubei Jinyang, Hunan Huaxin, Chihong Huize and Jiyuan Jili smelting projects.

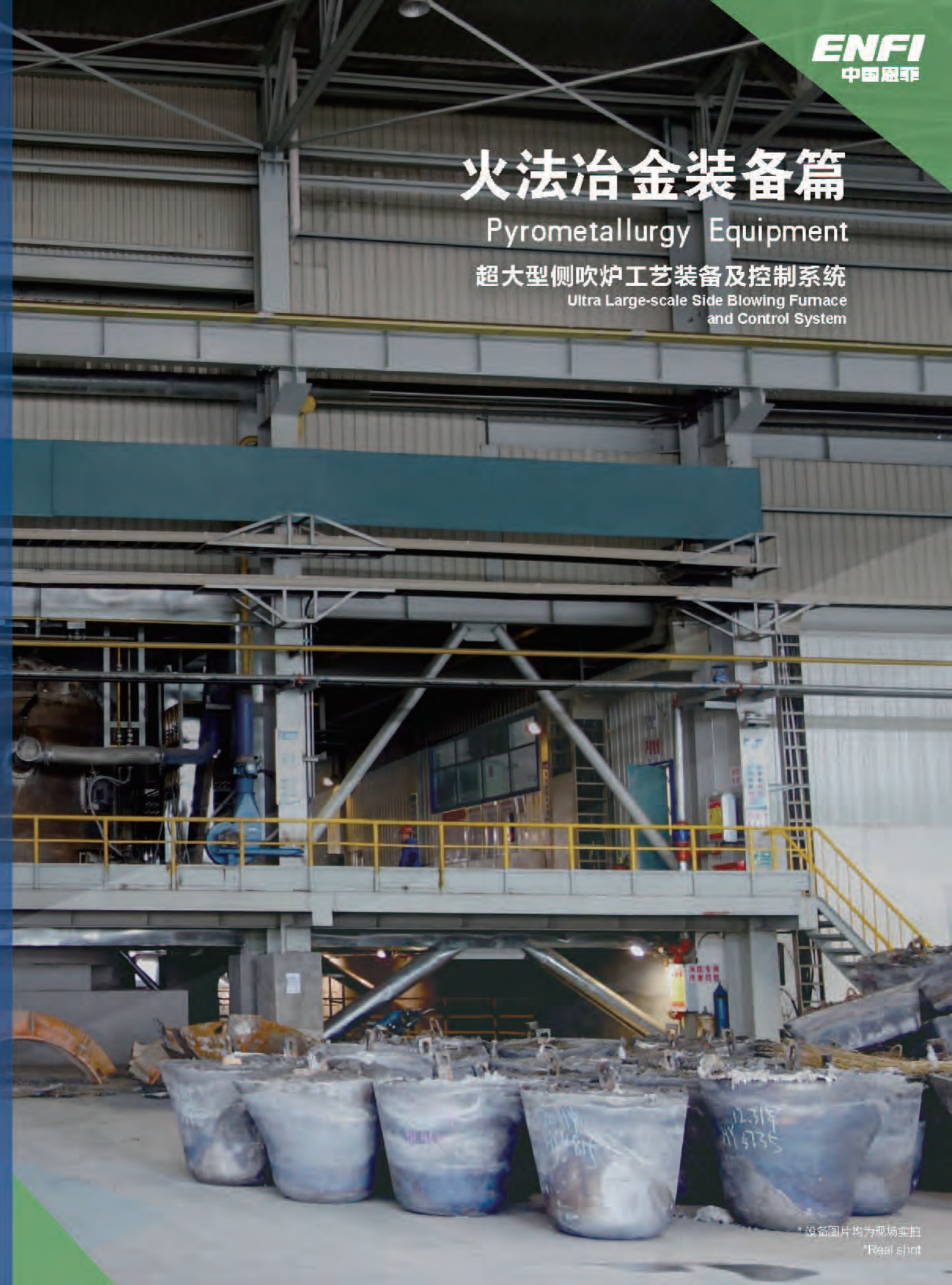


火法冶金装备篇

Pyrometallurgy Equipment

超大型侧吹炉工艺装备及控制系统

Ultra Large-scale Side Blowing Furnace and Control System



大型高效自调节圆盘制粒机

中国恩菲自主开发产品，能将细粒度粉状物制成粒度符合工序要求的球状物料。该产品结构先进、性能可靠、制粒效果好、低能耗、耐磨损、运行平稳、易于维护。

制粒物料在倾斜并且旋转的圆盘中受重力、离心力和摩擦力的作用而产生滚动和搓动，在补充适当水分的情况下形成母球。细粒度物料在潮湿的母球表面上滚动使母球长大并具有一定的强度。不同粒度的球粒在圆盘中自动地沿不同轨道运行，符合要求的成品球粒从盘中排出。

圆盘直径规格：3.8m, 5.5m, 6m。

圆盘倾角可调整、有多种圆盘转速可供选择、圆盘采用大型回转支承、圆盘内表面采用特殊耐磨材料作衬板、采用电动旋转刮刀清理圆盘底面和侧面的粘料等。圆盘倾角可在 40° ~ 55° 范围内调整，而且调整方便，可适应不同性质物料要求，使用范围广。

成功应用于印度德里巴、山东恒邦、湖南贵阳银星、赤峰山金等项目。

Large-scale High Efficiency Self-adjusting Disc Pelletizer

The patented product independently developed by China ENFI can make the fine particle powders into the particle size in accordance with process requirement. It has the advantage of reliable performance, advanced structure, good efficiency of pelletizing, low energy consumption, durable, running smoothly and easy maintenance.

The pelletizing materials in the tilt and rotating disc by the effect of gravity, centrifugal force and friction force producing rolling and rubbing and with the appropriate water supplementary will form a cue ball. The fine particle material rolling on the surface of wet cue ball will make the ball larger and stronger. Different particle sized spherulite in disk run along with different path, among them the required finished product will discharge from the tray.

Diameter specification: 3.8m, 5.5m, 6m.

The angle of the disc can be adjusted with a variety of optional rotational speed. The disc uses large slewing bearing and the inner surface is made by special durable material as the lining board. The angle of disc can be easily adjusted within the range of 40° ~ 55°. The pelletizer can be widely used for different material's properties.

It is successfully applied in India Dariba Lead Smelter Project, Shandong Homon Smelting Project, Guiyang Yinxing Smelting Proejct and Chifeng Shanjin smelting project, etc...

火法冶金装备篇

Pyrometallurgy Equipment

大型高效自调节圆盘制粒机

Large-scale High Efficiency Self-adjusting disc Pelletizer

圆盘浇铸机

中国恩菲自主开发产品，由传动装置、圆盘、锭模等组成，能将熔炼炉放出的高温熔融粗铅浇铸成约 2t/ 块的铅锭。

主要通过传动装置带动圆盘间歇旋转，圆盘周边上紧凑放置一定数量的空模，在浇铸位置上的空模承接熔炼炉连续排放的铅液，浇铸到设定液面线后设备启动，把下一个空模旋转至浇铸位置，依次进行。当冷却凝固的铅锭旋转到起吊位时，吊出并转运至铅锭储存地。空模均匀涂抹脱模剂，然后等待下一次浇铸铅液。

直径规格：6.7m，7.8m，9.0m。

传动方式：内啮合销齿传动，圆盘内侧均布挡轮定心；回转支承传动。

成功应用于印度德里巴、山东恒邦、湖南贵阳银星、赤峰山金等项目。

Disk Casting Machine

The patented product independently developed by China ENFI is composed of actuator, disk, ingot mould etc. and can cast the high temperature molten lead bullion into the big lead ingots with the weight of 2tons for each.

The disk intermittent rotates driven by actuator and around placed with the ingot mould for molten lead discharged from the smelting furnace. Once the molten lead reached liquid level line, the casting machine will start rotating to next empty mould in succession. The cooling lead ingot is rotated to the lifting place and will be hanged out to the store yard. Then the empty ingot mould will be smeared with release agent for the next molten lead casting.

Diameter specification: 6.7m, 7.8m, 9.0m

Transmission model: (1) Pin gear transmission, the wheel centering is well-distributed inside of the disk (2) Rotary bearing drive

It is successfully applied in India Danba Lead Smelter Project, Shandong Homon Smelting Project, Guiyang Yinxing Smelting Project and Chifeng Shanjin smelting project, etc...

火法冶金装备篇

Pyrometallurgy Equipment

圆盘浇铸机

Disk Casting Machine

火法冶金装备篇

Pyrometallurgy Equipment

加料口清理机

Cleaning Machine of the Feeding Port

加料口清理机

中国恩菲自主开发产品，由移动小车、捅打装置、升降装置、轨道等组成，针对冶金炉加料口堵塞或粘接情况进行清理的自动化机械设备，可适应冶金炉具有多个加料口的情形。

产品特点

- 整机可移动，能够实现多个加料口的选择性清理；
- 移动小车带有定位锁紧装置，能够有效保证捅眼杆子和加料口的对中性；
- 升降装置带有锁紧系统，能够保证受力的合理，安全可靠；
- 捅眼装置可旋转，结构简单，故障率低，能够有效实现加料口圆周范围内的全面清理。

Cleaning Machine of the Feeding Port

The patented product independently developed by China ENFI is composed of trolley, punching device, lifting device and orbit. The machine is applied for automatically cleaning of material blocking and adhesion at the multiple feeding ports.

Product characteristics:

- The mobile machine can realize the selective cleaning of the multiple feeding ports.
- The trolley with positioning and locking device can guarantee the drill rod to the center of feeding port.
- The lifting device with the locking system is to guarantee the safety and reasonable force.
- The rotatable punching device has the characteristics of simply structure, low failure rate and effectively clean the feeding port.



高温压力浸出系统

中国恩菲自主开发的加压浸出技术专利产品，包括预热器、加压釜、闪蒸装置等核心关键装备，广泛应用于国内外大型红土镍矿、硫化矿（钴、铜、镍等）、难处理金精矿、赤铁矿除铁、铜阳极泥、氧化铝等冶炼项目，为不同客户提供加压浸出技术及关键装备方面的专业化服务。

加压浸出是将物料送入（或经过预热后送入）加压釜，在釜内通入反应试剂（酸或碱或氧气）进行高温加压浸出（120~260℃），反应后釜内物料通过特殊的闪蒸装置将物料降到常压饱和和沸点状态，并输送给下游工序的过程。

该工艺能处理成分复杂及低品位资源，迅速有效地浸出原料中的有价金属，实现常压状态下难以达到的浸出率，能耗低、环境友好，能综合回收资源中有价金属以及实现渣资源化。

预热器

中国恩菲自主研发的预热器广泛应用于硫化矿浆预热、红土镍矿矿浆预热系统上，可降低系统热源介质用量、达到较高能源利用率。该设备运行及维修成本均低于同类产品。

加压釜

加压浸出工艺中的核心设备，其性能直接关系到系统整体作业率。

中国恩菲自主研发的加压釜均达到或超过额定有效作业率，即使在有严重不均匀结垢工况的矿浆体系，或磨损严重的工况体系下依然表现良好，保证了工厂稳定运行，为企业节省了大量的维护费用，得到用户一致好评。

闪蒸装置

中国恩菲兼有闪蒸装置专长技术及完善操作程序，可以保证装置在最恶劣的工况体系下可靠运行。

加压浸出技术核心装备成功应用于巴新瑞木红土镍矿、衢州华友硫化铜钴镍、呼伦贝尔驰宏矿业锌氧压浸出、贵州紫金氧压预处理、中原黄金铜阳极泥氧压浸出等项目。

High Temperature and Pressure Leaching System

The patented product independently developed by China ENFI is composed of preheater, autoclave, flashing system and is widely applied to the process of large-scale laterite ore, sulphide ore (including cobalt, copper and nickel), refractory gold concentrate, hematite iron removal, copper anode slime and aluminum oxide etc. The excellent quality and stable performance of the equipment has won the customer affirm and trust. Uphold the concept of Safe, Stable and Efficient, relying on the strong technical strength, China ENFI will provide different customers with professional services in the field of pressure leaching technology and equipment.

Pressure leaching process

The raw material (or after preheated) is fed into the autoclave, reacting with reagent (acid, alkali or oxygen) and leached under high temperature (120~260℃) and pressure. After reacting, the material reduced to atmospheric pressure and saturated to boiling point to next process.

The pressure leaching process is applicable to processing the complex and low grade ore, rapidly and effectively leaching of valuable metals from raw materials, to increase the leaching rate under atmospheric pressure with low energy consumption and friendly environment and comprehensive recovery of valuable metals and realization of slag recovery and utilization.

Preheater

China ENFI independently developed preheater is widely used in sulfide ore pulp and laterite ore pulp preheating system, and can reduce the system consumption of heat source medium and reach higher energy utilization rate. The preheater's operation and maintenance costs are lower than similar products.

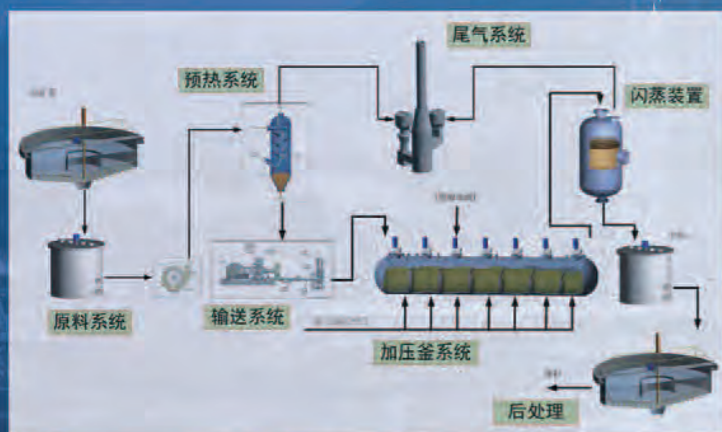
Autoclave

Autoclave is the core equipment of leaching process, and its performance is directly related to the overall operating rate of the system.

China ENFI independently developed autoclave has reached and exceeded the nominal effective work rate. The autoclave can perform well and ensure the stable operation of the plant under severe non-uniform scaling ore pulp system or serious wear and tear conditions. For saving a lot of maintenance cost of enterprises, China ENFI receives praise from clients.

Flashing system

China ENFI has the flashing system technical expertise and improve operating procedures. The system can ensure drive reliable operation in the toughest conditions.



典型工艺流程示意图

湿法冶金装备篇

Hydrometallurgy Equipment

高温压力浸出系统 High Temperature and Pressure Leaching System

* 设备图片均为现场实拍
*Real shot



湿法冶金装备篇

Hydrometallurgy Equipment

尾气洗涤装置

Vent gas treatment system

多介质混合喷管

Sparge pipe

核液位计保护套管

Nuclear source protection pipe

* 设备图片均为现场实拍

*Real shot



尾气洗涤装置

中国恩菲自主开发的尾气洗涤装置，应用于处理加压浸出系统排汽，使其达到环保标准后排出。专门针对加压浸出系统所排放的“不凝气体及蒸汽混合物”设计，洗涤效率达到99%以上；可实现尾气热量二次循环利用，充分体现节能与环保的先进设计理念；可调节式洗涤装置，广泛适用于范围波动大的工况；分段洗涤模式，保证了洗涤液的合理分配，节约投资；结构简单，模块化设计，维护方便。

Vent Gas Treatment System

The self-developed vent gas treatment system by China ENFI is applied for pressure leaching system exhausting gas to reach environmental standards.

The treatment system is specially designed for emissions ("non-condensable gas and steam mixture") of pressure leaching system, and treatment efficiency can reach more than 99%. The system achieves the vent gas heat of secondary recycling, and fully embodies the advanced design concept of energy saving and environmental protection; The adjustable treatment system is widely used in the conditions of large range fluctuation; Segmented treatment mode can ensure the rational distribution of scrubbing liquid and save investment; Simple structure, modular design and easy maintenance.

Hydrometallurgy Lance

China ENFI self-developed sparge pipe is made of special material, which is used to join various materials and ensure the material via effective mixing area smoothly for achieving optimum mixing and reaction effect.

Sparge pipe is arranged in the autoclave without incurring case of oxygen combustion, shock resistant, acid corrosion medium preventive; simple structure, each component with function of modular design that can be targeted to partial replacement, reduce the project operation cost; strong anti-fouling and anti-clogging function.



多介质混合喷管

中国恩菲自主开发的多介质混合喷管，选用特种材料加工而成，用于各类介质的加入，保障物料顺利通入有效混合区域内，达到最佳的混合及反应效果。

置于加压釜内部而不会产生遇氧燃烧，耐冲击、耐酸性介质腐蚀；结构简单，各部件具有模块化设计的功能，可有针对性地局部更换，降低项目的运行成本；防结垢、防堵塞功能强。



核液位计保护套管

中国恩菲自主开发的核液位计保护套管可对恶劣工况条件下的核仪表进行全面保护。由核液位计保护套管、核液位计外防护罩以及信号接收区域防护罩组成。其入釜部分选用特种材料，置于釜内不会产生遇氧燃烧，耐冲击、耐酸性介质腐蚀，杜绝高压釜内可能发生的核仪表腐蚀及核源脱落等安全问题。釜外部防护罩精准设计，能够防止信号接收端的额外辐射量以及核源在投入及封闭过程中的额外辐射量泄漏。

Nuclear Source Protection Pipe

China ENFI self-developed nuclear source protection pipe is used to supply comprehensive protection in the harsh working conditions.

The protection pipe system consists of nuclear source protection pipe, nuclear source outer protective cover and the signal receiving area protective cover. The protection pipe into the autoclave part is made of special material that is arranged in without incurring case of oxygen combustion, shock resistant, acid corrosion medium preventive, eliminating the possibility of nuclear instrumentation corrosion, nuclear power source fall off and other safety issues; Accurate design of autoclave external protective cover can prevent the additional radiation quantity of signal receiving end and additional radiation leakage in the process of feeding and closure nuclear source.



冶炼余热锅炉

拥有多项专利技术的核心技术装备，由膜式水冷壁、对流管束、汽包、振打装置等组成，是实现烟气余热回收的关键设备。

有色冶炼余热锅炉是实现重有色金属冶炼安全生产和节能环保的关键核心设备，完成烟气降温、降尘，并回收余热，为后续收尘和制酸创造条件。自上世纪六十年代，中国恩菲代表中国从日本、芬兰、西德等国家，引进反射炉、沸腾炉、焙烧炉、闪速炉、QSL炉等余热锅炉起，自行研制了铅、锌、铜、镍、锡等冶金余热锅炉，结束了有色冶金余热锅炉必须依靠进口的历史，与有色冶炼底吹炉、艾萨炉、奥斯麦特炉、回转窑、沸腾焙烧炉、鼓风机、反射炉、电炉、烟化炉、焦结炉、旋转炉等工艺炉窑完美匹配，经过几代人不懈的努力探索、创新发展，恩菲有色冶炼余热锅炉已达到国内领先水平，迈入世界先进行列。

余热锅炉作为恩菲十一大核心专长技术之一，在结构设计、强制循环、热力计算、控制系统、清灰设备等关键技术方面拥有自主知识产权专利 20 余项。能够有效解决积灰、结渣、腐蚀和磨损等难点问题，具备配套炉型多、应用范围广、可靠性高、经济效益好等优点。

技术指标：最大蒸发量可达到 164t/h；蒸汽压力最大 6.0MPa；蒸汽温度最高 420℃；能够实现强制循环、自然循环 + 强制循环。

截至 2015 年 6 月，中国恩菲总承包有色冶炼余热锅炉 49 台，设计并运行余热锅炉已达 130 台，包括世界上首台蒸发量最大的富氧顶吹镍熔炼炉余热锅炉（规模为 100 万 t/a，蒸发量 160t/h）、首台蒸发量最大的铜闪速炉余热锅炉（规模 40 万 t/a，蒸发量 116t/h）、世界首台蒸发量最大的锌浸出渣熔炼炉余热锅炉（蒸发量 164t/h，4.6MPa，260℃），创造了 12 项国内有色冶金余热锅炉的总包首例，并改造日本、美国、德国设计的余热锅炉 8 项。先后为金川、白银、五矿、中金、大冶、江铜、云铜、云锡、吉镍、中色等公司提供优良产品，并将余热锅炉输出到印度、巴基斯坦、赞比亚、刚果（金）、刚果（布）、缅甸、越南、巴布亚新几内亚等 10 余个国家。

有色余热锅炉项目曾获优秀工程设计金奖 1 项，银质奖 2 项，省部级优秀工程设计一等奖 4 项，省部级科技进步一等奖 4 项。

Smelting Waste Heat Boiler (WHB)

Core technical equipment of China ENFI, with a number of patented technologies, by membrane wall, convection bank, steam drum, vibration device and other components, and is the key equipment of waste heat recovery of flue gas.

Non-ferrous smelting waste heat boiler is to achieve safe production of heavy nonferrous metals smelting and energy saving key core equipment, complete flue gas cooling, dust, and waste heat recovery, create conditions for the subsequent dust collecting and sulfuric acid manufacture. Since 1960s, China ENFI as China representatives introduces WHB of reverberatory furnace, fluidized bed furnace, roaster, flash furnace, QSL furnace and other furnace from Japan, Finland, West German and other countries, and then self-developed WHB for smelting of lead, zinc, copper, nickel, tin and other non-ferrous metal. ENFI's WHB ended China must rely on the WHB imported history, and can perfect match bottom blowing smelting furnace, ISA furnace, Ausmelt furnace, rotary kiln, boiling roaster, blast furnace, reverberatory furnace, electronic furnace, fuming furnace, sintering furnace, converter and other process smelting furnace. After unremitting efforts of several generations to explore, innovation and development, WHB of ENFI has reached domestic leading level, and entered the advanced international ranks.

Technical indicators: maximum evaporation can reach 164t/h, maximum steam pressure is 6.0 MPa, highest steam temperature is 420℃; WHB can realize forced circulation, natural circulation + forced circulation.

As of June 2015, China ENFI has completed 49 EPC projects of WHB, the design and operation of WHB has reached 130 sets, including the world's first evaporation largest WHB of top-blown oxygen-rich nickel-smelting furnace (capacity is 1,000,000t/a, evaporation is 160t/h), the world's first evaporation largest WHB of copper flash furnace (capacity is 400,000t/a, evaporation is 116t/h), the world's first evaporation largest WHB of zinc residue smelting furnace (evaporation is 164t/h, pressure is 4.6 Mpa and temperature is 260℃). China ENFI has created 12 first domestic EPC projects of WHB, and completes 8 transformation WHB designs of Japan, USA and German. China ENFI supply excellent product to domestic company such as JINMC, BNMC, MINMETALS, China National Gold Group Corporation, DAYE NONFERROUS, Jiangxi Copper Corporation, CHINALCO, Yunnan Tin Company Limited, Jilin Jien Nickel Industry Co., Ltd, CNMC, etc. China ENFI also export WHB to about 10 countries including India, Pakistan, Zambia, The Democratic Republic of Congo, Republic of Congo, Myanmar, Vietnam, Papua New Guinea.

WHB project of ENFI is eligible for 1 gold award and 2 silver awards of excellent engineering design, 4 first prizes of provincial and ministerial award of excellent engineering design, and 4 first prizes of provincial and ministerial award of scientific and technological progress.



印度德里巴 10 万吨铅厂余热锅炉



赤峰林东余热锅炉



热工装备篇

Thermal Equipment

冶炼余热锅炉

Smelting Waste Heat Boiler (WHB)

弹性振打清灰装置

中国恩菲专利技术产品，能在工况复杂、环境恶劣的条件下有效清除各种锅炉积灰，实现锅炉的长效、清洁运行。截止目前，已在有色冶金行业近60个项目、130多台锅炉中使用，销量超过3000台。

该产品低频震荡，清灰效果好，不损受热面；振打周期可程序调控；能耗低、寿命长、使用维护方便。传动部件选用知名品牌的传动设备。

振打频率：3次/min可连续运行；振打力：40-400KN。

智能振打清灰系统为弹性振打清灰装置的机电一体化升级产品，配备恩菲低压智能配电系统，能够对运行过程中的卡锤、欠保养、严重过载等非正常运行进行在线监测、实时监视和智能控制，提高工厂自动化作业水平，精确保护振打锤。

Spring Hammer

Spring hammer is China ENFI's patented technology product, and can effectively remove various boiler ash in complex working condition and harsh environmental condition to achieve long term and clean operation of boiler. Up to now, spring hammer of ENFI has used for around 60 non-ferrous metallurgy projects and more than 130 boilers. The total sales is more than 3,000.

Features: low frequency vibration, good cleaning effect, no damage to the heating surface; vibration frequency is 3 times / min, and vibration cycle can be programmed regulation; low power consumption, long service life, easy maintenance; core components is selected international brand SEW transmission equipment.

Technical indicators: vibration frequency: 3 times/min can be continuous operation; vibration force: 40-400KN.

Intelligent spring hammer is mechatronics updating product of spring hammer, with ENFI's low voltage intelligent distribution system. This system can realize online monitoring, real-time monitoring and intelligent control for stuck hammer, less maintenance, serious overload and other abnormal operation to improve automation operation level of plant and protect precisely spring hammer.

热工装备篇

Thermal Equipment

弹性振打清灰装置

Spring Hammer

垃圾焚烧飞灰中二噁英脱除装备系统

拥有多项专利技术，国家863计划（2012AA062801）研发成果的工业化应用。系统由加热系统、进料系统、冷却系统和控制系统组成，能够在中低温度的情况下，有效脱除垃圾焚烧飞灰中二噁英。二噁英最高脱除率可达到99%，满足进入卫生填埋场的标准要求，填补了国内垃圾焚烧中二噁英处理工艺装备的空白。

特点：脱除效率高，运行连续稳定，自动化程度高。

技术指标：单条线可连续处理飞灰量500kg/h。工艺系列组合能满足日处理垃圾量400t/d-3000t/d焚烧厂的需求。

针对有色节能环保和垃圾焚烧废气、灰渣处置领域，还有节能型排污扩容器、阀门过滤器、换热器、半干法+干法烟气净化装备系统、焚烧飞灰电熔融设备、飞灰稳定化无机药剂等装备产品。



Dioxin Removal System Of Garbage Incineration Fly Ash

Dioxin removal system contains a number of patented technologies and is the industrialized application of national 863 program (2012AA062801) R&D results. The system is composed of heating system, feeding system and control system, and can effectively remove fly ash of garbage incineration in the case of low and medium temperature. Dioxin highest removal rate can reach 99% which can meet the requirement of the sanitary landfill site. This system fills the blank of domestic dioxin treatment process equipment of garbage incineration.

Features:
high removal efficiency, continuous operation stability, high degree of automation.

Technical indicators: a single line can continuously treat amount of fly ash 500kg / h. Process series combination can meet the needs of garbage incineration plant daily with capacity of 400t/d-3000t /d.

For energy saving and environmental protection of non-ferrous metallurgy, ash and slag disposal area, China ENFI can supply energy efficient flash tank, valve filter, heat exchanger, semi-dry + dry flue gas cleaning system, electro-fusion equipment of fly ash incineration, fly ash stabilized inorganic agent, etc.

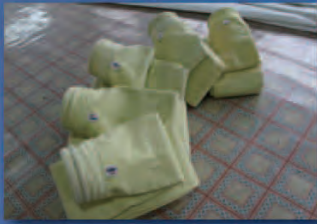
热工装备篇

Thermal Equipment

垃圾焚烧飞灰中二噁英脱除装备系统

Dioxin Removal System Of Garbage Incineration Fly Ash





多功能复合滤料

中国恩菲自主开发高科技产品，适用于各种冶炼的多种工况烟气除尘。

采用先进成网工艺和空气流输送纤维，以形成纤维束杂乱排列的均匀纤网，可达到纤维网的结构要求，进一步降低滤料阻力、增强了滤料纵横向强比。其出色的理化性能及力学性能，打破了多年来国外产品的技术垄断。不仅大幅降低了过滤式除尘的使用和维护成本，而且大幅提高了过滤式除尘的使用范围及除尘效率。

该产品具有优良的可透性，一部分污物粒子被阻挡在靠近上游的表面，一些小的粒子进入过滤介质内部，在收缩、膨胀、压力效应等作用下吸附在孔隙上沉积下来形成尘架，气体由间隙排除，粒子则被阻挡在尘架内部，该系列产品具有低压力损失、高过滤精度、大纳污容量、过滤效率高及寿命长等优点。

Multifunctional Composite Filter Material

Multifunctional composite filter material is independently developed high technological product by China ENFI, and can be used for flue gas removal of various working condition in nonferrous metallurgy.

Filter material adopts advanced network technology and fiber conveyed by air flow to form uniform fiber network of disorderly arrangement that can meet the structural requirement of fiber network for further reducing filter material resistance and enhancing filter material vertical and horizontal strength ratio. Material's excellent physical and chemical properties and mechanical properties break technological monopoly of foreign products over the years. This material not only significantly reduces the use and maintenance cost of filtering dust removal, but also significantly increases the scope and efficiency of filtering dust removal.

The product has excellent permeable. A portion of the dirt particles are blocked near the upstream surface, and some small particles enter into the filter material interior, and are absorbed on the pore wall to form dust frame under the effect of shrinkage, expansion, pressure and other factors. The gas is eliminated by the gap and the particles are blocked in the dust frame. The series products have the advantages of low pressure loss, high filtering accuracy, large absorption capacity, high filtration efficiency and long service life.



可再生脱硫剂 (高分子有机脱硫剂)

中国恩菲自主开发的专利产品，是一种烟气高效脱硫溶剂，能富集烟气中的二氧化硫，具有吸收速率快，脱硫效率高，可循环使用等特点。

该产品可将各类烟气中的二氧化硫气体以高浓度二氧化硫（99.9%，干基）的形式提取出来，提取后的二氧化硫可以根据用户需求送至硫酸车间制酸，或是生产液体二氧化硫及二氧化硫衍生品，吸收剂循环使用。将烟气中的硫进行富集；该吸收剂为淡黄色粘性液体，易溶于水和醇，是一种性能优良的脱硫溶剂。

相对密度（20/20℃）：1.02-1.05；
沸点（101.3Kpa）：245.5-255℃；
溶解性：与水互溶。

Renewable Desulfurizer (polymer organic desulfurize)

Renewable desulfurizer is independently developed patented product by China ENFI, and is a high efficient flue gas desulfurizer. The desulfurizer can enrich sulfur dioxide in flue gas and be used circularly. The desulfurizer has a fast absorption rate, high desulfurization efficiency, and can be used circularly, etc.

The product can extract sulfur dioxide gas from flue gas to form high concentration sulfur dioxide (99.9%, dry base) which can be delivered to sulfuric acid workshop for making acid with the requirements of the client's needs, or used for producing liquid sulfur dioxide and sulfur dioxide derivatives. The produce can be used circularly and enrich sulfur from flue gas. The absorbent is a pale yellow viscous liquid, dissolves easily in water and alcohol, and a excellent performance desulfurizer.

Performance
Relative density (20/20℃) : 1.02-1.05;
Boiling point (101.3Kpa): 245.5-255℃;
Solubility: miscible with water.

针对化工环保专业，还有转化器滑动底座、骤冷回收 As_2O_3 装备系统、二氧化硫制硫磺等装备。

For chemical environmental protection, there is reformer slide base, quench recovery system of As_2O_3 , sulfur dioxide system for making sulfur, etc.

化工环保篇

Chemical Environmental Protection

多功能复合滤料
Multifunctional Composite Filter Material
可再生脱硫剂
Renewable Desulfurizer

*设备图片均为现场实拍

*Real shot



智能设备及控制系统篇

Intelligent Equipment with Control System

井下提升机电控系统

Underground Hoist Electric Control System

井下提升机电控系统

中国恩菲作为国内提升机电控技术的先行者，掌握多项专利，在国内外矿山领域拥有卓越的业绩，多次获省部级科技进步奖。

具有安全、高效、节能的特点，适用于摩擦式、缠绕式、箕斗式、罐笼式、箕斗-罐笼混合式等各类提升机。配套的自主知识产权控制软件具有免维护、操作界面友好、安全性强的特点，目前国内首次实现了多台提升机的全自动运行集中监视。

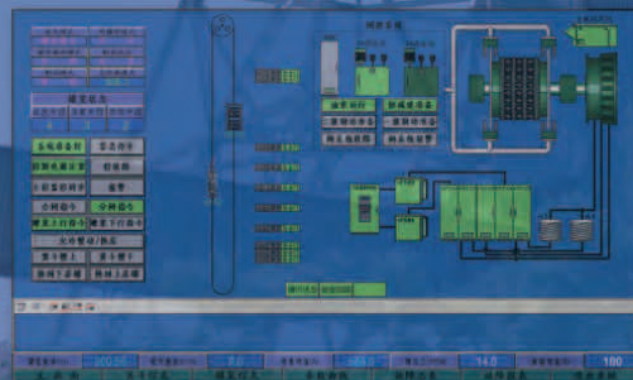
中国恩菲为客户提供机械、电气、土建、井建的综合提升系统解决方案，为矿山事业安全、高效发展提供坚实保障。

Underground Hoist Electric Control System

China ENFI is the domestic forerunner of the hoist electronic control technology, has a number of patents and outstanding performance in the field of mine at home and abroad, and won the provincial and ministerial scientific and technological progress award for many times.

Hoist electric control system of China ENFI has the characteristics of safe, efficient and energy saving. The system can be applicable to friction type, winding type, skip type, skip-cage hybrid type, and other types of hoist. Control software with independent intellectual property has the characteristics of maintenance free, friendly operation interface and strong security. Currently, the system firstly realized the automatic operation centralized monitoring of multiple hoists in China.

China ENFI can supply comprehensive system solution of mechanical, electrical, civil, shaft construction for clients, and provide a strong support for safety and efficient development of mine.



装备成套控制系统

提供装备机电一体化、全厂DCS控制系统及自控仪表成套服务。提供电炉供电与自控系统、顶吹炉自控系统、焙烧炉自控系统、转炉传动电控系统、低压智能配电系统等供货和服务。

电炉供电与自控系统

中国恩菲自主开发的电炉先进优化控制系统EF-APC，可用于各式埋弧电炉和电弧炉的控制，目前已在国内外多个镍铁熔炼电炉、铜冶炼贫化电炉及钒钛磁铁矿电弧炉上成功应用。系统采用以专家系统为核心的专利技术，相对传统死区控制方法可明显提高控制效果。通过对功率的精确平稳控制，使得炉况长期保持稳定，工艺及能耗指标达到最优，达到增产降耗的目的。由于对电网的冲击具有良好的抑制效果，可显著减少电能质量治理费用，对于弱电网运行情况具有明显优势。成功应用于谦比希祖铜冶炼厂、四川会理铜冶炼厂、湖北大冶铜冶炼厂和云锡铜冶炼厂等项目中，取得了良好的运行效益。

顶吹炉自控系统

中国恩菲打破国外封锁多年的顶吹炉DCS控制系统技术壁垒，该系统具有炉况平稳、炉温稳定、喷枪位置精确、对电网干扰小、操作方便、安全可靠等特点，经实践检验已达到国内外同类顶吹炉系统控制的先进水平。该技术已获得多项国家专利，曾获中国有色金属工业科学技术奖一等奖。

Complete Equipment Control System

China ENFI can supply service packages of mechanotronics complete equipment, including equipment supply and services for power supply and automatic control system of electric furnace, automatic control system of top-blown furnace, automatic control system of roaster, electronic control system of converter, low voltage distribution system, etc.

Power Supply and Automatic System for Electric Furnace

China ENFI self-developed electric furnace control system (EF-APC) can be used for various kinds of submerged arc furnace and electric arc furnace control, and has been successfully applied in a number of ferronickel smelting furnace, copper cleaning electric furnace, vanadium-titanium magnets electric arc furnace at home and abroad. The system adapts an expert diagnostic system as the core of the patented technology, and can significantly improve control effect compared with the traditional dead time control. The system can keep long term stable furnace conditions and realize optimizing process and energy consumption indicators to increase production capacity and reduce consumption through accurate and stable power control. Due to the impact of the power grid has a good suppression effect, the system can significantly reduce the cost of power quality management and has obvious advantages for the weak grid operation.

The system has been successfully applied to Chambishi Copper Smelter in Zambia, Sichuan Huili Copper Smelter, Hubei Daye Copper Smelter, Copper Smelter of Yunnan Tin Company Limited and other projects, and achieved good operating efficiency.

Automatic Control System of Top-blown Furnace

China ENFI broke the foreign blockade years of foreign top-blown furnace DCS control system technical barriers. The system has the characteristics of stable furnace condition and temperature, accurate lance position, small grid interference, easy operation, safe and reliable, etc. The system has reached the advanced level of domestic and foreign similar control system of top-blown furnace. The technology has won a number of national patents, and first prize of China nonferrous metals industry scientific and technological award.

焙烧炉自控系统

焙烧炉主厂房控制回路包括：焙烧炉给料控制，焙烧炉炉温控制，焙烧炉鼓风流量控制。

转炉传动电控系统

转炉传动电控系统为转炉、阳极炉、底吹炉传动与电控一体化装置，由配电、传动、检测与控制部分组成。回转炉体属于火法工艺流程中的关键设备，对设备的可靠性、安全性要求很高，结合中国恩菲工艺和项目优势，在炉体配电、传动、炉位综合检测与控制上不断优化升级，开发出回转炉传动电控系统。该系统在保障炉体的高可靠、安全性的基础上，提升了自动控制水平。目前，该系统已获多项专利，并已成功应用到国内外多个回转炉传动电控系统项目中。

低压智能配电系统

中国恩菲研发的低压智能配电系统是实现低压配电系统信息化和智能化的同时，性能价格比远高于传统电力系统低压智能配电系统，可以实现每条回路的远程控制，具备可靠的安全保护，具备完善的管理和统计功能，可以全面满足矿山生产和管理需求。

Automatic Control System of Top-blown Furnace

Control circuit of roaster main workshop includes feeding control, furnace temperature control and blast flow control.

Electronic Control System of Converter

Converter transmission electronic control system contains converter, anode furnace, bottom-blown furnace transmission and electronic control integrated device, and consists of power distribution, transmission, detection and control. Rotary furnace body is key equipment of pyro-metallurgical process and requires very high reliability and safety of equipment. Combined with process and project advantages, China ENFI developed converter transmission electronic control system through continuous optimization and upgrading of the furnace body power distribution, transmission, furnace position detection and control. The system can improve reliable and safe of furnace body and automatic control level. Currently, the system has won a number of patents, and has been successfully applied to domestic and international converter transmission electronic control system.

Low Voltage Intelligent Power Distribution System

China ENFI developed low voltage intelligent power distribution system can achieve information technology and intelligent of low voltage power distribution system. The system performance price ratio is much higher than the traditional low voltage power distribution system. The system can realize the remote control of each circuit with reliable safety protection, perfect management and statistical functions, and can fully meet the mine production and management needs.

智能设备及控制系统篇

Intelligent Equipment with Control System

装备成套控制系统
Complete Equipment Control System

索道

中国恩菲自主开发索道定制装备，拥有 7 项发明专利，3 项实用新型专利。产品主要包括往复式客运索道、单线循环固定抱索器吊椅（吊篮、吊厢）式客运索道、单线脉动循环固定抱索器吊厢组式客运索道、货运索道、专项用途索道等类型。

新中国成立后第一条完整设计和建设的架空索道即出自中国恩菲，可谓“中国索道、恩菲相伴”。

中国恩菲索道具有起步早、业绩多、类型广、技术先进、体系完善等优势特征，中国恩菲提供的索道定制化服务遍布全国 28 省市和各类风景名胜区，诸如华山、泰山、黄山、峨眉山、嵩山、张家界等，并已远销阿尔巴尼亚、朝鲜（元山马息岭）等国家，累计数量达 140 多条。

依托中国恩菲在索道领域多年的工程经验和实践总结，由中国建筑工业出版社出版中国恩菲编制的《索道工程设计集锦》一书已成为索道专业设计及施工人员、高校相关专业的参考书。

Ropeway

China ENFI has independently developed ropeway customized equipment, and achieved 7 invention patents and 3 practical new patents. The products of China ENFI ropeway are comprised of reversible passenger ropeway, mono-cable circulating with fixed detachable grip chairlift (bucket, cabin) passenger ropeway, mono-cable pulsatile circulating cabin-group passenger ropeway, cargo ropeway and special purposed ropeway.

The first complete aerial ropeway is designed and built by China ENFI after New China founded, which is said "China Ropeway, ENFI accompanied".

China ENFI customized ropeway has such strong points as earliest in the time, most in the quantity, complicated types, much difficult and advanced in technique and complete system. The service of China ENFI customized ropeway is all over the 28 provinces, municipals and autonomous regions. The products are provided successively to Huashan, Tai Mountain, Huang Mountain, Emei Mountain, Songshan, and Zhangjiajie, and exported further to Albania, DPRK and other countries. Totally it amounts to more than 140.



北京千灵山索道



河南黄河三峡景区索道



湖南德夯国家风景名胜区——海螺峰索道（效果图）

索道篇 Ropeway





我们始终以技术和服务，为您的工程建设全过程、
绿色生产全流程、运营全周期提供定制、智能、系统的解决方案。

We are striving to provide customized, intelligent, system solution for your whole
project construction process, green manufacturing process and operating cycle.



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