燃气轮机余热锅炉
HRSG

垃圾焚烧锅炉
WTE Boiler

燃气锅炉
Gas Boiler

生物质锅炉
Biomass Boiler

循环流化床锅炉
CFB Boiler

污泥炉 / 污泥干化机
Sludge Boiler/Sludge Dryer

煤粉锅炉
PC Boiler

工程总包（传统项目）
EPC project(traditional energy)

工程总包（光伏）
EPC project (photovoltaic)

技术咨询
Technical

顾全斌（总工程师）
电话：13812002423
Mr. Gu Quanbin (Chief Engineer)
Tel：13812002423

电站装备
Power plante equipment

邹涵（负责人）
电话：13338102881
李艳松（负责人）
电话：13951502076
Mr. Zouhan
Tel:13338102881
Mr. Li Yansong
Tel:13951502076

销售团队
Sales Director

张学明（销售总监）
电话：13861776940
Mr. Zhang Xueming
Tel:13861776940

技术改造及备品备件
Technical transformation & Spare Parts Services

朱亮（负责人）
电话：15152221696
Mr. ZhuLiang （Sales Director）
Tel:15152221696

(SH.600475)

共建清洁低碳生活

行稳致远 · 匠心超越

Building a clean and low-carbon life together

Achieve long-term development with prudent operation and surpass through ingenuity

华光环能全生命周期服务

技 改 备 件

WHEE life circle service：
Boiler modification and spare parts supply

无锡华光环保能源集团股份有限公司
WUXI HUAGUANG ENVIRONMENT & ENERGY GROUP CO ., LTD.

华光环能成立于 1958 年，前身为无锡锅炉厂，2000 年完成股份制改造，2003 年在上海证券交易所挂牌上市（股票代码 600475），2017 年完成重大资产重组。2020 年更名为“无锡华光环保能源集团股份有限公司”。

华光是江苏省首家既完成资产重组又实现员工持股和股权激励的大型国有控股上市公司。形成了“能源与环保领域的产业投资运营平台”的功能定位，以“共建清洁低碳生活”为企业使命，以“诚信、责任、专业、超越”为公司核心价值观，确立了成为“中国领先的环保能源综合服务商”的发展愿景。

公司是中国机械五百强、中国机械工业百强、中国分布式能源企业百强、中国工业行业排头兵企业。装备板块主营新能源类和传统能源类锅炉装备及总包：

- **传统能源类锅炉：**节能环保型燃煤锅炉（CFB+PC）。
- **新能源类锅炉：**零碳生物质发电锅炉、减碳固废发电锅炉。
- **清洁能源类锅炉：**低碳燃气—蒸汽联合循环余热锅炉。

截至目前累计研制投运环保装备达到近五千台套，分布国内各省，以及海外 38 个国家和地区。

WHEE (formerly Wuxi Huaguang Boiler Co., Ltd. 2000-2020) was known as Wuxi Boiler Works when established in 1958. We completed our shareholding reform in 2000, listed on Shanghai Stock Exchange in 2003 (SH. 600475), and completed major asset restructuring in 2017. We altered our name to "Wuxi Huaguang Environment & Energy Group Co., Ltd." in 2020.

WHEE is the first large state-owned listed company in Jiangsu Province to complete asset restructuring and realize employee stock ownership and equity incentive. We have formed the functional orientation of "industrial investment and operation platform in the field of energy and environmental protection". With "jointly building a clean and low-carbon life" as the corporate mission and "integrity, responsibility, professionalism and transcendence" as the company's core values, we establishes the development vision of becoming "China's leading comprehensive environmental protection and energy service provider".

WHEE have been awarded the titles of one of China's top 500 machinery enterprises, China's top 100 machinery industry enterprises, China's top 100 distributed energy enterprises and the leading enterprise of Chinese industry. Our equipment business sector is mainly engaged in design, manufacture supply and EPC of the boiler products in term of both new energy and traditional energy:

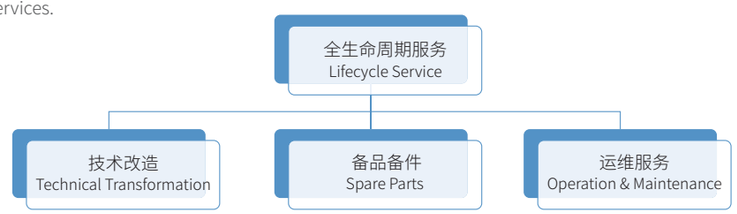
- **Traditional energy boilers:** energy-saving and environment-friendly coal-fired boilers (CFB + PC).
- **New energy boilers:** Zero Carbon biomass power generation boiler, carbon reduction solid waste power generation boiler.
- **Clean energy boiler:** low carbon gas steam combined cycle HRSG.

Up to now, nearly 5000 sets of environmental protection equipment have been developed and put into operation, which are distributed in all provinces in China and 38 countries and regions overseas.

01 华光环能全生命周期服务范围
Part I: The Scope of WHEE's Life Cycle Service

华光全生命周期服务包括：（电厂）技术改造、（锅炉）备品备件、（项目）运维服务三大类。

Our life cycle services include: (power plant) modification, (boiler) spare parts supply and (project) operation and maintenance services.



□ 技术改造概况 | Overview of modification services

华光环能致力于电厂节能环保工程的技术改造，随着世界各国对节能减排及环保要求的提高，实施锅炉改造势在必行，公司依托多年的从业经验和强大的设计能力提供各类锅炉技改业务。

在锅炉的技术改造中，根据用户实际要求，在确保锅炉性能的基础上，为用户尽可能地减少改造成本。提高锅炉出力，提升锅炉效率，降低 NO_x 排放，并能掺烧各类燃料，提高经济效益，满足各国环保要求。

WHEE is committed to the modification of the power plant energy consumption reduction and emission optimization . With the tightening requirements of energy conservation, emission reduction and environmental protection all over the world, transformation is necessary for many boilers. We provide all kinds of boiler modification services based on years of experiences and strong design ability.

The boiler modification is performed following the actual requirements of the client, we try to minimize the cost without influence the performance, so as to improve boiler output and efficiency, reduce NOx emission, convert of the existing fuel by mixing various other fuels, improve the economic performance and satisfy the environmental protection requirements of various countries.

□ 技术改造典型项目 | WHEE' s Typical modification projects

内蒙赤峰 480t/h 循环流化床低氮改造
Low nitrogen transformation of 480t / h circulating fluidized bed in Chifeng, Inner Mongolia.

光大环保能源（无锡）有限公司 500t/d 垃圾炉扩容改造项目
Furnace expansion and reconstruction project of 500 t/d waste incineration boiler by Everbright Environmental Protection Pnergy (Wuxi) Co., Ltd.

浙江绍兴振亚热电 2×130t/h CFB 中温中压升级高温高压改造项目
Zhejiang Shaoxing Zhenya thermal power 2 × 130t / h CFB medium temperature and medium pressure upgrading to high temperature and high-pressure.

富春江环保热电有限公司 500t/d 流化床垃圾焚烧炉改造，降低 CO 到 100mg/m^3 以下
CO reduction to less than 100mg/m^3 on 500t / D fluidized bed waste incinerator boiler of Fuchunjiang environmental protection Thermal Power Co., Ltd.

□ 备品备件概况 | Overview of spare parts supply service

华光环能自建厂以来承接各类备品备件，累计为上百个客户解决了备件问题。针对华光品牌的锅炉、设备成套、电厂总包项目，公司以优惠的价格、可靠的质量、及时的供货，提供全电厂备品备件服务。

Since our establishment, WHEE has supplied various spare parts and solved hundreds of spare parts concerned problems for our customers. For the boilers, complete set supply of equipment and power plant EPC projects of Huaguang brand, we provide spare parts services for the overall power plant with preferential price, reliable quality and timely supply.



□ 运行维护概况 | Overview of operation and maintenance service

◆ **保运：**结合我司众多的总包及运维经验，在电厂建成后，我司可提供完备的运行及检修人员来保证电厂进入正常生产运行状态，周期约为 3 个月至一年，并在此期间对电厂运行人员进行实时培训。

◆ **运维：**针对华光总包的和使用华光锅炉的电厂，我司可提供运行及维护服务。华光环能拥有循环流化床供热电站、垃圾焚烧发电电厂、燃气蒸汽联合循环电厂、掺烧污泥发电等电厂，结合设备制造及总包优势，可为业主提供电厂正常运行服务及提供定期检查、小修及大修服务，保证业主拥有一个高效、节能、安全运营的电厂。

◆ **Before operation:** with rich experiences in EPC as well as operation and maintenance, WHEE dispatches competent O&M personnel to the power plant after the completion of construction to make sure that the power plant operates properly, with a cycle of consultation about 3 months to 1 year, and provide real-time training for the operators of the power plant during this period.

◆ **O&M:** WHEE provides operation and maintenance services for power plants using our boilers and / or of our EPC projects. WHEE owns the power plants with CFB boilers, waste-to-energy boilers, HRSGs, sludge fired boilers and so on. With our advantages in equipment manufacturing and EPC, WHEE provides the owner with normal operation services and regular inspection, minor repair and overhaul services, so as to ensure that the owner has an efficient, energy-saving and safe-operating power plant.

02 全生命周期服务——技改篇
Part II: Life Cycle Service - Modification

□ 循环流化床锅炉提标改造 | Upgrading of CFB Boiler

◎ 锅炉提标改造 Upgrading of boiler

- ◆ 中温中压（次高温次高压）锅炉改高温高压锅炉
- ◆ 扩容改造
- ◆ 缩容改造
- ◆ 低氮燃烧改造
- ◆ 低氮低硫排放改造

- ・Change medium temperature and medium pressure (sub-high temperature and sub-high pressure) boiler to high temperature and high pressure boiler
- ・Capacity amplification
- ・Capacity reduction
- ・Modification of low NO_x combustion
- ・Modification of low NO_x and low SO_2 emission

◎ 燃料变更的锅炉改造 Modification of fuel conversion

- ◆ 燃煤锅炉改烧天然气
- ◆ 燃煤锅炉改烧生物质
- ◆ 燃煤锅炉改烧固废
- ◆ 燃煤锅炉改多种燃料混烧

- ・Coal to natural gas
- ・Coal to biomass
- ・Coal to solid waste
- ・Coal to multi mixed fuel

◎ 锅炉先进结构的改造 Boiler modernization by advanced structures

- ◆ 循环流化床锅炉最新风帽结构的改造
- ◆ 循环流化床锅炉提高分离器分离效率的改造
- ◆ 循环流化床锅炉点火进风结构改造
- ◆ 新型省煤器改造
- ◆ 空预器管箱防堵防积灰改造
- ◆ 尾部烟道清灰改造

- ・Air nozzles: latest structure
- ・Cyclone separator: improving the separating efficiency
- ・Modification of ignition air inlet structure of CFB boiler
- ・Economizer: latest structure
- ・Air preheater tube box: ash blockage and ash accumulation prevention solution.
- ・Back pass: ash removing.

□ 垃圾余热锅炉提标改造 | Upgrading of waste-to-energy boiler

- ◆ 通过在三通道内增加蒸发受热面，降低高温过热器前烟气温度，同时适当增加高温过热器的节距以改善腐蚀及结焦状况。
- ◆ 为减少过热器、省煤器爆管，更改省煤器、过热器管系结构。
- ◆ 减少炉膛高温结焦、挂焦现象，绝热炉膛更改为局部或全部水冷结构。
- ◆ 垃圾热值提升，余热锅炉扩容改造。

- By adding evaporating heating surfaces in 3rd pass to reduce the flue gas temperature before entering the high-temperature superheater. At the same time, appropriately increase the pitch of high-temperature superheater to improve corrosion and coking.
- Change the tube system structure of economizer and superheater, to reduce the tube rupture of superheater and economizer.
- Change the insulated furnace wall fully/ locally to reduce high temperature coking inside furnace.
- Increase the WTE boiler capacity respectively with the increasing of the heat value of the waste.

□ 煤粉锅炉提标改造 | Upgrading of PC boiler

◆ 调整炉膛结构
◆ 为适应燃气特性，降低省煤器沸腾度，增加蒸发受热面
◆ 更改省煤器结构，调整空预器受热面。

- Furnace structure optimizing.
- Evaporating heating surfaces are increased to adapt to the characteristics of the fuel gas, reduce the boiling degree of economizer.
- Change the structure of economizer and adjust the heating surface of air preheater.

□ 其他锅炉提标改造 | Upgrading of other boilers

◆ HRSG、燃气炉、固废炉等炉型

- HRSG, Gas fired boiler, Solid waste boiler, etc.

03 全生命周期服务——备件篇
Part III: Life Cycle Service - Spare Parts

◆ 包括锅炉全生命周期检修、部件更换等保养服务。
◆ 因我公司产品均有国外技术引进协议，建议用户在采购备品备件时询问我司是否涉及国内外知识产权专利问题，为避免知识产权纠纷，涉及专利部件，请用户向本公司采购备件。我司承诺将以最优惠的价格给予我司老客户。

- Boiler life cycle maintenance, component replacement and other maintenance services.
- Taking into consideration of the License Agreement concerning to WHEE's products, the client is recommended to consult us for any intellectual property related issue when purchasing spare parts. In order to avoid any dispute associated with IP rights, the client may purchase spare parts from WHEE, and we promise to offer the clients using our products with the most favorable price.

04 典型案例篇
Part IV: Typical Cases

◎ 典型案例一：150t/h 次高温次高压循环流化床锅炉改 170t/h 高温高压循环流化床锅炉

- Typical case 1: increase the capacity:150t / h sub-high temperature and sub-high pressure circulating fluidized bed boiler to 170t / h high temperature and high pressure circulating fluidized bed boiler

□ 改造前、后主要数据汇总表 | Parameters before and after modification

名称 Name	单位 Unit	改造前 Before	改造后 After	备注 Remarks
额定蒸发量 Rated output	t/h	130	130	
最大连续蒸发量 Maximum continuous rating	t/h	150	170	短时 short-term187t/h
额定蒸汽压力 Rated steam pressure	MPa	5.3	9.8	
额定蒸汽温度 Rated steam temperature	℃	485	540	
给水温度 Feed water temperature	℃	150	215	
环境温度 Ambient temperature	℃	20	20	
排烟温度 Exit gas temperature	℃	~120	135	
设计燃料热值 Design fuel heat value	Kcal/Kg	4720	4874	烟煤 Soft coal
热效率 Heatt efficiency	%	90.3	91.5	
原始排放量 Original NO_x emission NO_x	mg/Nm^3	~250	⩽ 80	
锅炉出口 NO_x 排放量 NO_x emission at boiler outlet	mg/Nm^3		⩽ 50	
炉膛出口空气过剩系数 Excess air coefficient at furnace outlet	/	1.14	1.14	
风室压力 Air chamber pressure	KPa	8-9	6.0 -7.0	
床温 Bed temperature	℃	950	870~900	
一、二次风比例 PA:SA	%	60：40	50：50	
炉体抗震烈度 Seismic intensity of boiler	度 Degree	七 Seven	七 Seven	
负荷变化范围 Load variation range	%	30 ～ 110	30 ～ 110	
受热面吹灰形式 Soot blowing form of heating surface		声波 Sonic	蒸汽 Steam	

◎ 典型案例二：晋煤金石化工有限公司 4×260t/h 循环流化床锅炉低氮低硫排放改造

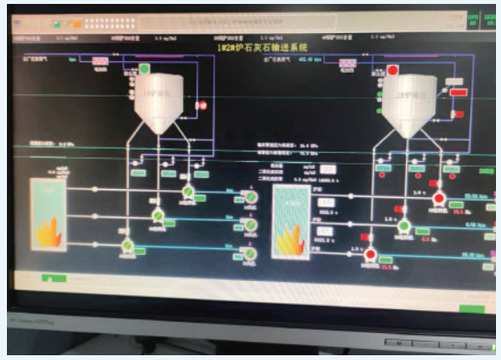
・Typical case 2: Improving the NO_x and SO_2 emission of the 4×260t/h circulating fluidized bed boiler in Jinmei Jinshi Chemical Co., Ltd.

□ 改造前、后主要数据汇总表 | Parameters before and after modification

名称 Name	单位 Unit	改造前 Before	改造后 After	备注 Remarks
额定蒸发量 Rated output	t/h	260	260	
额定蒸汽压力 Rated steam pressure	MPa	9.8	9.8	
额定蒸汽温度 Rated steam temperature	℃	540	540	
给水温度 Feed water temperature	℃	215	215	
环境温度 Ambient temperature	℃	20	20	
排烟温度 Exit gas temperature	℃	~140	~136	
设计燃料热值 Design fuel heat value	Kcal/Kg	4235	4235	无烟煤 anthracite
热效率 Heat efficiency	%	88.6	90.6	
NO_x 原始排放量 Original NO_x emission	mg/Nm^3	~250	⩽ 80	
锅炉出口 NO_x 排放 NO_x emission at boiler outlet	mg/Nm^3		＜ 30	
燃料中 S 含量 S content in fuel	%	＜ 1.5	＜ 1.5	
锅炉出口 SO_2 排放量 SO_2 emission at boiler outlet	mg/Nm^3	~3480	＜ 20	炉内脱硫 Desulfurization in furnace
炉膛出口空气过剩系数 Excess air coefficient at furnace outlet	/	1.2	1.16	
风室压力 Air chamber pressure	KPa	8-9	6.0 -7.0	
床温 Bed temperature	℃	980	870~900	
一、二次风比例 PA:SA	%	60：40	50：50	
负荷变化范围 Load variation range	%	30 ～ 110	30 ～ 110	

该项目通过锅炉改造实现炉内 NO_x、SO_2 双超低排放，大大降低了后期运行成本。

This project realizes ultra-low emissions of both NO_x and SO_2 in the boiler through boiler modification, which greatly reduces the subsequent operation cost.



◎ 典型案例三：浙江恒盛热电有限公司固废掺烧改造 (掺烧比例 70%)

・Typical case 3: Fuel conversion: coal to solid waste for Zhejiang Hengsheng Thermal Power Co., Ltd.(the solid waste accounts for 70% of the fuel)

□ 改造前、后主要数据汇总表 | Parameters before and after modification

名称 Name	单位 Unit	改造前 Before	改造后 After	备注 Remarks
额定蒸发量 Rated output	t/h	75	75	
最大连续蒸发量 Maximum continuous rating	t/h	90	90	
额定蒸汽压力 Rated steam pressure	MPa	9.8	9.8	
额定蒸汽温度 Rated steam temperature	℃	540	540	
给水温度 Feed water temperature	℃	200	200	
送风温度 Supply air temperature	℃	35	35	
排烟温度 Exit gas temperature	℃	145	137	
设计燃料 Design fuel	t/h	10t/h 煤 coal	3.7t/h 煤 coal+ 11.2t/h 布料 cloth	II 类烟煤 Bituminous coal grade II
热效率 Heat efficiency	%	88.4	90.3	
NO_x 原始排放量 Original NO_x emission	mg/Nm^3	450	⩽ 300	
炉膛出口空气过剩系数 Excess air coefficient at furnace outlet	/	1.2	1.18	
风室压力 Air chamber pressure	KPa	9.5-10	6.5-7.5	
床温 Bed temperature	℃	970	940	
灰、渣比 Fly ash : bottom ash	%	70：30	60：40	
一、二次风比例 PA: SA	%	60：40	50：50	

◎ 典型案例四：友联热电循环流化床扩容 + 低氮燃烧改造

・Typical case 4: capacity increasing and low NOx combustion modification of Youlian thermoelectric circulating fluidized bed

□ 改造前、后主要数据汇总表 | Parameters before and after modification

名称 Name	单位 Unit	改造前 Before	改造后 After	备注 Remarks
额定蒸发量 Rated output	t/h	150	150	
最大蒸发量 Maximum rating	t/h	135	150	
额定蒸汽压力 Rated steam pressure	MPa	5.3	5.3	
额定蒸汽温度 Rated steam temperature	℃	485	485	
给水温度 Feed water temperature	℃	150	150	
送风温度 Supply air temperature	℃	35	35	
排烟温度 Exit gas temperature	℃	137	125	
设计燃料热值 Design fuel heat value	Kcal/Kg	5000	5000	II 类烟煤 Soft coal grade II
热效率 Heat efficiency	%	88	91	
NO_x 原始排放量 Original NO_x emission	mg/Nm^3	350	⩽ 120	
炉膛出口空气过剩系数 Excess air coefficient at furnace outlet	/	1.2	1.16	
风室压力 Air chamber pressure	KPa	9.5-10	6.5	
床温 Bed temperature	℃	980	890	
灰、渣比 Bottom ash:flyash	%	70：30	60：40	
一、二次风比例 PA: SA	%	60：40	50：50	

◎ 典型案例五：盐城热电 130t/h 锅炉扩容改造

・Typical case 5: capacity increasing modification of 130t / h boiler of Yancheng thermal power

□改造前、后主要数据汇总表 | Parameters before and after modification

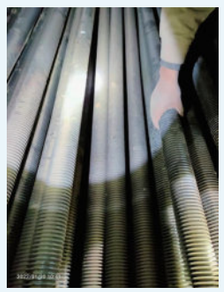
名称 Name	单位 Unit	改造前 Before	改造后 After	备注 Remarks
额定蒸发量 Rated output	t/h	130	150	
额定蒸汽压力 Rated steam pressure	MPa	9.8	9.8	
额定蒸汽温度 Rated steam temperature	℃	540	540	
给水温度 Feed water temperature	℃	158	158	
送风温度 Supply air temperature	℃	35	35	
排烟温度 Exit gas temperature	℃	134	133	
设计燃料热值 Design fuel heat value	Kcal/Kg	4300	4300	II 类烟煤 Soft coal grade II
热效率 Heat efficiency	%	91	91.5	
NO_x 原始排放量 Original NO_x emission	mg/Nm^3	120	⩽ 80	
炉膛出口空气过剩系数 Excess air coefficient at furnace outlet	/	1.2	1.16	
风室压力 Air chamber pressure	KPa	9.5-10	6.5	
床温 Bed temperature	℃	950	880	
灰、渣比 fly ash: bottom ash	%	70：30	60：40	
一、二次风比例 PA:SA	%	60：40	50：50	

◎ 典型案例六：威海热电省煤器改造项目：新型省煤器（螺旋翅片整体挤压型）

・Typical case 6: Economizer modification of Weihai thermal power plant: new economizer (spiral fin integral extrusion type)

螺旋翅片整体挤压型相比传统的屏式结构，增加了换热面积，有效的降低了锅炉排烟温度，同时因其特殊的结构，更不易积灰，避免堵塞。

Compared with the traditional platen structure, the integral extrusion type of spiral fin increases the heat exchange area and effectively reduces the boiler exit gas temperature. At the same time, due to its special structure, it is less prone to accumulate ash, so as to avoid blockage.

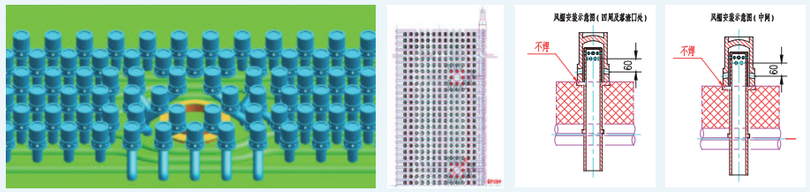


◎ 典型案例七：新型布风板风帽改造

・Typical case 7: Air grid nozzles modernization

根据我公司循环流化床锅炉的设计经验，发现针对布风板不同区域物料浓度来布置不同的开孔率的风帽，可以使整个布风板布风更加均匀。风帽采用新型的专用风帽，以调整合适的布风板阻力，使物料的流化更加合理与顺畅，同时也控制了氧量，降低流化风量，提高流化效果，降低一次风率。采用我公司自主研发的新型耐磨低氮专用风帽。

Based on our experiences in designing of the CFB boilers, a desired air distribution could be obtained by arranging air nozzles with different hole opening rates properly based on the material concentration in different areas of the air grid. Special air nozzles with new technology are used to adjust to the appropriate air grid resistance so as to make the fluidization of materials more reasonable and smooth. At the same time, it also controls the oxygen content, reduces the fluidization air volume, improves the fluidization effect and reduces the primary air ratio. The new wear-resistant low NOx special nozzle is independently developed by WHEE.



Installation pic of air nozzle

◎ 典型案例八：280t/h 循环流化床锅炉点火筒改风道燃烧器改造

・Typical case 8: modification from ignition tube to air duct burner of 280t / h circulating fluidized bed boiler

风道燃烧器结构能使炉膛布风更加均匀，在同样满足炉膛内物料流化正常的情况下，风室压力降低1000Pa 左右，因此一次风机压头大幅下降，功率降低，节能效果明显。

The air duct burner structure provides a better air distribution in the furnace and reduces the pressure in the air chamber by about 1000Pa under the same condition when the material fluidization in the furnace is kept normal. Therefore, the pressure head of the primary air fan is greatly reduced, the power is reduced, and the energy-saving effect is obvious.

传统一次风道结构运行画面：
风室压力 9.0KPa
Traditional primary air duct structure:
air chamber pressure 9.0KPa

一次风道结构改造后运行画面：
风室压力 7.5KPa
primary air duct structure after modification:
air chamber pressure 7.5KPa

◎ 典型案例九：沼气掺烧改造项目——废气燃烧器改造

・Typical case 9: Fuel conversion: mixed with biogas - modification of waste gas burner

锅炉型号：75t/h 高温高压循环流化床	**Boiler type:** 75t/h high temperature and high pressure circulating fluidized bed
掺烧介质：沼气	**Mixed burning medium:** Biogas
掺烧量：31200m^3/D	**Mixing amount:** 31200m^3/D

◎ 典型案例十：垃圾焚烧锅炉项目蒸发器改造

・Typical case 10: modification of evaporator in the waste incinerationWTE boiler project

随着城市生活垃圾热值日益提高，导致高过入口烟气温度过高，造成高温过热器严重腐蚀和结焦，降低了锅炉尾部受热面的使用寿命。经我公司研究分析，通过在三通道内增加蒸发受热面，降低高温过热器前烟气温度。具体方案为，在锅炉三通道增加旗式受热面，共分上下两组，横向采用大节距。并增加蒸汽吹灰器，吹灰区域加装防磨罩。

The increasing of the heat value of municipal solid waste (MSW) has caused an excessive high the flue gas temperature at the high temperature superheater , resulting in serious corrosion and coking of the high-temperature superheater, which reduces the service life of the back end heating surfaces of the boiler. According to the research and analysis of WHEE, the flue gas temperature in front of high-temperature superheater can be reduced by adding evaporating heating surface in the 3rd pass. The specific solution is to provide additional heating surfaces in the 3rd pass of the boiler, which are divided into upper and lower groups with large horizontal pitch. Besides, additional steam soot blower and anti-wear covers are to be installed in the soot blowing area.

□改造前 | Before

Start Time : 03/08/2020 08:00:00
End Time : 03/08/2020 16:00:00

	G	Point Name	Historian	Processing T	Description	End Value	Units	S	Low Scal	High
1	☑	(A) 3HNA10CT101-E.UNIT1@NET1	Auto Historian	Actual	一级蒸发器入口温度	714.503	℃	☑	0	799.
2	☑	(A) 3HNA10CT102-E.UNIT1@NET1	Auto Historian	Actual	过热器入口温度	645.526	℃	☑	0	799.
3	☑	(A) 3HNA10CT105-E.UNIT1@NET1	Auto Historian	Actual	省煤器出口温度	226.368	℃	☑	0	799.
4	☑	(B) 3LAE10CF101-COR1.UNIT1@NET1	Auto Historian	Actual	过热器减温水流量	6.000 P	t/h	☑	-1	10
5	☑	(B) 3LBA11CF101-COR1.UNIT1@NET1	Auto Historian	Actual	去空气预热器蒸汽流量	4.826	t/h	☑	-1	10

□改造后 | After

Start Time : 04/27/2020 00:00:00
End Time : 04/28/2020 00:00:00

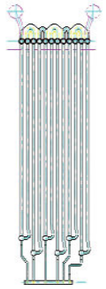
	G	Point Name	Historian	Processing T	Description	End Value	Units	S	Low Scal	High
1	☑	(A) 3HNA10CT101-E.UNIT1@NET1	Auto Historian	Actual	一级蒸发器入口温度	553.610	℃	☑	0	619.
2	☑	(A) 3HNA10CT102-E.UNIT1@NET1	Auto Historian	Actual	过热器入口温度	500.416	℃	☑	0	619.
3	☑	(A) 3HNA10CT105-E.UNIT1@NET1	Auto Historian	Actual	省煤器出口温度	207.554	℃	☑	0	619.
4	☑	(B) 3LAE10CF101-COR1.UNIT1@NET1	Auto Historian	Actual	过热器减温水流量	5.496	t/h	☑	0	6.6
5	☑	(B) 3LBA11CF101-COR1.UNIT1@NET1	Auto Historian	Actual	去空气预热器蒸汽流量	3.575	t/h	☑	0	6.6

◎ 典型案例十一：垃圾焚烧锅炉项目过热器、省煤器改造

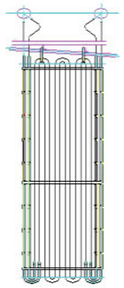
・Typical case 11: modification of superheater and economizer in the waste to energy boiler project

传统的垃圾焚烧炉过热器、省煤器结构，故障率高、检修频繁、且检修困难，给业主造成了一定的经济损失。故我方将过热器、省煤器的结构进行优化，并采用焊缝圆滑过渡（见下图），设计为漏点少、可以检修、方便更换的结构。

The traditional WTE boiler SH and ECO structure, with frequent failures, require constant and challenging maintenance and has caused economic losses to the owner. Therefore, WHEE has optimized the SH and ECO structure, and use the smooth transition of weld (see the figure below). Our design is proven to be with few leakage points, convenient maintenance and easy replacement.

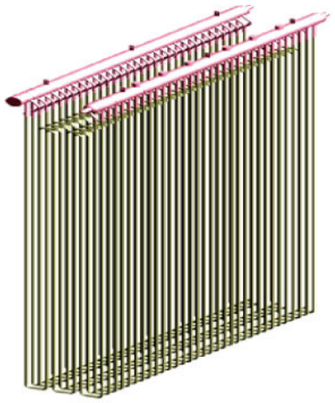


传统结构
Traditional structure



优化后结构
Optimized structure

焊缝圆滑过渡实物图
Smooth transition of weld



优化设计三维图
Optimized 3D design drawing

05 研发制造能力篇
Part V: R & D and Manufacturing Capabilities

☐ R&D and manufacture capacity | 研发 & 制造能力

200+ 名

拥有性能，标准，受热面，钢结构，工艺等专业的 200 多名工程师。

200+ Engineers

specialized in performance, standard, heating surface design, steel structure design, processing technology, etc.

+90%

采用参数化定制设计，设计出图效率提升 90%，可视化模拟安装现场，保障安装可靠性。

+90%

Design efficiency Tailor designed for client, the design efficiency increased by 90%, Visual simulation of erection procedure to ensure the reliability of Erection.

10000m²

10000 平米的厂房，专为余热锅炉模块组装新建。

10000 m²

workshop Specially built for the assembly of HRSG modules.

☐ R&D and manufacture capacity | 研发 & 制造能力

9 大体系
9 Systems

◆ ASME 体系	· ASME
◆ 质量管理体系	· Quality management system
◆ 环境管理体系	· Environmental management system
◆ 职业健康安全管理体系	· Occupational health and safety management system
◆ 知识产权管理体系	· Intellectual property management system
◆ 两化融合管理体系	· Information and industrialization integration management system
◆ 测量管理体系	· Measurement management system
◆ 研发管理体系	· R & D management system standardized management
◆ 党建标准化管理体系	· System of Party Building

☐ 体系证书全面 | Comprehensive system certificate

◎ 作为拥有 64 年创建历史的国有企业，公司高度重视制造质量。
◎ 1990 年，公司率先成为**全国 9 家 A 级锅炉制造许可证企业之一**；
◎ 1995 年 12 月，公司**首次通过 ISO19001 质量体系认证**；
◎ 1996 年 2 月，公司**首次获得 ASME 体系“U”“S”钢印认证**；
◎ 1999 年 12 月，公司**首次取得 A1、A2 压力容器设计、制造许可证**。
◎ 根据《特种设备生产和充装单位许可规则》的发布，2020 年调整为大型高压容器（A1）制造许可及固定式压力容器规则设计许可。我公司为无锡市唯一一家拥有 A1 级制造许可的单位。
◎ 2020 年 7 月，公司首次获得测量管理体系证书。
◎ 公司相继获得**国家二级企业、全国质量效益型先进企业、全国用户满意企业、中国工业行业排头兵企业**等荣誉称号。

- As a state-owned enterprise with a history of 64 years, WHEE attaches great importance to manufacturing quality.
- In 1990, we became one of the nine enterprises that obtained class A boiler manufacturing license in China.
- In December 1995, we passed ISO19001 quality system certification for the first time.
- In February 1996, we obtained the “U” and “S” steel stamp certifications of ASME system for the first time.
- In December 1999, we obtained the design and manufacturing license of A1 and A2 pressure vessels for the first time.
- According to the “Accreditation Criteria on Special Equipment Inspection Agencies”,the “design and manufacturing license of A1 and A2 pressure vessels” are converted to “the manufacturing license of large high-pressure vessel (A1) and the design license of fixed pressure vessel ” in 2020. WHEE is the only one with A1 level manufacturing license in Wuxi.
- In July 2020, we obtained the measurement management system certificate for the first time.
- WHEE has successively won the honorary titles of national second-class enterprise, national advanced quality and benefit enterprise, national user satisfaction enterprise, the leading enterprise of Chinese industry and so on.

Class A boiler manufacturing license
A 级锅炉制造许可证

The leading enterprise of Chinese industry
中国工业行业排头兵企业

National advanced quality and benefit enterprise
全国质量效益型先进企业

National second-class enterprise certificate
国家二级企业证书

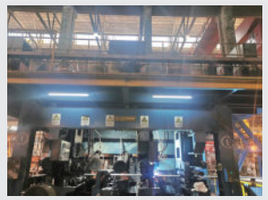
□ 制造质量保证 | Manufacturing quality assurance

作为特种设备的制造厂家，公司建立了系统的质量管理制度和程序，制定了标准的控制流程、具体的操作程序及操作指导书，来明确人员、具体工作内容以及需要达到的要求 , 同时配合专业的第三方监检机构及省市特种设备监察局对产品监督检查，以确保全过程的质量管控。

As a manufacturer of special equipment, WHEE has established systematic quality management systems and procedures, formulated standard control processes, specific operation procedures and operation instructions to clarify personnel, specific work contents and requirements to be met. Meanwhile, we cooperate with professional third-party supervision and inspection institutions and provincial and municipal special equipment supervision bureaus to supervise and inspect our products, so as to ensure the quality control of the whole process.

质量过程管理方法 Quality process management measures			
步骤 Step	过 程 Process	描 述 Description	管理方法 Management measures
1	质量管理体系运行控制 Operation control of quality management system	除每年至少一次对各相关部门进行内部审核及管理评审，审核覆盖公司的质量活动、产品和服务全过程外，由第三方 ASME 监检机构及省市市场监督局对体系运行进行监控。 In addition to the internal audit and management review of relevant departments at least once a year, which covers the whole process of the company’s quality activities, products and services, the operation of the system is monitored by the third-party ASME supervision and inspection institution and the provincial and municipal market supervision bureau.	《质量管理体系内部审核程序》 “Internal audit procedure of quality management system”
2	生产过程检验控制 Inspection control of production process	确保过程严格按照有关标准、法律法规、质量计划或形成稳健的程序，对生产过程中影响质量及生产过程的因素进行控制，以满足顾客的需求和期望，追求卓越产品质量。 Ensure that the process is in strict accordance with relevant standards, laws and regulations and quality plan. Form a robust procedure to control the factors affecting the quality and production process in the production process, so as to meet the needs and expectations of customers and pursue excellent product quality.	《生产过程控制程序》 “Production process control procedure”
3	不合格品控制 Control of nonconforming products	通过对不符合要求的产品标识、记录、隔离、评审和处置，防止其非正常使用或交付。 Prevent abnormal use or delivery of nonconforming products through identification, recording, isolation, review and disposal.	《不合格品控制程序》 “Nonconforming product control procedure”
4	外部供方管理 Management of external suppliers	建立供方评价档案，年初公布《供方定点一览表》，对外协、外购件、原材料按照质量特性进行分类管理。 Establish supplier evaluation files, publish the list of designated suppliers at the beginning of the year, and classify and manage outsourcing, purchased parts and raw materials according to quality characteristics.	《供方的选择、评价、监控、定期评价管理程序》 “Management procedures for supplier selection, evaluation, monitoring and regular evaluation”
5	质量改进控制 Control of quality improvement	改进服务以满足要求；纠正、预防和减少不利影响；改进质量管理体系的绩效和有效性。 Improve services to meet requirements. Correct, prevent and reduce adverse effects. Improve the performance and effectiveness of the quality management system.	《纠正措施控制程序》、《纠正措施控制程序》 “Corrective action control procedure”

□ 设备能力清单 | Equipment capacity list

设备类型 Type	数量 Quantity	具有代表性的先进设备 Representative advanced equipment	设备图片 Picture
研发试验类 R & D test	33	CFB 冷态流动机理实验系统 : 国内第一台实验设备 CFB cold flow mechanism experimental system: The first experimental equipment in China	
检验检测类 Inspection and detection	174	6Me 直线加速器：江苏省最大探伤设备 6Me linear accelerator: The largest NDT equipment in Jiangsu Province	
		X 射线数字实时成像系统：行业内最先引进使用 X-ray digital real-time imaging system: First introduced and used in the industry	
生产制造类 Production and manufacturing	1964	意大利 FACCIN 的数控液压卷板机：国内锅炉行业最大卷板能力的设备 Italy FACCIN's CNC hydraulic plate bending machine: the equipment with the largest plate bending capacity in the Chinese boiler industry	
		德国弯管线： 最先引进使用，并带动其他锅炉厂家步入蛇形管生产成线的生产模式 Germany imported tube bending line: First introduced and applied in China, and led other boiler manufacturers to enter the production mode of coil production line	
		日本日下部机械株式会社的 76 头膜式壁自动拼排焊机：全世界产量第一 76 head film wall automatic welding machine of Japan riyu Machinery Co., Ltd.: the largest output in the world	
生产制造类 Production and manufacturing	1964	膜式壁智能切割机器人： 国内首台膜式壁智能切割设备 , 可加工最宽 8000mm 的膜式壁 Membrane wall intelligent cutting robot: The first membrane wall intelligent cutting equipment in China, which can process membrane walls with a maximum width of 8000mm	
安全环保类 Safety and environmental protection	39	大型喷漆房：尺寸为 24m×6m×5m，拥有 VOCS 在线监测系统，是在行业内领先的喷漆设备 Large paint booth: 24m× 6m×5m in size, with VOCS online monitoring system. It is a leading paint spraying equipment in the industry.	
市政环境类 Municipal Environment	5	圆盘式污泥干化机： 1、拥有更好的能耗控制，较国外同类产品拥有更好的成本控制。 2、单位面积污泥干化量提高近 1 倍，污泥干化机热效率从 85% 升到 91%。 Disc sludge dryer: 1. It has better energy consumption control and better cost control than similar foreign products. 2. The sludge drying capacity per unit area was nearly doubled, and the thermal efficiency increased from 85% to 91%.	
热电运营类 Thermoelectric operation	1	智慧电厂系统：运用智慧电厂系统，以数据为基础建立数字化工厂管理、三维智能动态展示、融合互联网 + 概念，建设“智慧焚烧厂”。 Intelligent power plant system: be used to establish digital plant management, three-dimensional intelligent dynamic display, and integrate the Internet + concept based on data to build a “intelligent incineration plant”.