Ruichang
瑞昌环境工程

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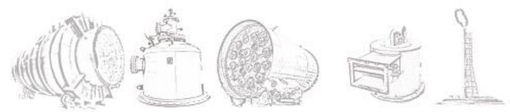

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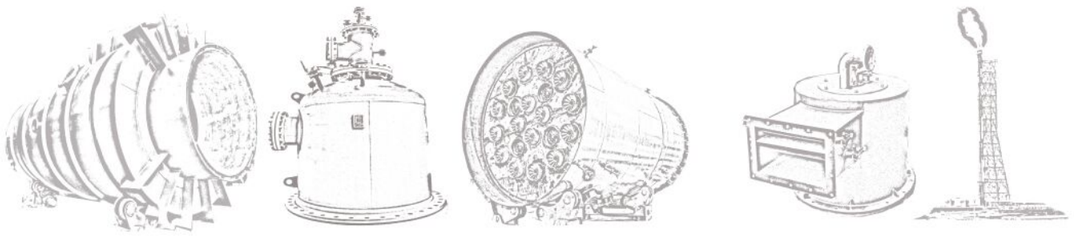
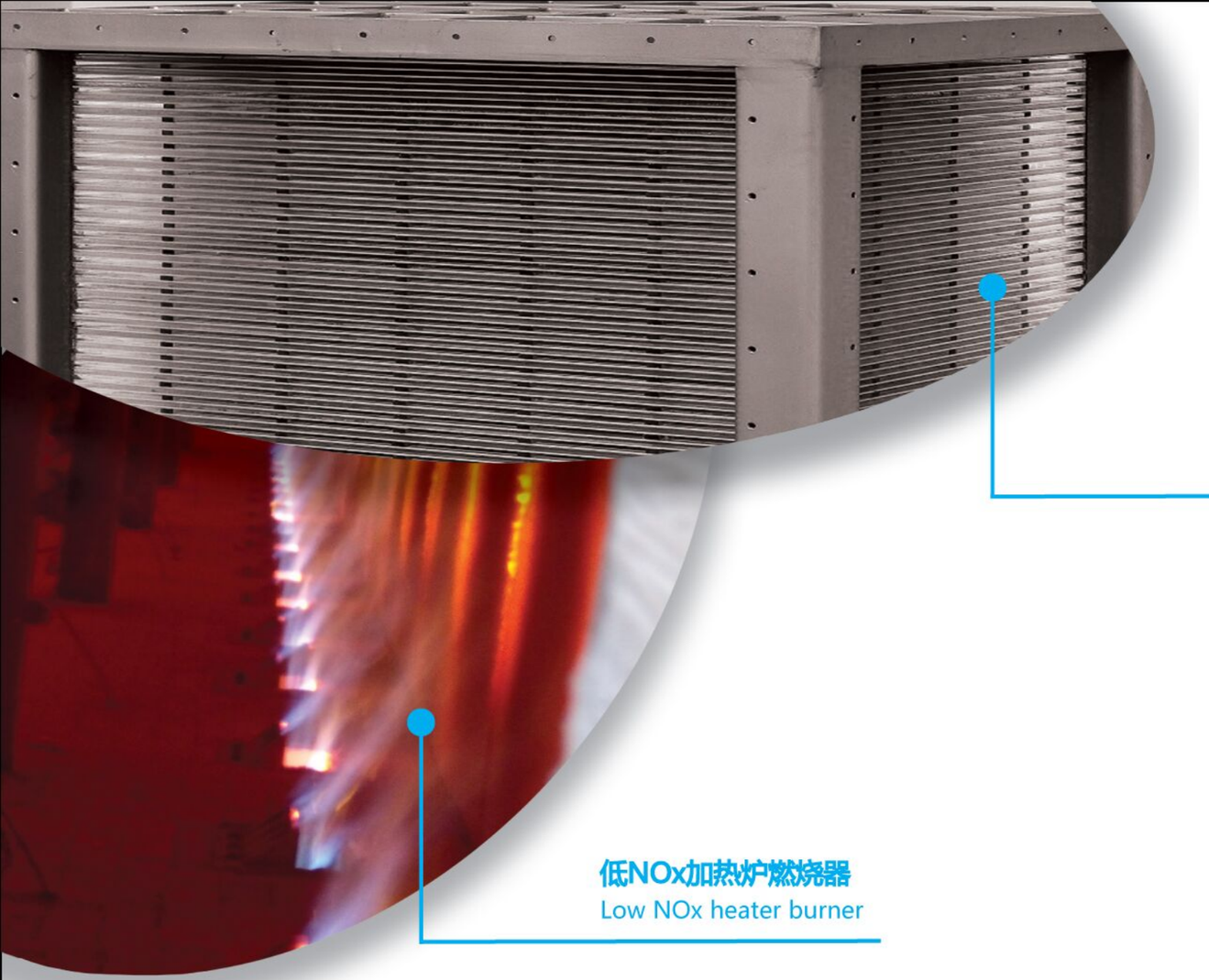


做中国**受尊敬的节能环保**技术公司

To be the respected energy saving & environ mental protection technlolgy company in China

- 国家高新技术企业
- 核心产品为各类环保型加热炉燃烧器,节能型催化设备（含复合耐磨陶瓷喷嘴的内件）,大型硫磺回收、废气、废液焚烧装置等环保成套设备以及高可靠的火炬系统,REGLASS非金属板换
- 低NOx环保燃烧器、高温（助燃空气温度大于450℃）制氢燃烧器、超大型CO焚烧炉燃烧器、RT耐磨陶瓷喷嘴、低压降节能设备、硫磺回收燃烧器、REGLASS非金属板转换等六十多项国家专利，火炬、焚烧系统均采用行业领先的UOP Callidus技术
- 中石化物资采购电子商务网一、二级网络成员、中国石油一级供应商网络成员单位、中国海油采办业务系统成员单位
- 拥有GB/T19001/ISO9001，GB/T24001/ISO14001，GB/T28001体系认证和一 二类压力容器设计、制造许可证及GC2压力管道设计许可证
- ASME（美国机械工程师协会）“U”、“U2”钢印证书
- 2013年瑞昌石化与美国霍尼韦尔（Honeywell）及其控股公司UOP Callidus签订战略联盟协议
- 位于洛阳的Honeywell-UOP-瑞昌石化亚太联合研发中心，包含多个加热炉实验平台和火炬实验平台

- National high and new technology enterprise
- Core products are all kinds of environmentally friendly heater burner, energy-efficient FCC equipment (including composite anti-wear ceramic nozzle internal) and complete set of equipment for SRU, waste gas, waste liquid combustion and highly reliable flare system, REGLASS nonmetal plate heat exchanger
- Over 50 national patents covering low NO_x environmental protection burner, high temperature(combustion air temperature over 450℃),super large CO incinerator burner, RT anti-wear ceramic nozzle, low pressure drop energy saving equipment, SRU burner and the flare and combustion equipments adopt UOP Callidus' core technology
- SINOPEC procurement e-network 1st and 2nd network member、CNPC 1st class vendor network member、CNOOC procurement platform member
- With GB/T19001/ISO9001,GB/T24001/ISO14001,GB/T28001 system certificate and level1，level2 pressure,vessel design and fabrication certificate and GC2 pressure piping design certificate.
- ASME U & U2 certificates
- In 2013, RC has signed strategic alliance agreement with Honeywell and its subsidiary UOP Callidus
- Honeywell UOP and RC AP joint R&D center is built in Luoyang, including multiple heater platforms and flare testing platform

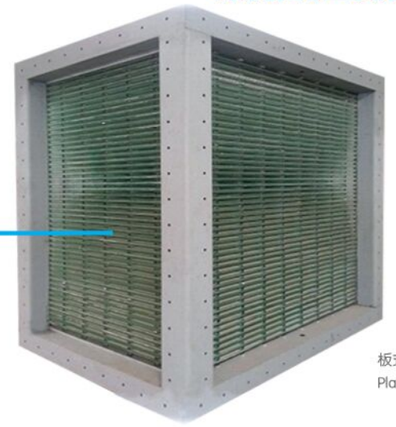


低NOx加热炉燃烧器
Low NOx heater burner

高效燃烧的同时
更加注重**环境的保护**

Pay much more attention on environmental protection during high efficient combustion

REGLASS®
瑞格拉斯



板式空气预热器
Plate air preheater

我公司自主研发的REGLASS玻璃板式换热器（发明专利号：ZL201010595778.3），主要应用于石化行业加热炉系统空气预热器装置上。相较于传统换热器，该产品具有抗腐蚀、压降低、结构轻巧、安装维修方便等优势。

REGLASS glass plate heat exchanger (patent number: ZL201010595778.3), which is independently R&D by our company, mainly used on air pre-heater petrochemical industry, Compared to conventional heat exchangers, this product has the advantages of corrosion-resistant, low pressure drop, compact structure, easy installation and maintenance.

茂名石化240万吨/年渣油加氢装置
玻璃板式空气预热器
Glass Plate Heat Exchanger 2.4 million ton/ year residue oil hydrotreating unit for Maoming Petrochemical

技术特点：

1、耐腐蚀性能优良——除氢氟酸外，完全抵抗其他所有酸性物质腐蚀。

2、流动阻力低——换热片表面光滑平整，流道通畅，流动阻力低，压降小。

3、不易积灰，易于清洗——换热片间距适宜，表面光滑，气体流速高，不易积灰；可在线/离线水喷淋清洗

4、安装方便，空间适应性强——单机模块化设计，可采用各种组合方式拼接，灵活方便，现场安装施工量小。

5、使用寿命长——非焊接组装，换热片无应力集中，使用寿命长。

6、密封性好，泄漏量少——采用多重密封材料混合密封，板片两侧气体压差小于8Kpa时，泄漏量小于3%。

Features:

1, Excellent corrosion resistance– Except for hydrofluoric acid, completely resistant to all other acidic corrosion.

2, Low flow resistance– Flat and smooth on fin surface with fluent flow channel makes it low flow resistance and pressure drop.

3, Hard to dust deposition, easy to clean– Suitable spacing on fins, smooth surface with high gas flow rate makes it hard to dust deposition; and online / offline water spray cleaning is available

4, Easy installation, strong space adaptability– Independent modular design for various types of combinations assembly, and this flexibility makes on-site installation volume low.

5, Long service life– Non-welding assembly, no stress concentration on heat exchange fins, long service life.

6, Good sealing, less leaking– Use multiple sealing materials for composite sealing, pressure differential is less than 8Kpa on two sides of fin, and leakage rate is less than 3%.

拥有40余项燃烧专利技术，自行设计的低氮氧化物燃烧器采用燃料分级技术，分散燃烧，同时还与美国霍尼韦尔（Honeywell）及其控股子公司UOPCallidus合作，采用其先进技术，可生产NOx排放低于国家环保部特别排放限定的燃烧器。

With over 40 patents, our self designed low NOx burner is using fuel staged technology and scattered combustion. meanwhile, we cooperated with Honeywell's subsidiary UOP Callidus, by using their advanced technology, we can produce burners which the NOx level is lower than state environmental protection agency's special emission limit.

1996-2015年氮氧化物(国标排放限值变化）

1996年《大气1996年污染物综合排放标准》
GB16297-1996

2015年《石油炼制工业污染物排放标准》
GB31570-2015

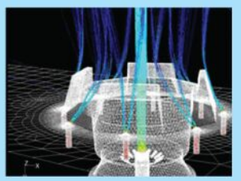
超低NOx加热炉燃烧器
Ultra-low NOx heater burner

顶烧火焰
down fire flame

高温制氢燃烧器
High temperature hydrogen generation burner

低氮氧化物附墙环保分级
焦化燃烧器火焰
Flame of low NOx attached wall staged coking burner

位于洛阳的
霍尼韦尔-凯勒特-瑞昌
燃烧测试中心
Honeywell-UOP Callidus-Ruichang combustion test center in Luoyang



燃烧器CFD流线图
The burner CFD simulation diagram

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环保压力日趋严峻，
国家对NOx排放要求日趋严格
氮氧化物是一种危害人体健康和破坏大气环境的剧毒污染物，
主要是在燃烧过程中产生的。

Environmental protection stress is becoming increasingly serious;
the requirement to the NOx discharge from the state is gradually strict.
Oxynitride is a kind of toxic pollutants that is harmful to human health and
can destroy the atmospheric environment, it is mainly produced in burning.

国务院印发《大气污染防治行动计划》，根据要求，重点行业主要大气污染物排放强度到2017年底下降30%以上。

拟颁布的《石油炼制工业污染物排放标准》2013版中规定现有和新建企业大气污染物特别排放限值“工艺加热炉氮氧化物排放指标100mg/NM3（相当于50ppm）”。

拟颁布的中国石油天然气集团公司企业标准《管式炉燃烧器技术规定》烧气燃烧器的NOx排放浓度应不大于100mg/Nm³（相当于50ppm）。

The State Council printed and distributed “atmospheric pollution prevention action plan”, according to the requirement, the main atmospheric pollutant discharge intensity of key industries should reduce more than 30% by the end of 2017.

Planning to issue “petroleum refining industry pollution discharge standard” of 2013 edition, it stipulates the special emission limits “process heating furnace NOx emission index 100mg/NM（equal to 50ppm）of atmospheric pollution for the existing and new enterprises.

Planning to issue company standard of China National Petroleum Corporation “Tube furnace burner technical regulations”, the NOx emission concentration of gas-burning burner should be not more than 100mg/Nm^3（equal to 50ppm）.

传统石油炼制企业
工艺加热炉NOx控制缺陷

NOx control methods of process heating
furnace in petroleum refining enterprises.

1、大多数石油炼制企业拥有的工艺加热炉，炉膛温度一般小于900℃，数量众多且负荷和炉温都不相同。

2、烟气脱硝工艺路线复杂，且投资运行成本高，只能依靠低氮燃烧技术控制氮氧化物产生

3、与催化裂化装置的NOx控制方法不同，催化裂化装置是先产生再消除。而工艺加热炉采用低氮氧化物燃烧器是从源头来减少氮氧化物的产生。

1、For the process heating furnace owned by majority of petroleum refining enterprises, furnace chamber temperature generally is less than 900℃, both load and furnace temperatures are different.

2、De-NOx process route is complex, and investment operation cost is high, so it can only rely on the low-NOx combustion technology to control the generation of NOx.

3、 Different from the NOx control method in catalytic cracking unit, catalytic cracking unit is generating first, then eliminating. But the process heating furnace adopts the low NOx burner to reduce the generation of NOx from the source.

瑞昌超低NOx燃烧器特点：

新一代的超低NOx燃烧器采用最新的燃烧技术，能够在工艺加热炉NOx产生的源头，也就是燃烧的火焰区，抑制NOx的产生，极大的降低加热炉NOx的排放，生产NOx排放值低至30ppm的燃烧器。具有以下特点：

1、燃料分级技术，采用两套独立燃料枪将燃料分别从火道砖的内侧和外侧送入燃烧器。

2、耐火砖采用独特的异型结构，具有先进的配风理念，保证了燃烧的高稳定性和高可靠性。

3、燃料配入形式和耐火砖的结构也构成低氧燃烧技术，极大的降低了热力学NOx的排放。

4、采用烟气再循环技术，来降低火焰区的温度，抑制热力学NOx产生。

5、本燃烧器与传统燃烧器相比，可实现更低的NOx排放，最低可低至30ppm。

Ruichang Ultralow NOx Burners’ Feathers:

The new generation of ultralow NOx burners adopts, it can suppress the generation of NOx in the NOx generating source of process heating furnace NOx, also it is the burning flame zone, greatly reduce the NOx discharge of heating furnace, RC produces burners that the NOx discharge can be lowed to 30ppm, they have the following features:

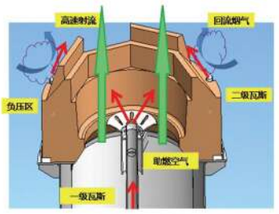
1、Fuel staged division technology, adopting two individual fuel guns and injecting the fuel into the burner separately from the inner side and outer side of the flame channel tile,.

2、Refractory brick adopts unique special-shaped structure, it has advanced air distribution concept, it can make sure the high stability and high reliability of the combustion.

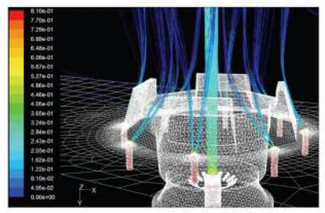
3、The fuel distribution type and refractory brick structure forms the low-oxygen combustion technology, greatly reducing thermodynamics NOx discharge.

4、Adopting flue gases recycle technology, to reduce the temperature in flame zone, suppress the generation of thermodynamics NOx.

5、Compared with the traditional burners, this kind of burners can realize lower NOx discharge; the minimum can be lowed to 30ppm.



燃料分级与烟气回流技术
Staged combustion and fume gas-self-flow back technology



燃烧器CFD流线图
The burner CFD simulation diagram

超低NOx燃烧器火焰
Ultralow NOx burner flame

超低NOx燃烧器使用证明
The usage verification of ultralow NOx burner

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REGLASS® 瑞格拉斯

工业湿烟气低温
冷凝加热消白烟技术

为碧水蓝天提供
优良设备
有效降低烟气
污染物排放

For the clear water and blue sky
Excellent equipment
Effective flue gas reduction
Pollutant emissions

技术介绍： Technology Introduction

“急迫性”：工业湿烟气在烟囱口排入大气的过程中因温度降度，烟气中部分汽态水和污染物会发生凝结，在烟囱口形成雾状水汽，雾状水汽会因天空背景色和天空光照、观察角度等原因发生颜色的细微变化，形成“有色烟羽”，通常为白色、灰白色或蓝色等颜色。

Urgency: During the industrial wet flue gas dischargedfrom the chimney into the atmosphere, because of abrupt temperature drop, vapor water from wet flue gas and pollutant condense and form foggy vapor. The color of foggy vapor changes slightly due to the background color of the sky and the viewing Angle. And white, grey, blue are common, we call it “Colored smoke plume”

有色烟羽常常携带大量盐类等超细颗粒物，直接排放，对环境影响大，是诱发雾霾的元凶之一。

“政策性”：上海、浙江、天津、河北等地要求燃煤电厂采取烟温控制及其他有效措施消除石膏雨、有色烟羽等现象。

“可行性”：加热空气冷凝的低温湿烟气，通过降低烟气中的水含量，同时提高烟气的不饱和度，可以有效降低或消除白烟的产生。同时，通过烟气中水蒸气凝结后生成的冷凝液吸收烟气中的硫酸盐和硝酸盐等物质，可有效减少超细颗粒物的排放。

Thecolored smoke plume often carries a large amount of superfine particulate matter, such as salt. And have great impact on the environment if it was discharged directly into the air, also, It is one of the main causes of smog.

Policy: Shanghai, Zhejiang, Tianjin, Hebei and other places require coal-fired power plants to adopt smoke temperature control and other effective measures to eliminate the phenomenon of gypsum rain and colored smoke plume.

Feasibility: Heating air condensing wet flue gas at low temperature. By reducing the water content in flue gas while improving the flue gas saturation, it can effectively reduce or eliminate the production of white smoke. Meanwhile, through absorbing materials such as sulfate and nitrate in flue gas by condensation generated of water vapor in flue gas condensate, which can effectively reduce the emission of ultrafine particles

适用行业：
石油、化工、电力、钢铁、焦化、锅炉等行业
适用范围：
0~10KPa，250℃以下，气—气换热环境（特别适用于腐蚀性气体环境）

Applicable industries:
Petroleum, Chemical Industry, Electric Power, Coking and Boilers etc.
Application range:
0~10KPa，below 250℃, air to air heat exchanging environment (especially for corrosive gases condition)

工艺方法： Techniques

湿烟羽治理的技术路线主要有：

（1）加热法：在一定条件下，能消除湿烟羽，但随环境温度降低、环境湿度提高彻底消除湿烟羽变得不经济。

（2）降温冷凝法：在一定条件下，能消除湿烟羽，但随环境温度降低、环境湿度提高，不能完全消除。

（3）空气冷凝混兑法：在一定条件下，能消除湿烟羽，但随环境温度降低、环境湿度提高，不能完全消除。

（4）空气冷凝再热法：适应范围最广，技术经济性能较好。

Heating method: Could eliminatewet smoke plume under certain conditions, however, with the ambient temperature decrease and humidity increase, complete elimination will getting more and more uneconomic.

Cooling & condensing: Could eliminate wet smoke plume under certain conditions, but cannot eliminate it totally with the ambient temperature decrease and humidity increase.

Air condensing and blending: Could eliminate wet smoke plume under certain conditions, but cannot eliminate it totally with the ambient temperature decrease and humidity increase.

Air condensing and reheating: The widest range of adaptation, and better technical and economic performance

江苏通达热电脱硫湿烟气除湿脱白项目
Jiangsu Tongda project

唐山天茂实业冲渣乏汽除湿脱白项目
Tangshan Tianmao project

原现场工况

Reglass启动后

创新技术应用
有效提高客户价值

The application of innovative technologies effectively improve the customer value

大型催化设备
FCC

一、催化陶瓷喷嘴和催化进料喷嘴

自主研发、生产的专利产品RT耐磨陶瓷喷嘴，已广泛应用于国内催化装置反再系统中各类分配器、降压孔板、临界流速喷嘴等产品。国内炼油行业90%以上的客户使用我公司的RT陶瓷喷嘴。被LPEC、SEI、CEI等国内著名的设计工程公司认可、推广。

A. FCC ceramic nozzle and FCC feed nozzle

The independent R&D and patent product RT FCC ceramic nozzle has been widely used in each type of distributor, decompression orifice plate, critical nozzle for domestic FCC unit reverse regeneration system. over 90% of domestic refinery clients use RT ceramic nozzle made by our company. And this product has been recognized and recommended by domestic famous engineering company, such as LPEC, SEI and CEI.

RT耐磨陶瓷喷嘴
RT anti-wear ceramic nozzle

催化进料喷嘴
FCC feeding nozzle

应用RT耐磨陶瓷喷嘴的降压孔板
Decompression orifice plate which equipped with RT anti-wear ceramic nozzle

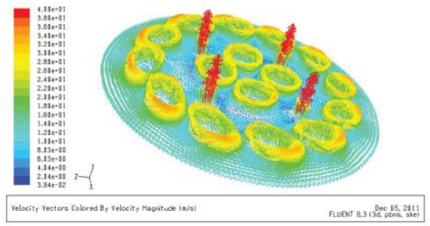
大孔分布板
large hole distribution plate

二、超大型CO焚烧炉燃烧器

应用我公司发明专利CO焚烧炉燃烧器可使焚烧后烟气CO排放低于50ppm；炉膛无多余开口，整体性好且结构紧凑，现场施工简便、稳定性高，成本低。

B. Large CO incinerator burner

By using our company's innovation patent CO incinerator burner, CO emissions of flue gas can reach to 50ppm, meanwhile, no extra opening is needed at hearth, the overall structure is good and compact, easy for site construction, high stability and low cost



低压降设备
Low Pressure Drop Energy-saving Equipment

低压降辅助燃烧室：低压降节能辅助燃烧室与老式辅助燃烧室相比可降低压降60~90%，可达到300Pa以下。

新型低压降水封罐：新式水封罐的压降可比原水封罐压降减小50%~80%，最小可达到300Pa以下。

Low pressure drop auxiliary combustion chamber: low pressure energy saving auxiliary combustion chamber compared with old type, the pressure drop can reduced by 60~90%, which can reach to below 300Pa

New model water sealed tank: compared with original version, pressure drop can reduce by 50~80%, the minimum level can reach to below 300Pa

新型低压降水封罐
New model low pressure drop water sealed tank

镇海炼化300万吨/年催化裂化装置
辅助燃烧室改造后现场图
3 million ton/year FCC equipment auxiliary chamber site shoot after upgrade in Zhenhai refinery

吉林石化140万吨/年催化
低压降水封罐使用现场
J1.4 million ton/year low pressure drop water sealed tank site application in Jilin Petrochemical

10万吨硫磺燃烧器
100,000 ton/year SRU Reactor

硫磺回收装置硫磺回收和焚烧系统
The sulfur recovery and combustion system unit

公司不断加大自主研发力度，在大型硫磺回收装置（10万吨/年以上）燃烧器等关键设备领域取得重大创新成就，性能已达到了国外同类产品技术水准，大量工业应用业绩证明完全可以替代进口。

With continuously increasing on independent research and development, company has gained major innovation achievements on the key equipment, such as large SRU (over 100,000 ton/year) and burners, their performance have reached the same level with foreign products, with large amount of industrial application, it has been proved that these products can completely replace the imported ones.

全面的解决方案
推动更高的回报价值

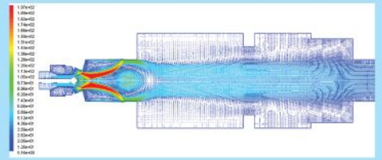
Comprehensive solution
Promote higher return value

硫磺回收装置反应炉
SRU reactor

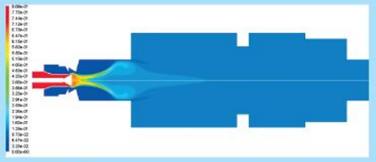
硫冷凝器
Sulfur condenser

废热锅炉
Waste heat boiler

酸性气燃烧器CFD模拟图



炉内速度矢量分布
Velocity vector distribution in the furnace

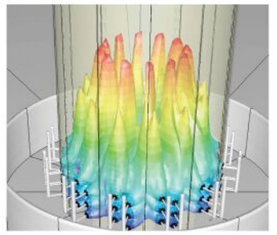


炉内H_2S分布
H_2S distribution in the furnace

火炬系统
flare system

火炬排放系统用于处理炼油、化工、油气田等企业生产工艺装置排放的可燃或有毒可燃气体，是国家环保要求也是确保企业安全运行的设备。我公司和UOPCallidus通过战略联盟合作，实现强强联合，提供世界领先的火炬和火炬系统。

Flare emission system for dealing with flammable and toxic flammable gas from companies for oil refining, petro-chemical, oil and gas filed. It is the requirement of state environmental protection and also the equipment to ensure enterprise safety operation. By building up strategic alliance cooperation with UOP Callidus, and achieve win-win partnership, we provide world leading flare and flare system.



全封闭地面火炬CFD模拟图
TEGF CFD simulation diagram

全封闭式地面火炬
Totally enclosed ground flare

高架火炬
high stack flare

可拆卸高架火炬
dismountable flare

长明灯
Pilot

废气焚烧
系统化综合处理技术

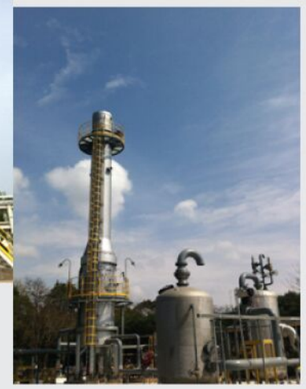
Integrated process technology of exhaust gas burning

瑞昌为炼油、化工、精细化工、煤化工、VOC、MTO等行业量身定制含氯、氟、氨、硫化氢、氰化物、聚合物、非甲烷烃、苯系类等有害废气焚烧系统。燃烧效率≥99.99%，焚毁去除率 ≥99.99% 。具备开发工艺包能力，已拥有多套焚烧系统在炼油化工等行业稳定运行。

Ruichang customize solutions of exhaust gas burning such as chlorine, fluorine, ammonia, hydrogen sulfide, cyanide, polymer, NMHC, DNTs for oil refining industry, chemical industry, fine chemical industry, coal chemical industry, VOC and MTO industry. Combustion efficiency≥99.99%, destruction and removal efficiency(DRE) value≥99.99%. Ruichang has the ability of development of process design package, and we have had several combustion systems running stably in oil refining and chemical industry

中化蓝天霍尼韦尔新材料有限公司
含氟废气处理装置
Processing unit of waste gas containing fluoride
Sinochem Blue Sky Honeywell New Materials Co., Ltd

应用案例 Applications



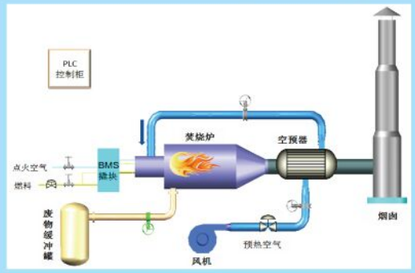
上海金山石化水务部有机废气处理装置
Organic waste gas processing unit
Water Department of Shanghai Jinshan Petrochemical Plant

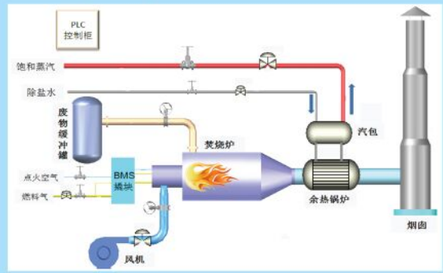
更低的排放
满足日日益提高的环保标准

Lower emission
Satisfy the rising environmental protection standards

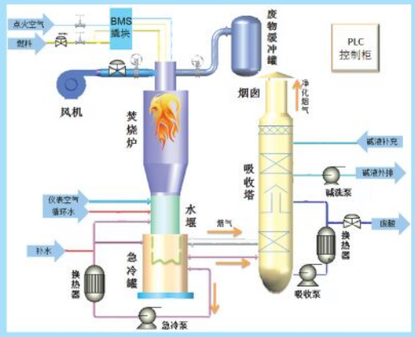
焚烧类型介绍
Introduction of combustion types

废气焚烧及余热回收系统
System of exhaust gas burning and waste gas recovery

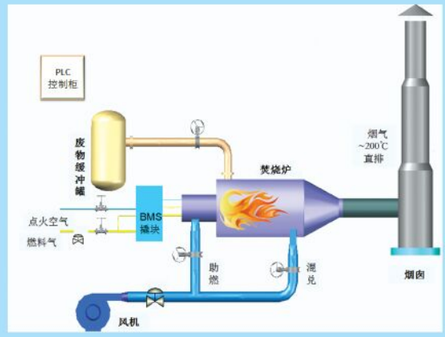




废气焚烧及烟气净化吸收系统
System of exhaust gas burning and fuel gas’ s absorption and purification



废气焚烧及烟气混兑直排系统
System of exhaust gas burning and fuel gas’ s absorption and purification



创新科技
引领节能减排

Innovative technology leads energy saving and emission reduction

半干法烟气脱硫技术

Semidry Flue Gas Desulfurization Technology

循环流化床半干法烟气脱硫技术在石化行业主要应用于硫回收装置尾气单元酸性气处理、FCC装置烟气处理、制酸装置含酸雾烟气处理等领域。

系统高于露点温度运行，无需防腐；无废水产生，干态副产物易处理；投资运行费用低；系统流程短，占地少；动设备少，维修量小；全自动控制，运行安全可靠，脱硫效率高。

Circulating fluidized bed (CFB) Semidry Flue Gas Desulfurization Technology (SFGDT) is mainly used in these areas, such as tail gas unit acid gas treatment of SRU, fuel gas treatment of FCC unit and fuel gas containing acid mist treatment of sulfuric acid unit.

The system operates above the dew point temperature, so there's without anticorrosion; No waste water produced and dry state by-products are easy to treat; Low cost, short process, less land occupation; Less rolling equipments, smaller maintenance; Full automatic control, safe and reliable operation, and high

吸收剂：成品消石灰$Ca(OH)_2$粉末（300~400目）

反应塔：循环流化床

反应原理：喷雾增湿活化脱硫剂并使之多次循环使用

入口SO_2含量：200~20000mg/Nm^3；烟气量：2000~100万Nm^3/h；

性能保证：SO_2：＜100mg/Nm^3，粉尘＜20 mg/Nm^3

（特殊地区可满足SO_2＜50mg/Nm^3）

Absorbent: power of $Ca(OH)_2$, 300~400 mesh

Reaction tower: CFB

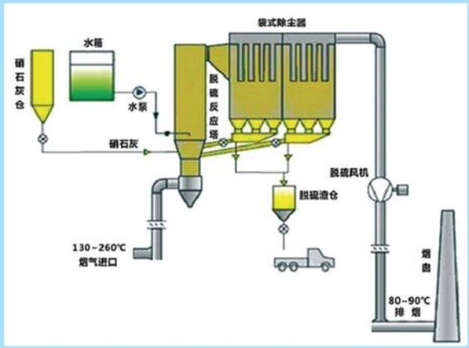
Reaction theory: Spray humidification activates the desulfurizer and makes it recycled.

Inlet content of SO_2: 200~20000mg/Nm^3; flue gas exhaustion: 2000~1 million Nm^3/h;

Performance Guarantee: SO_2：＜100mg/Nm^3，dust＜20 mg/Nm^3

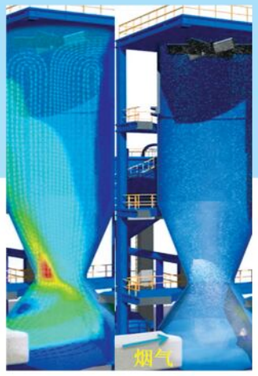
（for special area, SO_2＜50mg/Nm^3）

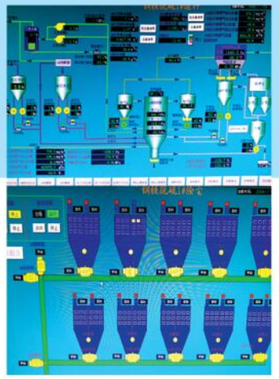
系统流程图 System flowchart

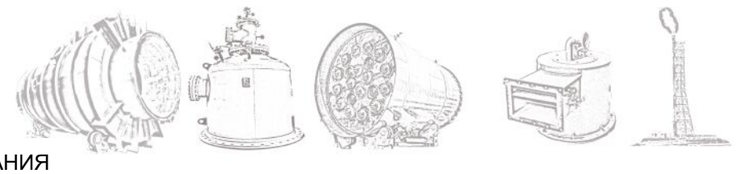


- 吸收剂料仓及输送系统
- 循环流化床反应塔
- 布袋除尘器系统
- 吸收剂再循环系统
- 工艺水系统
- 烟气系统
- 脱硫灰输送系统

- Absorbent bin and delivery System
- Circulating fluidized bed reaction tower
- Bag precipitator system
- Absorbent recirculation system
- Process water system
- Fuel gas system
- Desulfurized fly ash delivery System







ООО «ТИ-СИСТЕМС» ИНЖИНИРИНГ И ПОСТАВКА ТЕХНОЛОГИЧЕСКОГО ОБОРУДОВАНИЯ
Интернет: www.tisys.ru www.tisys.kz www.tisys.by www.tesec.ru www.ти-системс.рф
Телефоны: +7 (495) 7774788, 7489626, (925) 5007155, 54, 65
Эл. почта: info@tisys.ru info@tisys.kz info@tisys.by

To join hands in creating a better future with you

与您携手 共创美好未来

霍尼韦尔（Honeywell）及其控股子公司UOP Callidus和瑞昌战略联盟

The Strategic Alliance has formed between Ruichang and Honeywell, together with its subsidiary, UOP in January 2013.

Certificate of Authorization
授权证明

Dear Valued Customers,
尊敬的客户：

Effective from January 15, 2013, Callidus Technologies L.L.C. and Luoyang Ruichang Petrochemical Equipment Co., Ltd. have entered into a strategic alliance to serve our customers in mainland China. Subject to the terms and conditions of this strategic alliance, Ruichang is authorized to market, sell, manufacture and service licensed UOP Callidus combustion equipment including Process burners, Flare systems, and Thermal Oxidizers as listed in appendix attached hereto.
自 2013 年 1 月 15 日起生效，Callidus Technologies L.L.C.和洛阳瑞昌石油化工设备有限公司（"瑞昌"）订立一份战略联盟以服务于中国大陆地区的客户。取决于这份战略联盟的条款和条件，瑞昌被授权市场推广、销售、制造经技术许可的 UOP Callidus 燃烧设备（包括工艺燃烧器、火炬系统和热氧化炉，如附件所详述）并提供售后服务。

Sincerely,
此致

Callidus Technologies L.L.C.

By/签字: Doyle Bishop
Doyle Bishop

UOP Callidus授权证明
UOP Callidus Certificate of Authorization"

Honeywell

STRATEGIC ALLIANCE AGREEMENT
战略联盟协议

This Strategic Alliance Agreement (this "Agreement") is entered into by and between:
本战略联盟协议（本"协议"）由下列双方签订：

Party A: Honeywell (China) Co., Ltd.
甲方：霍尼韦尔（中国）有限公司

Name /姓名: Zhang Yi Feng
Title /职位: Vice President and General Manager, Honeywell Performance Materials & Technologies, Asia Pacific/霍尼韦尔特性材料和技术集团亚太区副总裁兼总经理
Address for Notices /通知地址: 430 Lihing Road, Zhangjiang Hi-tech Park, Pudong New Area, shanghai 201203., PRC, Attn: General Counsel, Honeywell Performance Materials &Technologies, Asia Pacific/ 中国上海浦东新区张江高科技园区李冰路 430 号（邮编 201203），收件人：特性材料和技术集团亚太区总法律顾问

Party B: Luoyang Ruichang Petrochemical Equipment Co., Ltd.
乙方：洛阳瑞昌石油化工设备有限公司

Name /姓名: Lu Bo/陆波
Title /职位: General Manager /总经理
Address for Notices /通知地址: No.8 Yangguang Road, High-tech Zone, Luoyang City, Henan Province 471003, PRC, Attn: Lu Bo/中国河南省洛阳市高新技术开发区阳光路 8 号（邮编 471003），收件人：陆波

This Agreement has been executed by the authorized representatives of the Parties on January 15, 2013.
本协议自于 2013 年 1 月 15 日由以下授权代表签署。

HONEYWELL (CHINA) CO., LTD.
霍尼韦尔（中国）有限公司

By/签字: Zhang Yi Feng
Name/姓名: Zhang Yi Feng
Title/职位: Vice President and General Manager, Honeywell Performance Materials & Technologies, Asia Pacific/霍尼韦尔特性材料和技术集团亚太区副总裁兼总经理

LUOYANG RUICHANG PETROCHEMICAL EQUIPMENT CO., LTD.
洛阳瑞昌石油化工设备有限公司

By/签字: Lu Bo
Name/姓名: Lu Bo/陆波
Title/职位: General Manager/总经理

霍尼韦尔(Honeywell)与瑞昌石化战略联盟协议
The Strategic Alliance Agreement between Honeywell and Ruichang

霍尼韦尔–UOP Callidus –瑞昌联合亚太研发和测试中心
The asia–pacific R&D and testing center of Honeywell UOP Callidus and RCPC union.

UOP凯勒特技术 + 瑞昌创新 = 能效提升及大力减排的解决方案

UOP Callidus technology + Ruichang innovation = Solutions to improve energy efficiency and significantlyreduce waste and emissions.

霍尼韦尔（Honeywell）及其控股子公司UOP Callidus和瑞昌战略联盟，使得双方可以通过运用世界顶尖燃烧技术制造的过程加热炉燃烧器，火炬，热氧化炉为中国炼化及石化行业服务。中国正朝可持续发展方向转变，这样的联盟将帮助工业用户提升能源效率，并极大的减少废物和废气排放来满足日益严格的标准。

The UOP and Ruichang strategic alliance brings UOP Callidus' industry leading technology to Ruichang' sportfolio, allowing them to serve the Chinese refining and petrochemical industries with process heater burners, flares, and thermal oxidizers utilizing the world' s best combustion technology. As China transitions towards sustainability practices, this alliance will help industrial customers improve energyefficiency and significantly reduce waste and emissions to meet increasingly stringent standards.

物资采购电子商务网一、二级网络成员
SINOPEC procurement e-network 1st and 2nd network member

一级供应网络成员单位
CNPC 1st class vendor network member

中国海油采办业务系统成员单位
CNOOC procurement platform member