



Shuttle kiln 梭式窑

Tunnel kiln 隧道窑

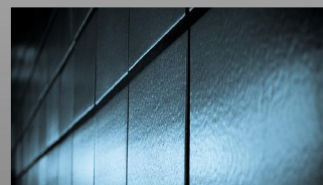
Roller kiln 辊道窑

Hi-Temp. Oven 高温窑

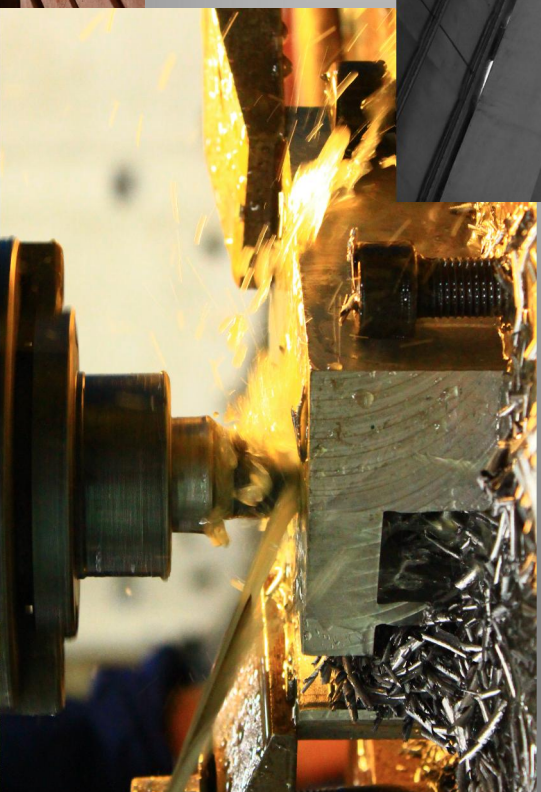
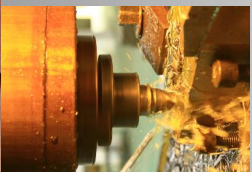
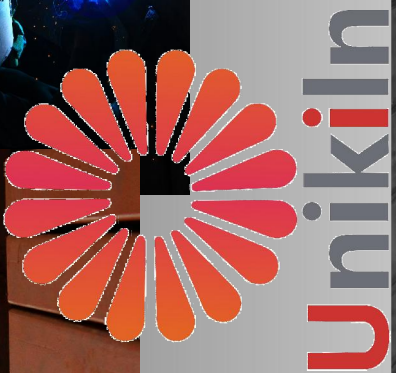
Dryer 干燥器



Industries we strive to



欧科窑业





be part of your success

Sanitary ware 卫生陶瓷

Tableware 日用瓷

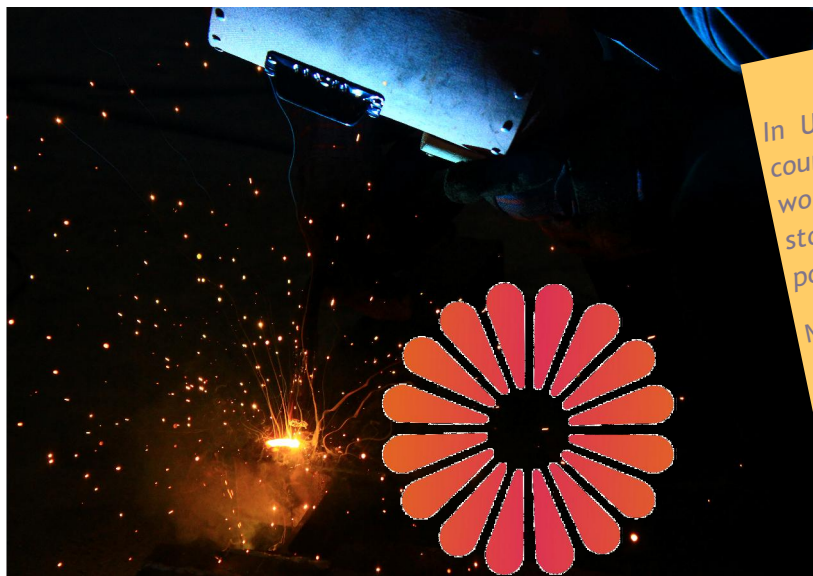
Tiles 瓷砖

Solar Energy 太阳能石英陶瓷

Insulator 绝缘陶瓷

Advance Ceramic 先进陶瓷

欧 科 窑 业



Unikiln

杰出的团队

TEAM

We are proud of our outstanding team who are dedicated to the substantial developments.

They are the most valuable property beyond any facility. Most of them are with rich experience in line with the firing engineering, meanwhile with the background of working for famous international kiln companies and their involvement of the projects allow us the integration of the technology worldwide.



持续提高，永不止步

More than 15 years experience,
assured customers across continents,

VALUE

In Unikiln, the open minds are being encouraged, the serious and circumspect working style is being initiated, the non-stop learning and innovation are being empowered.

Meeting the high standard of our products and service, we put our efforts onto being the leader in the relative segment of thermal engineering providers.

We do believe that only customers' success can generate our accomplishments..

共赢的理念

卫生陶瓷, 日用陶瓷, 太阳能石英坩埚, 绝缘陶瓷, 功能陶瓷领域内经验丰富, 可靠的热工伙伴。提供隧道窑、梭式窑, 高温窑及热工方案的制造, 安装, 调试的专业服务。

ABOUT

Unikiln,

your reliable partner of thermal facilities and devices;

We focus on the design, manufacturing of **shuttle kiln, tunnel kiln, and roller kiln** along with its afterwards service;

The commitments to our customers are assured by both in-depth thermal engineering design, edge firing technology and fine organized manufacturing;

We do believe there is no success unless our customers' success in advance;

We also believe that there is no one-for-all type kiln so we provide our unique customized solution to any individual customer by intensively understanding their needs to meet;

Our activities are concentrated on the below industries:

Sanitary wares | Ceramics Tiles |

chinaware | Photo Voltage |

Advance Ceramics | Insulators





SHUTTLE KILN

梭式窑

IN GERNERAL | 总体描述

SK SERIES

Technical Range

content	指标	单位	Value
Useful Volume	有效容积	m ³	3~200
Max. Temperature	最高温度	C	1400
Kiln car	窑车	set	1~15
Max. Setting Width	最大有效宽度	mm	4200
Max. Setting Height	最大有效码高	mm	1800
Flue Gas Temp.	排烟温度	C	< 250
Firing Cycle	烧成周期	hr	16~168
Energy Consumption **	能耗	Kcal / kgware	1800 +/- 10%



** the Energy Consumption data is subject to the porcelain sanitary ware firing @ 1240C with 24 hrs cold to cold operation; The vary of firing condition will lead to the data deviation.

** CAN-BUS means that all controlled parameter to be input and output by a PC touch screen interface with Fame View software through PLC and PID

Standard and Optional

		Standard	Optional
Kiln Body	窑体	Full Fiber 全棉	砖棉 Fiber+ Bricks
Kiln Door	窑门	Automatic 自动	手动 Manual
Kiln car	窑车	Automatic 自动	手动 Manual
Firing	烧成	Impulse 脉冲	
Control	控制	CAN-BUS** 总线控制	仪表 P.I.D
Atmosphere	气氛	Oxidation 氧化气氛	还原气氛 Reduction

Highlights

关键词

Flexibility

灵活

Customized Design

量身定做
设计

Side-down Draft

侧底排烟

FM-Impulse Firing

调频式
脉冲燃烧

Energy Saving

节能

Hi-Grade Insulation

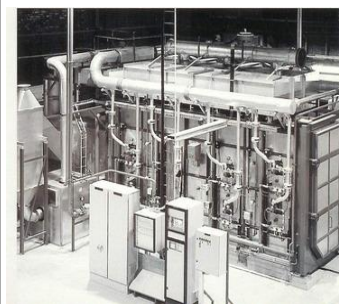
高等级
隔热组合

Automatic Control

全自动

- 表中所列能耗水平基于普通卫生陶瓷在1240摄氏度，24小时烧成周期的情况下之数据，烧成条件的变化将导致能耗水平的波动。

- CAN-BUS是将所有控制参数的输入输出集中在触摸屏中完成，基于Fame view软件和PLC及PID的基础之上。

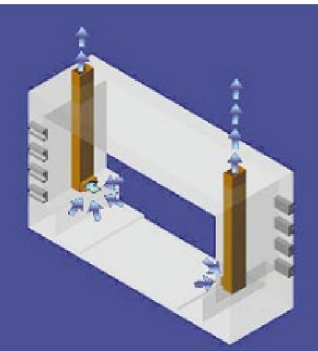




Reliability



Energy Saving



Uniformity

FRAMEWORKS

窑体框架

● Light Steel structure

The kiln body is made up of the steelworks which will support all the refractory, insulations, firing facilities;

The steelworks are formed of the light shaped-steel giving the strong bearing of the kiln;

● Welding

The Carbon Oxide Welding process is applied to the steel structure, which helps the release of the welding stress and thus the kiln body

dimension accuracy is assured;

● Modular

All steel structure is been manufactured with several standard modular, leading to a fast onsite assembly and easy transportation to customer;

● Body Cover

The kiln body is covered by the roasted color-paint steel sheet, which will protect the insulation and firing facilities. Meantime the beautiful appearance is emerged.

● 轻质钢结构窑体：采用型钢焊接，支撑耐衬和烧成设施，结构轻便，坚固；

● CO2 保护焊：减轻焊接变形，保证尺寸精度；

● 模块化制作：使现场安装便捷，方便运输到客户现场；

● 烤漆面板：保护耐火内衬，美化外观。

INSULATION LINING

窑体内衬

Full Fiber Lining

The highest grade ceramic fiber is used, featuring the low thermal conduct coefficient, light heats accumulation. The excellent energy saving could be expect;

The fiber is in form of blocks which are fixed tightly with anti-heat alloy tools.

Sandwich Structure

With the combination of the fiber and bricks in highest standard, this structure provides the solid body strength and long-life usage with ease of maintenance;

Our experience masonry crafters assure the kiln body refractory to reach the tar-

get.

● 全纤维结构

采用顶级陶瓷纤维棉，保证低热导，低蓄热，减轻内衬厚度，到达节能效果。采用可靠的耐热合金固件将棉块固定。

● 三明治结构

顶级耐火砖与棉的组合，高强

FLUE DRAFT

排烟道

Sidedown Draft

Thanks to the sidedown draft design, the flue gas of exhaustion will be taken out of the kiln chamber from the top to the bottom, thus the hot turbulence on the top is forced to come down to heat up the air in the bottom area, so the more

temperature would be expected.

The flue gas draft holes are set up on the down part of the both sidewalls evenly;

The special refractory materials are applied to the flue gas channel.

侧底排烟设计

在窑墙两侧的底部区域均匀的设有排烟道，强制的将窑内顶部热烟气导向底部，以加热窑炉底部相对低温的空气，这样有助于窑温的均匀。

烟道采用特殊的材质砌筑；

IMPULSE FIRING

脉冲燃烧

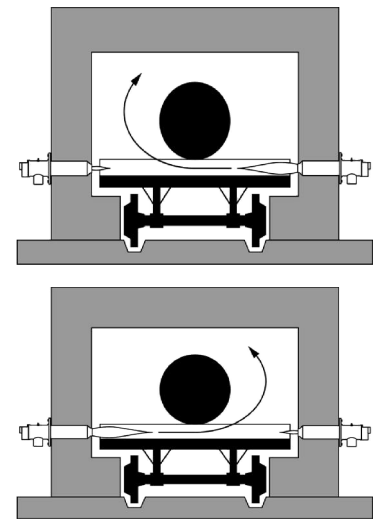
Impulse Firing

This technology is a method to make the flame and hot air inside of the firing chamber under the mode of high/low fire within a certain frequency, for instance, within a 5 second cycle, the fire will be altered from low-high-low condition, just like the impulse of heart beaten;

in this circumstance, thus the hot air inside of the firing chamber will help to make the irregular turbulence to eliminate the temperature difference, meanwhile it can increase the firing efficiency and reduce the thermal consumption up to 10~15%;

脉冲燃烧

脉冲燃烧技术使火焰和热空气在窑炉内腔里周期性的完成大火-小火-大火的转换,使窑内气流得到充分的搅拌,从而消除层流,促进湍流,帮助消除温差,并可节能10~15%。



Impulsor

System Composition

系统组成



Energy Saving

● Random Impulse

The impulse firing system consists of several individual burners or burner groups, each of which is independent in random of output in the impulse condition.

● Proportional Combustion

When the alternation between high and low fire, the special regulator will adjust the ratio

of air/fuel to reach the complete combustion.

● High Velocity Jetting air

Thanks to the control of air and fuel inlet pressure control, the flame is jetting out the burner whenever the high/low firing, the speed could be up to 120 m/s. So the strong agitation inside of kiln chamber is realized.

● 随机脉冲燃烧

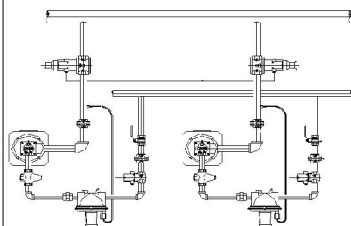
每只喷枪或燃烧组的脉冲状态完全随机,以形成湍流。

● 比例控制

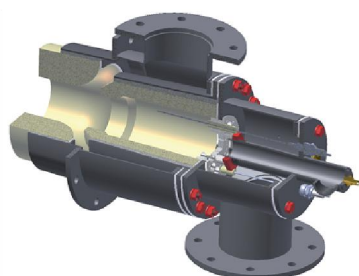
无论大小火,通过比例控制,达到完全燃烧

● 高速搅拌

出口速度可高达120m/s



Eco Friendly

● Big Turndown Range

For high/low fire output, the power of burner can be working in a range up to 1:20

● Special Design

for Mixing of air and gas

The particular design for the complete mixing of air and gas to form the strong and

powerful combustion.

● Comprehensive Supervision

firing condition of each burner are fully supervised with respects of flame on/off, temperature following up and so on.

● **大范围调节比**;使喷枪输出功率可在1:20的范围调节

● **特殊的混风结构设计**;保证充分和有利的燃烧。

● **全面的燃烧监控**,包含火焰检测,跟温状态等方面。

Burners

烧嘴

CAN-BUS in all 总线控制

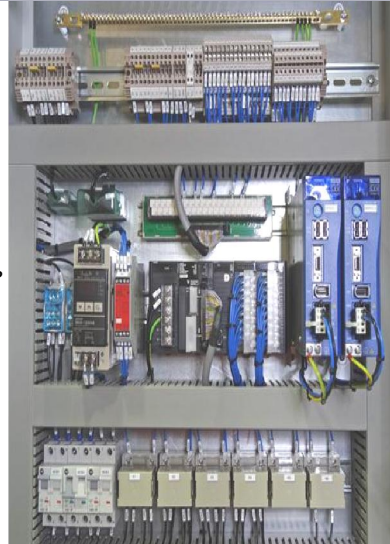
All the necessary to-be-controlled for the firing is integrated into an united man-machine interface, fulfilling the I/O, this is what we called CAN-BUS in all control system

Consisting of the technical data collection of the temperature, pressure, the industrial Computer will calculate the value of pre-setting and real, then the feedback will be sent to the servo mechanism to reach

the desired firing condition: the reasonable firing curve, pressure stability, energy consumption, safety protection;

All those important technical data is displayed on the screen, behind which there are the FameView software, PLC, temperature / pressure controller, sensors, and so on.

The simply interface makes the easy operation.



所有必要的窑炉技术控制参数融为一体，通过人机界面进行I/O操作；

这些参数包括温度，压力，安全等，由计算机连续的进行比较和反馈运算，达到我们的目的。

通过人机界面背后的软件，PLC，各种传感器，实现直接简捷的人机对话。

这就是总线控制。

Hardware & Software 软硬件



使用了世界级的控制元件构成了控制系统的硬件基础，包括西门子，施耐德，三菱，霍科德，霍尼韦尔等著名品牌。

通过为工业环境特殊开发的Fame view 软件将优良的硬件与软件完美结合，为客户提供可靠性，稳定性和安全性统一的窑炉。

Hardware

Employed with world class control components, such as SIEMENS, SCHNEIDER, MITSUBISHI, SCHRODE KROME, HONEYWELL, we always take the reliability, stability, safety as the highest priority.

Those components come into

form of the key sensors, regulators, PLC, frequency inverters, and so on.

Software

All hardware to be recognized by the FameView software which we customize for the industrial environment, Simple, Easy, and Manageable.

PID Control (Optional)

As an economic option for the control method, this system also provide the reliable operation manner.

By the PID controllers, the parameter of pre-set and the real is continuously calculated and feedback to realize the wanted operation.

The upgrade possibility is preserved from PID into CANBUS.

The ease of use, and quality components assure the kiln performance.

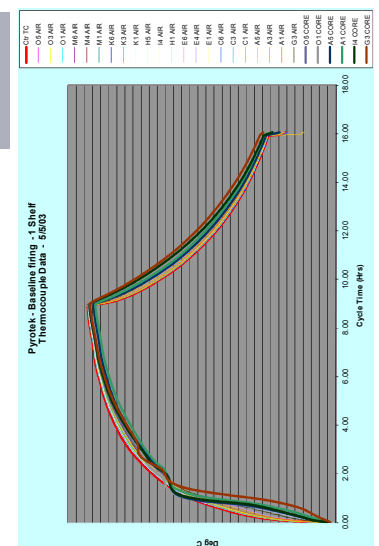
仪表控制 选装

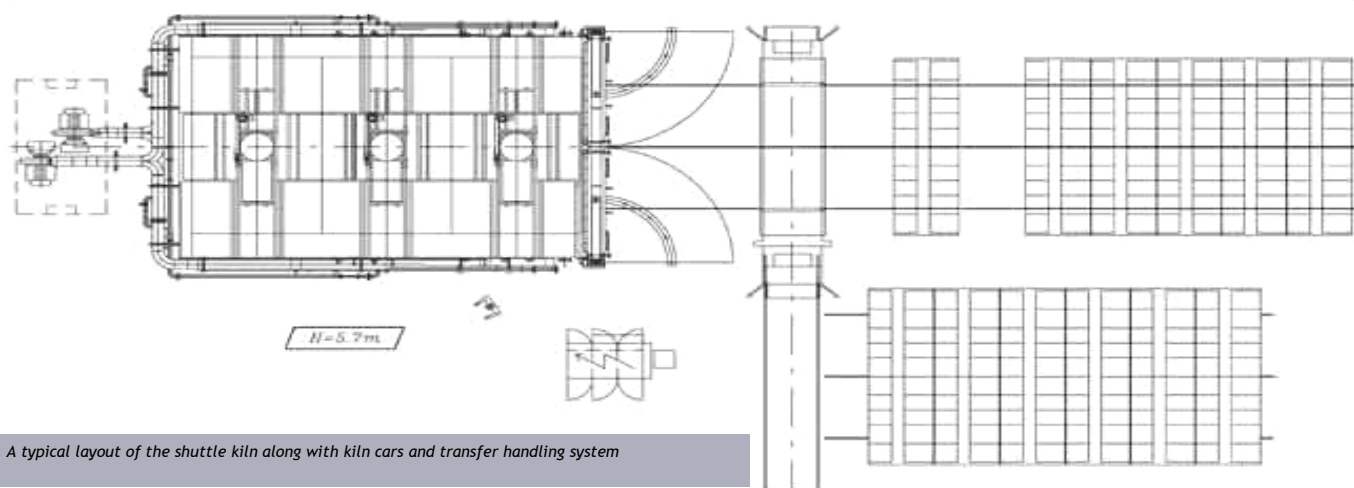
仪表控制提供了一种传统，经济的控制方式，简单，可靠。

通过PID控制器的连续微积分运算，对设定值和实际值的比较和反馈，达到控制目的。

预留了升级到CANBUS的可能性。

依然采用了优质的元件。





A typical layout of the shuttle kiln along with kiln cars and transfer handling system

Kiln Door

Three options, up to customer's choice:

- Hydraulic
- Pneumatic
- Manual

三种窑门设计：客户可选择液压、气动和手动方式。

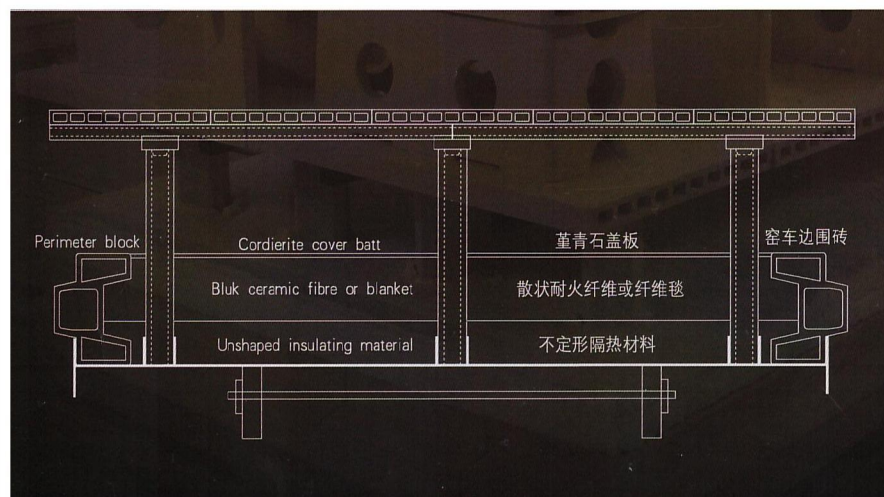
**Kiln Car 窑车**

通过专业的窑具搭载系统，使窑车码高可高达1800；

轻型窑车选用了特殊隔热材料，并覆盖有莫来石或堇青石硬质材料，既减少蓄热损失，又坚固耐用。

Light kiln car

With superb insulations to reduce the weight of the kiln and result in the less heats accumulations; Also the flame-facing of the kiln car is covered with solid materials: refractory brick in Mullet or Mullet-Cordierite;

**Double Deck Loading:**

By professional design of the car furniture loading solution, the shuttle kiln allows the double-deck loading of green bodies with height up to 1800mm;

Cordierite and Reaction Silicate Carbonated materials are applied for the assurance.



TUNNEL KILN

隧道窑

IN GERNERAL | 总体描述

TK SERIES

Technical Range

content	指标	单位	Value
Kiln Length	窑炉长度	m	40~150
Max. Temperature	最高温度	C	1400
Kiln car Excess	外部窑车比例	%	50~60%
Max. Setting Width	最大有效宽度	mm	4200
Max. Setting Height	最大有效码高	mm	1200
Flue Gas Temp.	排烟温度	C	< 250
Firing Cycle	烧成周期	hr	12~36
Energy Consumption**	能耗	Kcal / kgware	1000 +/- 10%



** the Energy Consumption data is subject to the porcelain sanitary ware firing @ 1240C with 16 hrs entrance to exit operation; The vary of firing condition will lead to the data deviation.

** Impulse firing could be applied into the firing system when customer need to ultra wide setting of the products;

** CAN-BUS means that all controlled parameter to be input and output by a PC touch screen interface with Fame View software through PLC and PID

- 表中所列能耗水平基于普通卫生陶瓷在1240摄氏度，24小时烧成周期的情况下之数据，烧成条件的变化将导致能耗水平的波动。
- CAN-BUS是将所有控制参数的输入输出集中在触摸屏中完成，基于Fame view软件和PLC及PID的基础之上。
- 应客户需求可选装脉冲燃烧系统

Highlights

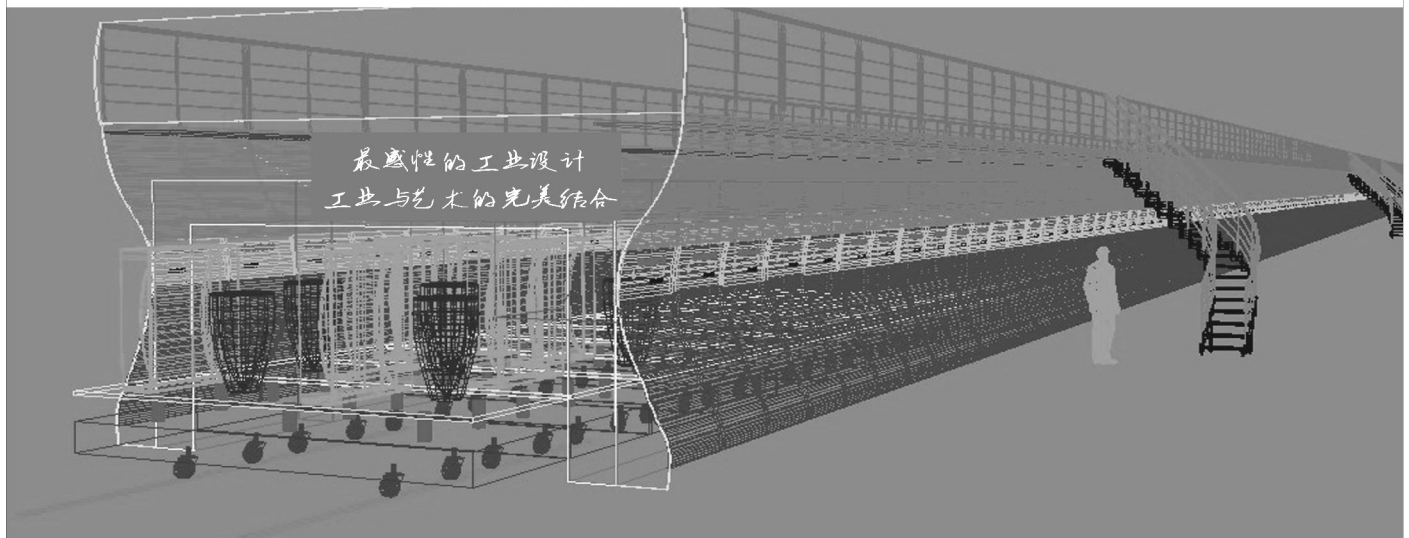
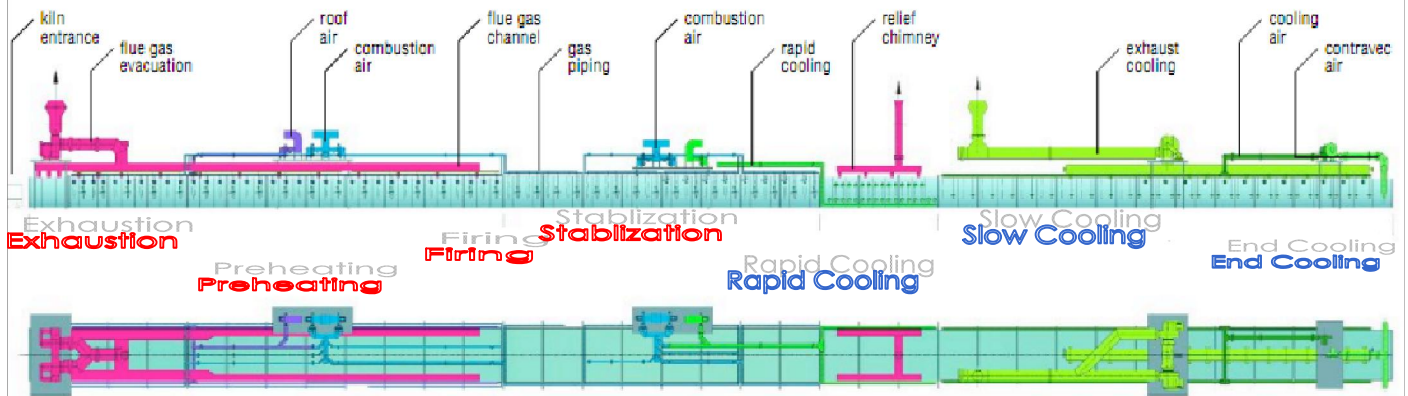
关键词

Stable	稳定
High Efficiency	高效
Energy Saving	节能
Hi-Grade Insulation	高等级隔热组合
Automatic Control	全自动



Standard and Optional

Standard			Optional	
Kiln Body	窑体	Fiber+ Bricks 砖棉	全棉	Full Fiber
Kiln car	窑车	Automatic 自动	手动	Manual
Firing	烧成	Group Firing 分组燃烧	脉冲	Impulse**
Control	控制	CAN-BUS** 总线控制	仪表	P.I.D
Atmosphere	气氛	Oxidation 氧化气氛	还原气氛	Reduction

**FUNCTION ZONES**

AS A SAMPLE OF PORCELAIN
WARE WITH GLAZE FIRING

Exhaustion

To take out the flue gas, side down draft helps to eliminate the temperature difference.

The air curtain to seal the ambient air coming into the firing chamber.

Preheating

To preheat the green bodies softly and also eliminate the moisture and organic stuff of the green bodies.

Firing

The glaze and the body coming into mature under the heating by several groups of burners to form the strengthens and wanted surface.

Stabilization

Allowing the body and glaze fully converting into the form of porcelain, and the meantime the homogenous of all products could be reached.

Rapid Cooling

The ambient cool air blow into this zone to save the total transmitting time thanks to the vitreous stuff inside of body.

Slow Cooling

By the indirect hot air to cool the body under a relative slow speed so that the body cracks to be avoided.

End Cooling

The ambient air is forced into cool the body with big flow for the heats exchange. The outcome products will be touchable.

功能段布置，以釉面瓷器烧成为例

排烟

多组侧底排烟单元，含气幕风；

预热

排除水分和有机物；

升温

坯体和釉面逐渐成熟；

保温

所有产品达到一致性；

急冷

快速降温，缩短烧成周期；

缓冷

使用间接冷却，避免坯体开裂

尾冷

将产品温度降到常温。

THERMAL RECYCLE | 热风利用

**WAIST FLUE GAS**

The flue waist gas is taken from the firing zone to the kiln's entry, thus the body could be heated up.

The outcome waist flue gas also could be used to heat up the cool ambient air by a exchanger, then the heated cool air could be sent to drying application.

**HOTAIR FROM RAPID COOLING**

To be sent into combustion air fan with the mixing of the ambient air to become the combustion air so that the energy saving could be expected.

tion air so that the energy saving could be expected.

HOTAIR FROM SLOW COOLING

To be used as the seal air curtain in the entry of kiln, and as the roof cooling as well.

Also could be used for the drying

HOTAIR FROM END COOLING

To be send to the spot where needs warm temperature below 80 centigrade.

窑头烟气

从烧成带抽过来的烟气预热坯体用，排除窑外后通过换热器，将加热的空气用于干燥

急冷换热风

可用于助燃风预热

缓冷换热风

用于气幕风，窑顶平衡或干燥用

尾冷换热风可用于生活

LINING | 内衬材料

We use the top grade refractory materials and insulations to reach the best energy saving performance.

为到达最好的节能效果，我们采用最顶级的耐火隔热材料。

The carefully calculated and selected composites of the refractory and insulations target the low thermal conduct, light heats accumulation, long life usage, and the meantime, the kiln operator's environment in the workshop is improved.

所有材料的选择和组合都经过严格的热工计算，低热导，低蓄热，长寿命。同时窑炉操作环境也得到很大的改善。

Mullet Bricks

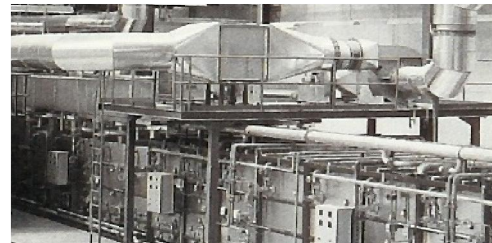
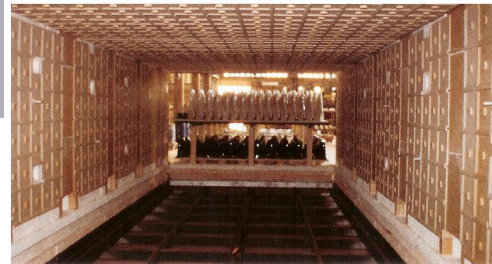
Density low to 0.70 g/cm³ with enough strength for temperature up to 1400 C.

莫来石砖等级最高30，比重低至0.7，耐温1400C。

Ceramic Fiber

With certain content of Alumina in form of blanket or block or board to be applied in the different zone of the tunnel kiln.

陶瓷纤维面也得到广泛运用。



助燃风预热

COMBUSTION AIR HEATING UP

Up to 100 Centigrade

The heated up combustion air could save energy significantly comparing to the cool air.

All the combustion air pipe works could be covered with insulations and main pipes go inside of the kiln body to keep the temperature.

The hot air from rapid cooling zone could be sent to combustion air fan where the temperature would be regulated at certain level by adjust the mixture of cool air and hot air;

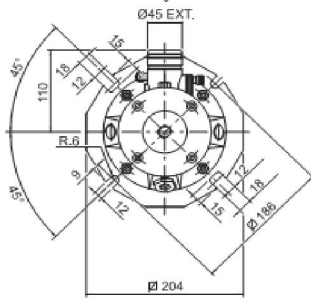
急冷带的交换热风用于加热助燃风到100摄氏度左右，可以有效节约能源。

管道保温和在窑内分布都有效的降低热损。

BURNERS I 烧嘴

**Burner**

- Big turn-down range of power
- High velocity
- Complete combustion
- Powerful flame
- Easy maintenance
- Reliable materials

**Burner Group**

The burners are grouped into the different zones of the kiln;

Each group comes into a firing unit, and the burners are located

in place of up/down of the side walls to heat up the products evenly.

Group Setting

From the middle of preheating zone to the end of the stabilization zone, the burner groups are set up according to the necessary firing process.

The flame will go through the fire channel without direct touch of the products.

烧嘴

大调节比*高速*燃烧完全*火焰平直有力*拆卸简单*材料可靠

烧嘴组

对所有喷枪进行编组，每组形成一个独立的燃烧单元。烧嘴上下交叉布置，均匀加热制品。

烧嘴组布置

从预热带中部到保温带，火焰走火道。

Air/Gas Ratio I 空燃比调节

For each burner group, there are three options to adjust the Air/Gas Ratio:

→ **Fixed Air and Gas modulated**

The output power of burner will be carried out by the gas automatic servo motor to adjust the Gas input while the combustion air to the burner always keep the same level;

响应喷枪的输出功率和气氛控制，通过三种方式调节空燃比；

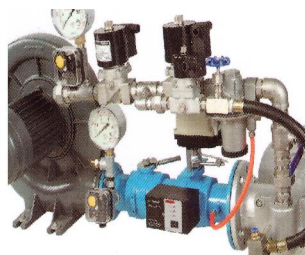
- 固定助燃风/调节燃气
- 比例控制调节
- 脉冲燃烧

→ **Proportional Adjustment**

For each burner group, there is a set of proportional control facility to supervise both the gas and air to keep the two factors ration always stable in need to the combustion power;

→ **Impulse Firing**

Within certain cycle time, the low/high fire to be carried out alternatively with the air/gas ratio always stable.



COMBUSTION AUXILIARY

燃烧辅助

- **Burner Tube**

To each burner, a cone-shape tube in form of SiC nozzle or Mullet-Cordierite is applied.

对每只喷枪的燃烧提供辅助功能的装置：

- 烧嘴砖或烧嘴套

- **Flame detection**

To each burner, the flame is constantly detected by either a electrode or UV probe, the operator could know the real live condition of each burner.

- 火焰检测（高压、紫外线）

- **Self automatic Ignition to each burner**

- 自动点火

Kiln car I 窑车

Light & Solid

With superb insulations to reduce the weight of the kiln and result in the less heats accumulations; Also the flame-facing of the kiln car is covered with solid materials: refractory brick in Mullet or Mullet-Cordierite;

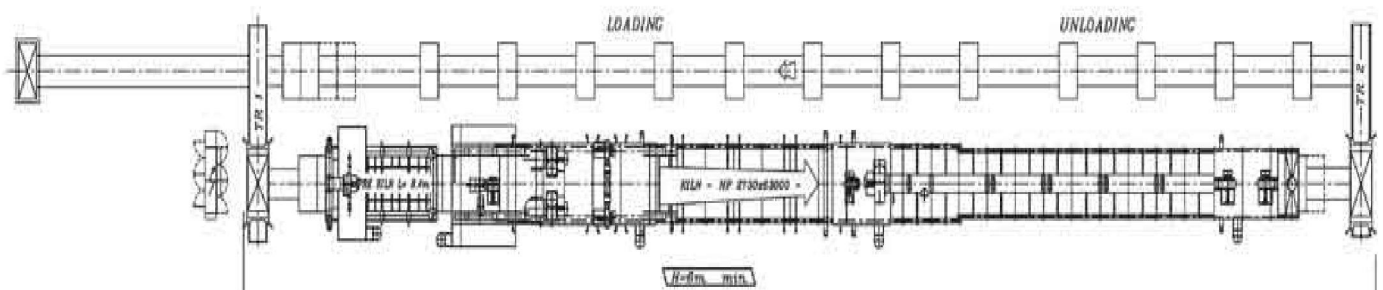
Tight Sealing

The touching face between cars are tightly sealed, so be the intervals between the cars and side walls.

坚固的钢结构使窑车不变形；

采用了大量的轻质高温耐火材料和纤维，使窑体蓄热大幅下降。

窑车曲封严密。

**Materials**

Quality Cordierite and Reaction Silicate Carbonated materials are applied for the assurance.

采用高品质堇青石莫来石材料和反应烧结碳化硅进行窑车搭载。

Loading Solution

We are able to customize the loading solution design for our customer as per their details of the products.

我们为客户提供产品搭载系统设计，装载密度和空间利用非常关键。

The reasonable loading solution are critical for the ideal firing. The loading density and space utilization are the key factors to be considered.

loading**窑车装载****Cars Handling 窑车运转线****Including:****包含:**

Pushing Cylinder, with reliable hydraulic system

顶车机

Track Unit, to take out the car to transfer car.

牵引机

中转车

Transfer Cars, to converse the cars moving direction.

回车线

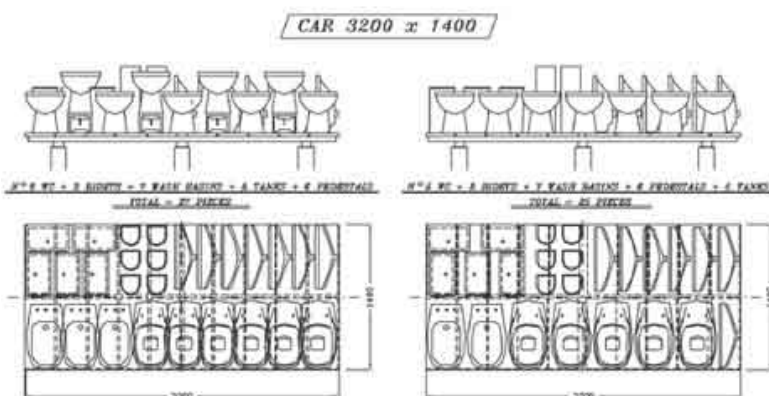
轨道

Return Line, for unloading and loading the items

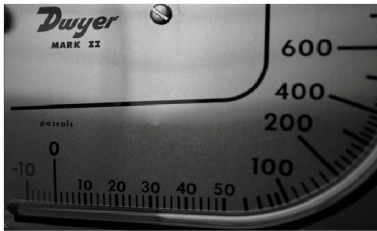
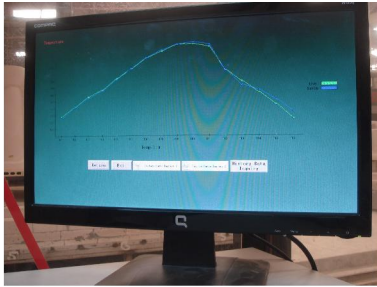
控制箱

Rails, with full running tracks inside and outside.

Control Panel, to make all devices in a overlap by the Program Logic Calculation.



Temperature & Curve I 温控及曲线



The temperature and its curve are controlled in different zones by means of:

Preheating

- To regulate the exhaust-tion
- In addition to the burner group

Firing

- Burner groups setting up
- Logic & PID with feed-back

Cooling

- Cooling air flow adjustment
- To regulate the hot air suction

温度点及曲线的控制，在不同功能区，手段不同：

预热带：

调节排烟及喷枪

烧成带：

喷枪组设置及逻辑，微积分运算，并连续反馈

冷却带：

调节冷却风量和抽热风控制。

The pressure of the kiln chamber is vital to the temperature and energy saving.

Several key spots are setting up with pressure transmitter to carry out the overlap control with inverter or thermal couple

Preheating

To be controlled under micro negative in pressure

Firing

To be controlled under neutral or micro positive in pressure

Cooling

In fast cooling with big positive pressure, while the pressure is going to down below neutral to the kiln exit.

The neutral pressure is positioned steadily.

窑压与温度控制紧密相关。

预热带微负压

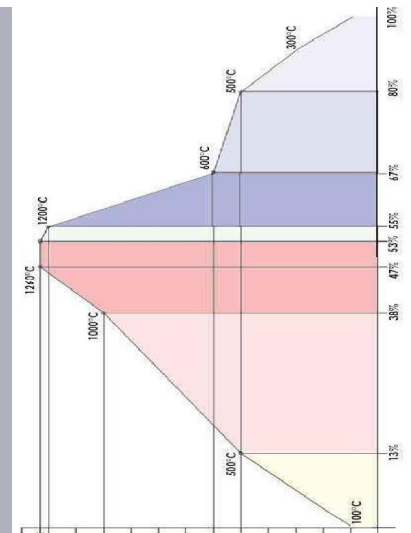
烧成带微正压

冷却带从正压过度到负压

零压面得到稳定不漂移。

Pressure Control

压力控制



CAN-BUS Control I 总线控制

Including:

Measuring

- Temperature control spots
- Pressure control spots

Data Processing

- Program Logic Calculation
- Control PID controller or modular

Man-Machine interface

- Display Screen
- Industrial PC
- Fame View software

Auxiliary Management

- Alarm
- Safety
- Cars handling
- History
- Remote and internet

包括：

窑炉温度，压力等主要数据测采集，处理，反馈及执行的系统，并通过工业级PC和人机界面将控制系统整合在一起，并综合报警，历史记录，窑车运行，安全报警等功能，并可远程控制。



ROLLER KILN

辊道窑

IN GERNERAL | 总体描述

RK SERIES

Technical Range

content	指标	单位	Value
Kiln Length	窑炉长度	m	30~360
Max. Temperature	最高温度	C	1400
Max. Setting Width	最大有效宽度	mm	3200
Max. Setting Height	最大有效码高	mm	650
Flue Gas Temp.	排烟温度	C	< 200
Firing Cycle	烧成周期	Min.	30~480
Energy Consumption**	能耗	Kcal / kgware	400 +/- 10%

** the Energy Consumption data is subject to the ceramic tiles firing @ 1200C with 40 minutes entrance to exit operation; The vary of firing condition will lead to the data deviation.

** Impulse firing could be applied into the firing system when customer need to ultra wide setting of the products;

** CAN-BUS means that all controlled parameter to be input and output by a PC touch screen interface with Fame View software through PLC and PID

• 表中所列能耗水平基于普通陶瓷砖在1200摄氏度，40分钟烧成周期的情况下之数据，烧成条件的变化将导致能耗水平的波动。

• CAN-BUS是将所有控制参数的输入输出集中在触摸屏中完成，基于Fame view软件和PLC及PID的基础之上。

• 应客户需求可选装脉冲燃烧系统

Ceramic Tiles

china-ware

Mosaic

Sanitary ware

Abrasive

Highlights

关键词

Art of up-to-date

精良做工

High Efficiency

高效

Energy Saving

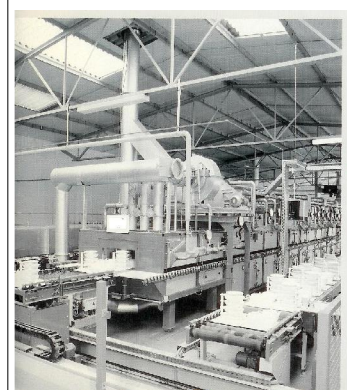
节能

Flexibility

灵活

Easy Maintenance

易维护



日用瓷 Tableware



马赛克 Mosaic



瓷砖 Tiles

Standard and Optional

		Standard	Optional
Kiln Body	窑体	Fiber+ Bricks 砖棉	全棉 Full Fiber
Firing	烧成	Group Firing 分组燃烧	脉冲 Impulse**
Control	控制	CAN-BUS** 总线控制	仪表 P.I.D
Atmosphere	气氛	Oxidation 氧化气氛	还原气氛 Reduction



Kiln Modular I 窑体模段

● Light Steel structure

The kiln body is made up of the steel-works which will support all the refractory, insulations, firing facilities;

The steelworks are formed of the light shaped-steel giving the strong bearing of the kiln;

● Welding

The Carbon Oxide Welding process is applied to the steel structure, which helps the release of the welding stress and thus the kiln body dimension accuracy is assured;

● Modular

All steel structure is been manufactured with several standard modular , leading to a fast onsite assembly and easy transportation to customer;

● Body Cover

The kiln body is covered by the roasted color-paint steel sheet, which will protect the insulation and firing facilities. Meantime the beautiful appearance is emerged.

- 轻质钢结构窑体：采用型钢焊接，支撑耐衬和烧成设施，结构轻便，坚固；
- CO₂ 保护焊：减轻焊接变形，保证尺寸精度；
- 模块化制作：使现场安装便捷，方便运输到客户现场；
- 烤漆面板：保护耐火内衬，美化外观



Driving System I 传动系统

Compact Roller Pitch

Special design for small size items firing such as mosaic, small format tiles, to save the slabs and cost of energy.

The minimum roller pitch is low to 32 mm;

Reliable Materials

The transmission gears and rods are made up of special hot treated alloy for long-term running without wearing .

Wide range speed adjustment

According to firing process time, the gear motors in various transmission ratio are selected, which allow the wide range of speed;

From 30 to 480 minutes firing cycle is possible.

Cycloid motor or Variable Speed Motor is employed .

Precisely Assembly

Our professional engineers assure the accuracy of the driving system with limited tolerance, so that the items could be conveyed steadily and safely.

紧凑的传动间距，更可适合各种小规格产品如马赛克，小瓷砖，三次烧产品，为客户节省垫板。最小辊距低至32mm.

传动采用经过严格热处理的合金材料，可靠，耐磨；

传动周期调节范围大，从30分钟到480分钟连续可调。

安装严格，误差小，传动精确

Rollers I 辊棒

In our roller kiln, the below size and materials rollers are equipped with top reliable quality for different products:

Alumina Roller

®25, ®32,®40,®45, ®50,®60,

Temperature: ~1240C

R-SiC Roller

®45, ®50,®60

Temperature: ~1300C

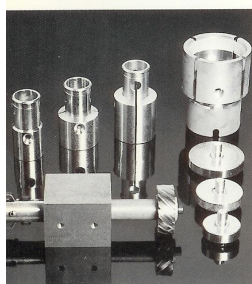
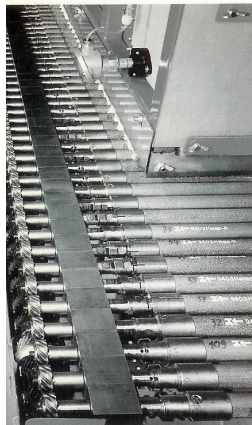
SiSiC Roller

®45, ®50,®60

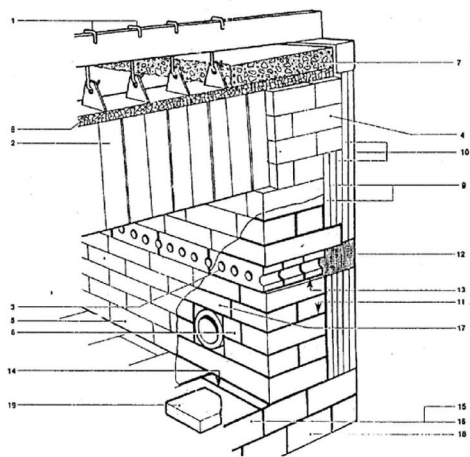
Temperature:~1350C

针对不同烧成温度产品，采用规格和材质不同的辊棒，来源于最高等级的供应商。

直径从®25到®60，材料包括氧化铝，反应烧结碳化硅，重结晶碳化硅等。适用温度高达1350C。



Sidewall

High
InsulationSolid
StrengthSafe Temp.
Margin

节能

保温

Materials Selections Standard
Of refractory and insulation

Bricks

TJM-30*Mullet 1400/ 1350

TJM-28*Mullet 1350/ 1300

TJM-26*Mullet 1300/ 1250

TJM-23*Mullet 1250/ 1200

Hi-Al Poly-ball 1200/ 1150

Light Hi-Al 1150/ 1100

Light clay brick 1100/ 1000

Fiber- Blanket or Board

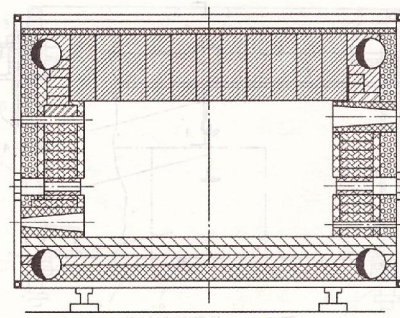
Zr-Al Fiber 1400/ 1300

Hi-Al Fiber 1300/ 1200

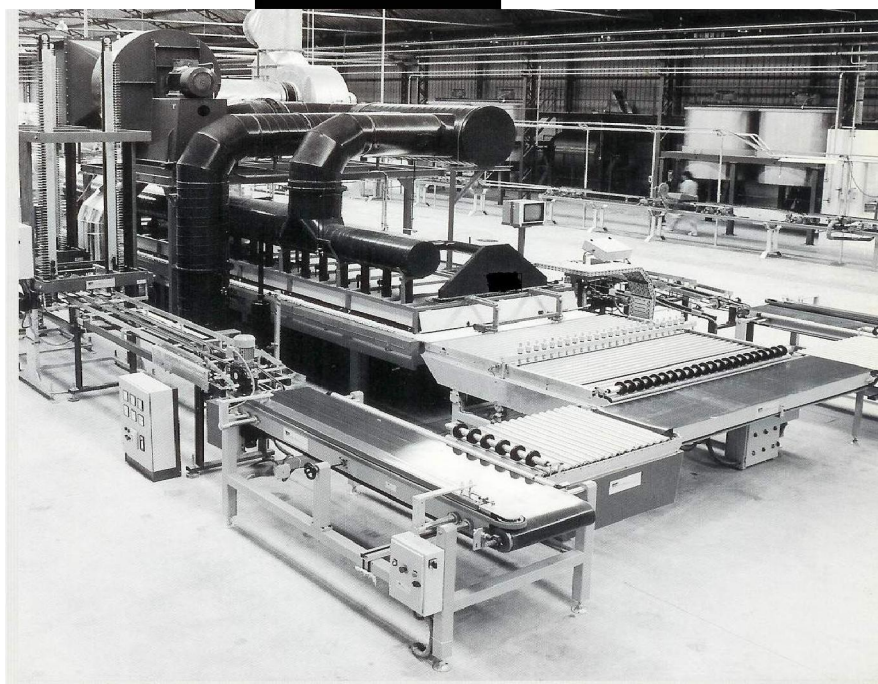
Standard-Al 1200/ 1100

Silicate-Al 1100/ 1000

Kiln Roof

Strong
StructureLow
conductionLong
Usage LifeEnergy
SavingsSafe
Temp.
Proof

Reliable



Persistence to high-standard selections of refractory, insulation and its combinations along with the strictly masonry always surely result in the cost-saving, easy maintenance to our customers.

坚持高标准的选材原则，坚持科学严谨的材料组合方案，坚持严格的砌筑项目管理，为客户节约使用成本，免除后续维护成本和费用。

Burners Laying 喷枪分布

Principle

Light Power

For each burner, we select the small output power one, and thus more sets of burner would be applied to be laid alongside the total length of the kiln. The thermal load of firing inside the chamber would be much more even.

Grouping

All burners are grouped in different firing zone, and each burner group forms an independent control unit with overlap mode.

Multi-Spots

From the rear part of preheating until the end of the firing zone, we set up more spots of

locations for the burners, which giving the easy adjustment of firing curve for more products. Our customer could expect this advantages.

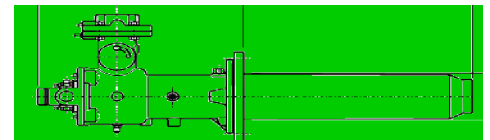
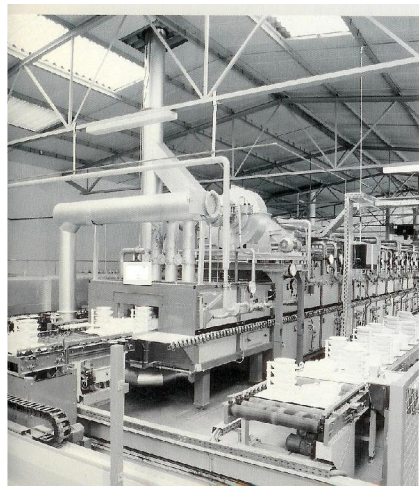
原则

小功率

组控

多点布置

这样使窑炉的热负荷更加匀称，控制更加稳定，烧成曲线更加易于调节，为客户带来更多的灵活性。



Atmosphere

烧成气氛

By modulating the excess air, we are able to generate three kind of firing atmosphere in roller kiln for different products

- Oxidation
- Neutral
- Reduction

Combined with the analysis system of the flue gas chemical composition, the firing atmosphere could be monitored constantly with these sensors and then the reacted servo facility will feed back to adjust the ratio of the air and gas to realize what we want;

某些产品在还原气氛下产生不可替代的效果，通过调节过剩空气系数，我们可以在辊道窑上实现氧化，中性及还原气氛。

Features of Burner

喷枪特点：

Big Range of output turndown

- 大范围调节比

Up to 1:20

- 特殊充分混风结构

Complete mixing of the gas and oxygen to assure the full combustion, no waist of the gas to be carbonized.

- 火焰形状与速度重新设计

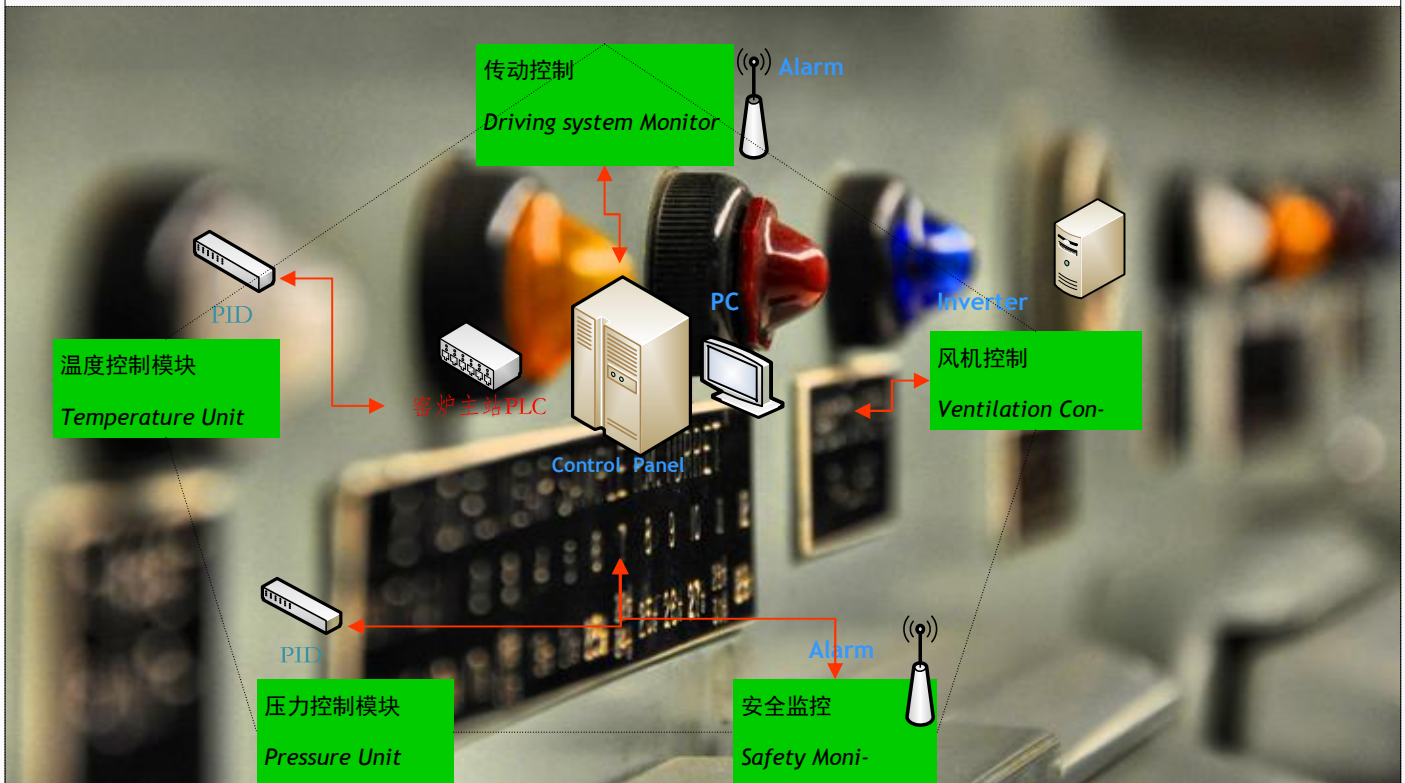
- 采用特殊合金材料保证热力学性能

Special design for the light output power with the redeveloped flame shape and velocity;

Quality Alloy to be applied for high temperature resistance

Taylor-Made Burner

特殊设计的喷枪



CANBUS

Logic Diagram

Reliability is the key of running the kiln, all electronic elements for the control system are from the best quality suppliers of world class, and the customized can-bus man-machine interface supported by the fame-view software can be operated onto those hardware steadily.

Long and rich experience is the essential to compose the software for the kiln running, we take as much as possible factors in relation to the operation into our considerations amid our design of the whole

system.

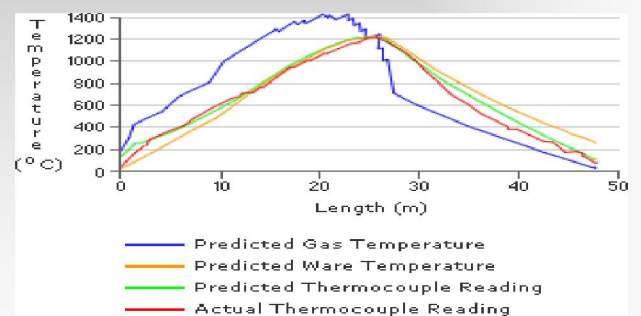
Meantime, the system also provide the history record and trouble shooting suggestion, which will help to improve the management of the operator;

The Internet connection and the remote control is also an option up to customer's requirement.

However, the simple and traditional control mode is also available to the economic operation.

全新一代的CANBUS窑炉综合控制系统，基于长期的热工经验，并采用世界顶级的电气元件，确保窑炉的运行稳定，可靠，直观，同时互联网及远程控制技术的运用也作为选项，为客户提供了更加强大的管理功能。

同时，我们也提供经济可靠的传统式控制模式。





Hi-Temp. KILN

高温窑

IN GENERAL | 总体描述

HTK SERIES



1400~1800

Centigrade

The special kilns for hi-tech and advance material firing, creating the rich value-added products.

Usually in form of shuttle kiln and tunnel kiln, the solution provides the accurate thermal engineering calculation, strict refractory composition of the line, the high efficient combustion with unique firing-aid means, such as combustion air preheating, impulse firing, and oxygen enrichment; And such technology would be also applied into the tunnel kiln in high temperature range.

Furthermore, the exhaustion system, firing chamber sealing, mechanic works and so on had been optimized designed to match the high-temperature environment

The measuring and controlling elements along with the software are all different from the normal kiln

We 'd like to respond to customer's particular requirement of their products and present the solution with our experience and technology;

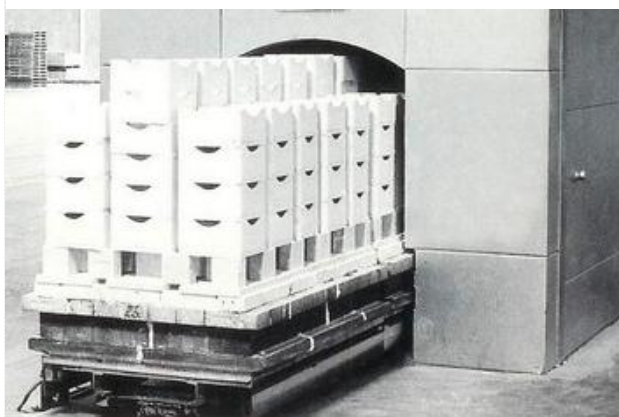
高温窑, 使用温度介于1400~1800C之间, 用于高温陶瓷及先进材料的烧成, 对燃烧系统, 排烟系统, 炉膛控制, 温度测量和控制, 都采用了特殊的技术手段。

针对客户不同的工艺烧成要求, 我们提供定制的高温燃烧及控制方案。

Highlights

关键词

Safety Assurance	安心
Reliable Materials	材质可靠
Energy Saving	节能
Accuracy	精密
Easy Maintenance	易维护



Technical Features

content	指标	单位	Value
Max. Temperature	最高温度	C	2000
Max. Working Temperature	最高工作温度	C	1800
Fuel	燃料	Gas, Oil	
Combustion	助燃风预热	Air-preheating	
	脉冲	Impulse	
	富氧	Rich Oxygen	
Heats Recycle	热能回收	Heating Exchange	

Al2O3

Ceramic

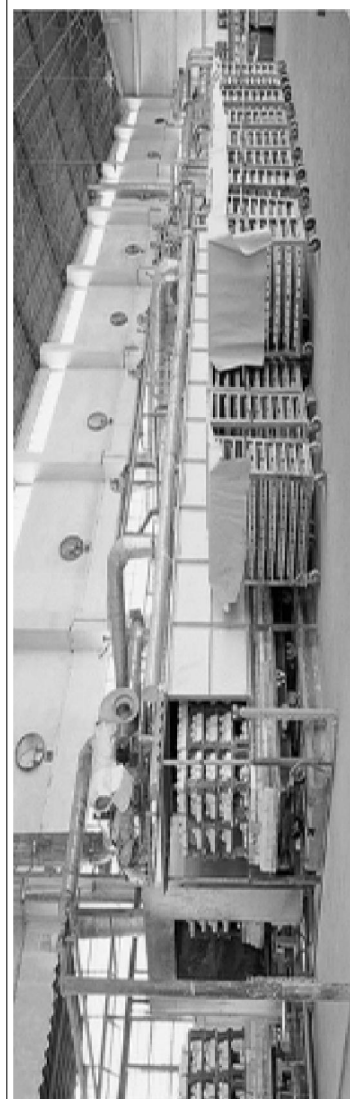
Advance

Ceramic

Technical

Ceramic

Refractory



Side Down Draft

底侧排烟

高温窑产生的烟气温度可高达1600C，由此产生了极大的向上的几何压头；

窑体采用底侧排烟设计，强制性将高温烟气导向炉膛内部底侧，这样，高温烟气不断向下流动，同时，底部的低温空气将向上流动，形成垂直方向的扰动，使炉膛内的温度趋向均匀。

同时，使传热导热效率提高，降低了能耗。

底侧排烟集中的热烟气将汇集于炉膛底部的地下，与换热器热交换后，温度降低，并抽出窑外。

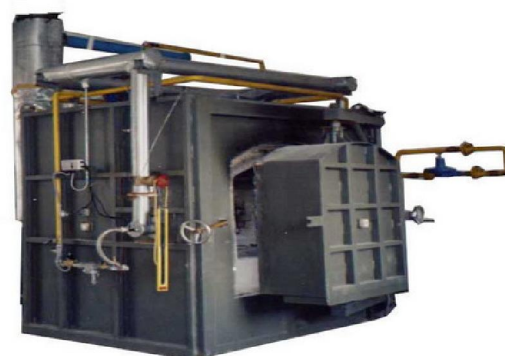
The waist flue gas temperature could be up to 1600C in the firing chamber, which

features the strong upward pressure head;

Thanks to the side down exhaust design, such upward pressure head is forced to move downward to the bottom of firing chamber, where the relative cool air will be pushed to the top inside, thus the turbulence is generated to reduce the temperature dif-

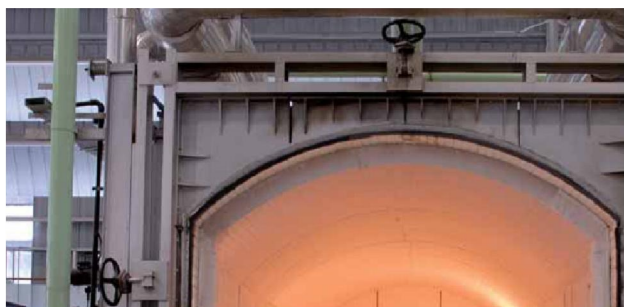
ference and enhance the uniformity and heats conducts.

The high-temp. flue gas is concentrated underground the firing chamber, and then go throughout the kiln after a heating exchanger which will reduce the outgoing flue gas temperature.



Arc Roofing

拱顶结



为了抵抗高温段时窑体的膨胀，采用了拱顶结构，结合窑体两侧的坚固的钢结构，使整个窑体坚固，可靠。

同时，拱顶结构全部使用高温耐材砌筑，避免了使用金属吊挂件，增加了耐火结构的高温稳定性；

拱顶结构还适当增加了炉膛的空间，增加了烟气流动的时间，相对降低了码窑密度，使热交换更加高效。

In order to resist the expansion in the high temperature firing phase, the arc roofing, along with the strong steel support is taken into use to provide the solid and reliable structure for general kiln.

Meantime, any metal stuff is avoided in the arc roof which reduce the risk of the destruction.

Moreover, the arc roof also increase the room for flue current and decrease the loading density relatively, which results in the enhancement of heats exchange

Reliability & Efficiency

REFRACTORY- VITAL SELECTIONS

关键的选择

Only the quality and reliable refractory materials can be used for kiln masonry, especially the performance of inner facing bricks are a vital factor to a successful kiln, the below technical data is always taken into our consideration for its high temperature application:

1. Maximum Refractoriness

2. Maximum Working Temperature

3. High-temp. loading strengthens

4. High-temp. shrinkage

5. Thermal conduct

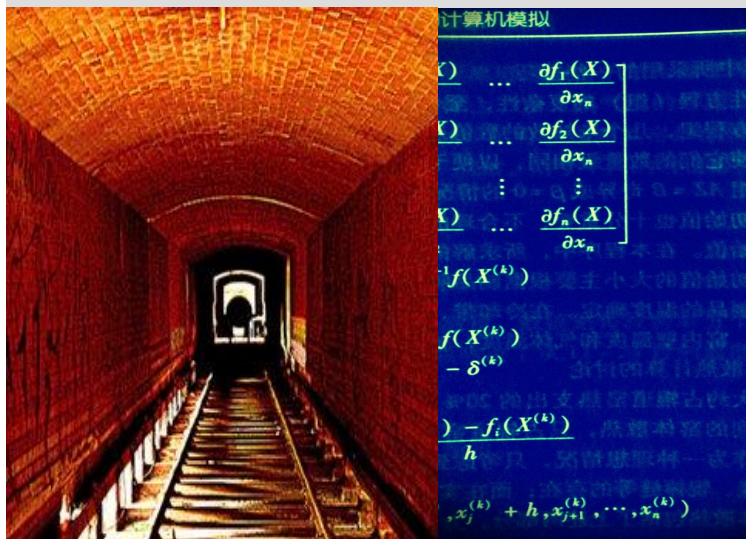
6. Anti-thermal shock

Close cooperation with top materials manufacturers to ensure the reliability of the applied environment.

采用优质可靠的高温耐火材料进行砌筑，见火面材质的品质是高温窑的决定性因素之一，下述技术参数必须经受高温环境的考验：

- 最高耐火温度
- 最高工作温度
- 高温荷重强度
- 高温收缩率

- 导热系数
 - 抗热震能力
- 和顶级供应商密切合作，只有经过验证的可靠材料才会纳入我们的使用范围。



Rigorous calculations

of thermal balance determine the lining of kiln wall and roofing:

1. Refractory materials selection
2. The combination of the various materials
3. The thickness to the refractory and insulation structure

Al₂O₃ and ZrO₂ in certain purity to be contained in the various mixture stuff in forms of sphere, granule, or fiber, to form the bricks, light board, or blanket materials, so both the high temperature proof and high insulation performance are realized.

严谨的热平衡计算决定了耐火材料的内衬结构：

1. 材质确定
2. 材质组合
3. 窑墙/窑顶厚度

氧化锆和氧化铝材料，以不同的纯度等级或混合体，形成不同密度的球形砖体，纤维棉板，棉毯的形式，通过夹层结构，形成既满足耐火性能，同时又满足的轻质保温节能的要求。

高温粘接剂的选择同样非常重要，其决定了耐火材料烧成后的整体强度。

The high-temp. mortar is also a vital materials to form the overall kiln lining during the firing process.

某些耐火材料定制成特殊形状并互相咬合以消除高温热应力。

Some refractory bricks are tailored to interlock to eliminate the stress during the high temperature phase

Applied materials



Hollow Sphere
Al₂O₃ / ZrO₂



Light Corundum
Bricks

耐火及隔热材料的组合运用

富氧燃烧技术

Oxygen Enrichment

The study and the Practice have proven that the enrichment features the great advantages comparing to the conventional firing:

1. To increase the temperature of the flame
2. To lower the combustion temperature
3. To accelerate the combustion completely

4. To reduce the waist flue gas dramatically
5. Energy saving
6. The high thermal efficiency

Along with our partner, we have developed the mature technology enabling the enrichment of the Oxygen contained in the combustion air

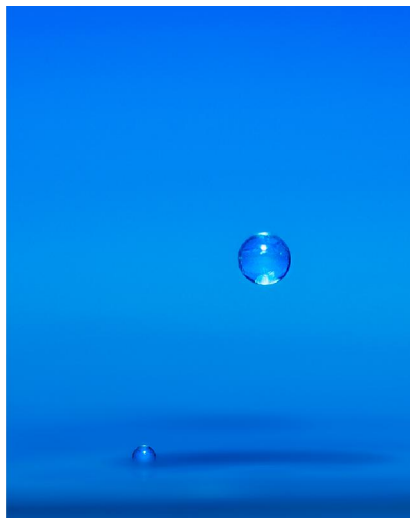
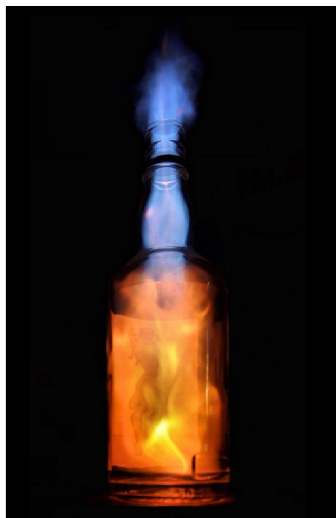
with steady condition, to achieve the goals of its own should be.

研究和实践都已经证明：富氧燃烧技术在特定的条件下具备以下特点：

1. 提高火焰温度；
2. 降低燃点温度

3. 加速完全燃烧
4. 减少烟气量，
5. 节约能源
6. 提高热效率

通过成熟有效的技术手段，我们将助燃风的氧气含量控制在合理范围之内，以实现上述目标；



高效换热器-助燃风预热系统



By means of the preheated combustion air, the remarkable energy saving and shortening of the firing cycle could be carried out.

The more important, those advantages are not realized by the extra energy consumption.

The high temp. waist flue gas out coming the kiln will go through a heating exchanger which newly development featuring the mass exchanging area and high efficiency, then the clean and cool ambient air at-

tains the heats and to be heated up to 600 C, which benefits the combustion.

通过将助燃风预热可以有效提升燃料的利用率，可取得显著地节能效果。并缩短烧成周期；

这些优势的取得并不是通过额外的能量消耗。在高温窑的燃烧过程中产生大量的高温烟气，它们通过新型开发的换热器将环境清洁空气进行高效热交换，之后经过预热的洁净热空气可被用于助燃，其温度可以达到600C。

Heating Exchanger, for combustion air preheating



Dryer

干燥器

IN GERNERAL | 总体描述

DO SERIES



Two options: Continues or intermittent

– Continues Dryer

For the items with simple geogra-
phy like tiles , bricks or those
needing the big output, the contin-
ues dryer could be employed which
transport the green items with
roller or cars through the total
drying process without stop.

– Intermittent Dryer

For those thick, weight, and com-
plicated items such as crucible,
vitreous sanitary ware, the inter-
mittent dryer is an ideal choice
which processing the green bodies
in-and-out during a whole drying
cycle by a batch, and afterwards,
another batch will repeat.

Whatever, all our design for the
drying in both methods is in
conformity with the principle of
the drying by fitting the tempera-
ture and moisture to the green
bodies;

– 连续式干燥器

对于几何形体简单的物体及产能较大
的流程, 通常使用连续式干燥器, 使用
辊棒或者干燥车传输, 将生坯连续
不断通过整个干燥过程。

– 间歇式干燥器

器型复杂及需要灵活安排生产的情况
下的最佳选择。将生坯放在干燥室
内, 完成整个干燥周期后, 在进行下
一次的循环。

湿度和温度的控制是我们设计这两种
干燥器都遵循的目标。

Highlights

关键词

Fast

快速

Uniformity

均衡

Energy
Saving

节能

Safe

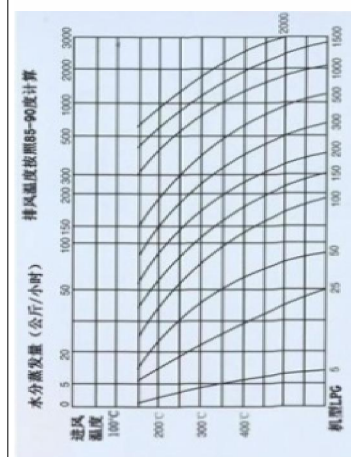
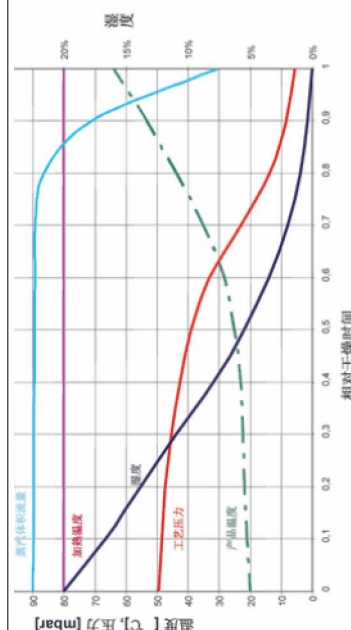
安心

Easy
Operation

易操作

Technical Features

content	指标	单位	Value
Range of humidity of Air	空气湿度	%	0~95%
Max. Operation Temperature	最高操作温度	C	300
Fuel	燃料	Gas, Oil	
Heating Sources	热源		
	燃烧机	Heating generator	
	窑炉预热	Recycle from kiln	
Moisture after drying	干燥后含水率	< 1%	
CERAMIC TILES	WHITE-WARES	QUARTZ CRUCIBLE	CLAY BRICKS



**Roller Dryer**

mono or multi channel

单层多层辊道干燥窑

The ideal solution for tiles drying, which could be in term of mono or multi layers to transport the items with high and fast drying efficiency;

The heats from the generator and the kiln section are feed evenly by the several groups of the hot air distributors, which could be regulated according to the need drying curve automatically;

The exhaust fan to take out the wet moisture air and also control the drying speed and pressure;

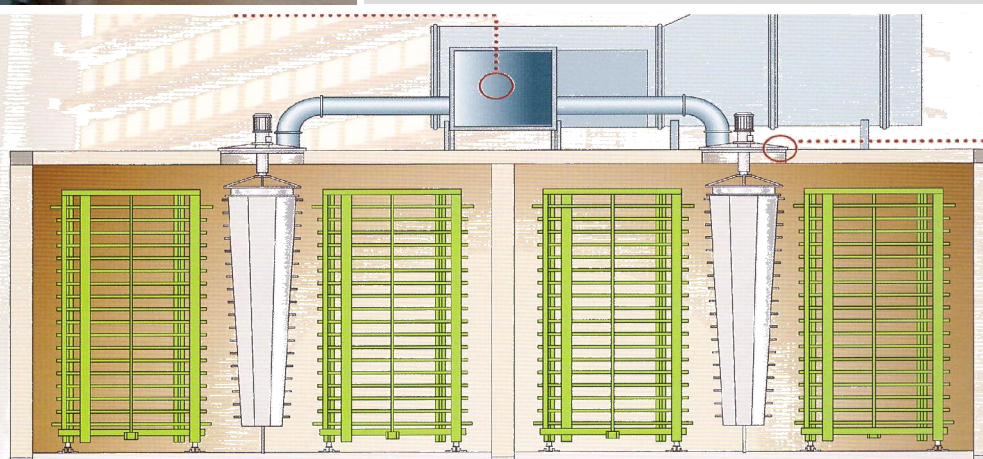
The gear reduction transmission assure the steady driving of the fragile green tiles;

- Layers : 1~ 5 channel
- Max. working temp.:250 C
- Drying cycle: 15~60 min.
- Max. width:3200mm

瓷砖的理想干燥设备，可设计为单层或者多层的形式，产量大，效率高；

来自于热风炉和窑炉的热量通过热风分风器均匀的分布在干燥器上，分风器的流量可根据干燥曲线自动的调节。

排潮风机将湿空气抽出窑外，并可调节干燥速度和窑压。

**Tunnel Dryer****Frameworks:**

Pre-fabricated modular which is made up of painted metal tubular section covered with sandwich type insulating panels with galvanized sheet steel; the fast assembly onsite is expected.

Heating:

Airflow pipe burner for the heating the process air. Normally the clean hot air is recovered from the cooling section of the kiln with which the drier is associated. The hot air in-take and wet air out-take is balanced by the ventilation system;

Control:

Consisting of the temperature curve distribution and moisture monitoring;

The PLC and PC carry out and display the complete process;

结构:

预制模锻窑体，每个模段都由彩钢和镀锌板做覆盖面的保温夹板所制成；可快速安装；

热量分布:

采用燃烧机或大功率喷枪加热空气，同时也采用来自窑炉冷却段的干燥清洁的热空气，共同提供干燥热源；热空气的鼓风和湿空气的排潮通过通风系统得到平衡；

控制系统:

包含了温度曲线的实现和湿度的监控；

全过程通过PLC和工业PC来实现；

Technical Data 技术参数**Effective channel width:**

有效通道宽度 <3500mm

Effective dryer car width:

有效干燥车宽度 <900mm

The total length: 干燥窑长度

按产量计算 As per the capacity

In-let green body moisture:

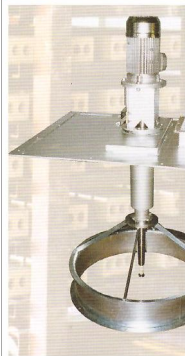
生坯入窑含水率 <15%

Processing cycle:

干燥周期 8~12 hours

隧道式干燥窑

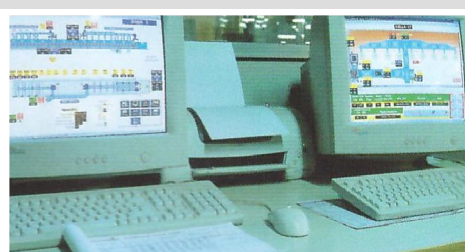
DRYING CONE MIXER



Chamber Dryer

干燥房

- Light Insulation Sandwich Wall with steel sheet covering treated for anti-corrosion, filled with compressed fiber wool
- Hot air is recycled for energy saving
- Heating supply with independent ducting and generator, and agitating the inner hot air by cone mixer
- Exhaustion controlled by inverter
- All drying parameters are monitored by CAN-BUS with PLC and PC;
- 轻质隔热墙体材料, 使用彩钢和耐腐蚀镀锌板, 中间填充压缩隔热棉;
- 独立热风供应系统和管道, 干燥房内使用锥形搅拌风机, 使热风分布均匀;
- 独立风机用于抽湿抽热, 变频控制, 独立管道;
- 可使用窑炉余热;
- 循环风系统进一步降低能耗;
- 全套CAN-BUS总线控制系统, 对干燥过程全面监控和调整;



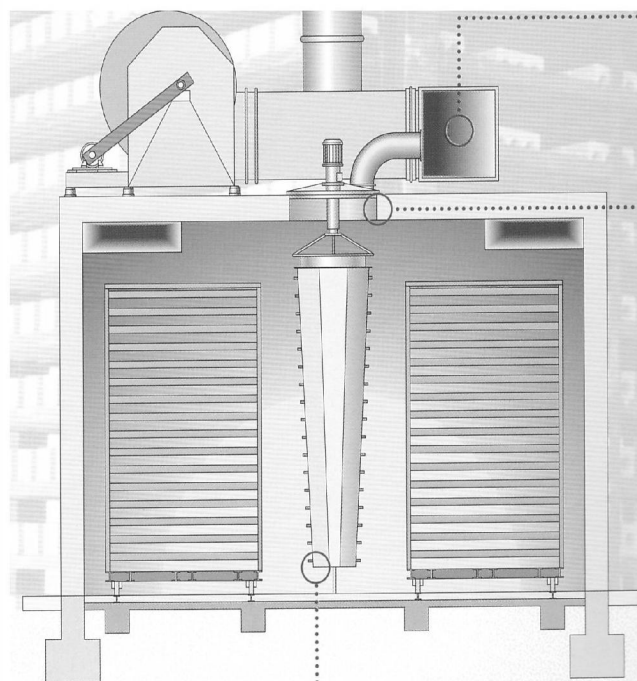
CAN-BUS Control

Based on: PLC+PC and Fame View Software

总线控制

基于可编程控制器和工业PC的控制系统软件。

Technical Features



供热来源:

- 热风炉, 0%~100%
- 窑炉余热, 0~50%

燃料

- 天然气, 8200kcal/n.m3
- 液化石油气, 11000kcal/kg
- 轻柴油 12000 kcal/kg

干燥参数

- 8~24 小时 (冷-冷)
- 入窑水分: < 15%
- 出窑水分: <1%
- 坯体温度: 80~130 C
- 能耗: 800~1000 kcal/kg*H2O

Hot Air Supply

- Heating generator, 0~100%
- From kiln, 0~50%

Fuel

- N.G., 8200kcal/n.m3
- L.P.G, 11000kcal/kg
- Light Diesel 12000 kcal/kg

Processing

- 8~24 hours (cool-cool)
- Inlet moisture: < 15%
- Outlet moisture: <1%
- Body temp.: 80~130 C
- consumption: 800~1000 kcal/kg*H2O

干燥房之技术指标

One-stage or Two -stage burner is employed into the heating generator with the option of proportional firing device, the outlet hot air temperature are fully monitored automatically.

The light diesel or Gas could be used;

Automatic ignition and flame detection are functioned;

Combustion Air feeding are automatically adjusted.

Burner

Structure of Generator

热风炉结构

The Generator consisting of three parts into one:

A. The burner

It provides the heating that needed for drying, with proportional firing system, could be in mode of high/low fire for easy control

B. The oven

The flame by burner will enter into the oven which built with refractory bricks, the oven chamber also contains the air inlet taking-in to mix to

achieve the hot air at wanted temperature

C. The control unit

To determine the outlet hot air temperature and control the burner condition of firing: On/off or high/low fire;

比例燃烧系统，出口火焰温度可自动调节

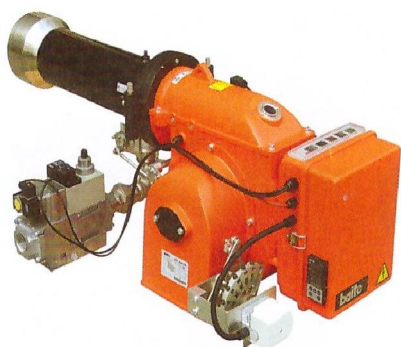
B. **炉体**：使用了轻质耐火砖砌筑成，同时炉体包含了可以让外界冷风进入调节混风温度的装置；

C. **控制单元**：决定了出口热风温度，同时对燃烧机的燃烧工况进行调节和监控：开启/关闭 或 大火/小火；

热风炉包含三个部分：

A. **燃烧机（喷枪）**；它提供了干燥需要的热量，带

使用单段火或者双段火**燃烧机**，可选择比例调节控制；热风炉的出口温度自动调节。燃烧机可使用柴油或天然气以及液化石油气。可实现自动点火和火焰检测功能。同时，助燃风的进风量自动调节；



Heating Exchanger



The heating exchanger is utilized the separate pipes to feature the mass heat exchanging area and high efficiency;

The flue gas which could be used directly enters into the gaps and intervals between the pipes inside of the exchanger leading to the pipes temperature up, and at the meantime, the ambient cool and dry air is taken into the pipes, thus the heats is transformed from the pipes into the ambient air and then to be taken out the exchanger to where needed, such as, drying or pre-drying and so on;

The exchange pipes are in thin and long form of stainless steel with compact laying and welding;

我们采用了高效的管式隔离换热系统；具备换热面积大，换热效率高的特点；

不可直接使用的热烟气换热管通过换热管的外部空隙，使换热管的管壁温度升高，与进入换热管内的外界清洁的冷风进行热交换，冷风的温度升高后，被抽出换热器，共干燥或其他地方使用；换热管采用薄壁不锈钢密集分布。结构坚固，密封；

管式换热器

Engineering Units Conversion Table | 单位换算表

	Pa	KPa	MPa	bar	mbar	kgf/cm ²	mmH ₂ O	p.s.i
Pa	1	10 ⁻³	10 ⁻⁶	10 ⁻⁵	10 ⁻²	10.2×10 ⁻⁶	101.97×10 ⁻³	0.15×10 ⁻³
KPa	10 ³	1	10 ⁻³	10 ⁻²	10	10.2×10 ⁻³	101.97	0.15
MPa	10 ⁶	10 ³	1	10	10 ⁴	10.2	101.97×10 ³	0.15×10 ³
bar	10 ⁵	10 ²	10 ⁻¹	1	10 ³	1.02	10.2×10 ³	14.5
mbar	10 ²	10 ⁻¹	10 ⁻⁴	10	1	1.02×10 ⁻³	10.2	14.5×10 ⁻³
kgf/cm ²	98066.5	98.07	98.07×10 ⁻³	0.98	980.67	1	10.000	14.22
mmH ₂ O	9.806	9.807×10 ⁻³	9.807×10 ⁻⁶	98.07×10 ⁻⁶	98.07×10 ⁻³	10 ⁻⁴	1	1.42×10 ⁻³
p.s.i	6894.76	6.89	6.89×10 ⁻³	68.95×10 ⁻³	68.95	70.31×10 ⁻³	703.07	1

$$1^{\circ}\text{F} = 5/9^{\circ}\text{C}$$

	公 里 km	公 尺 m	公 分 cm	公 厘 mm	英 寸 inch	英 尺 ft
公里 km	1	1000	10 ⁵	10 ⁶	39370	3280.83
公尺 m	0.001	1	100	100	39.37	3.28083
公分 cm	10 ⁻⁵	0.01	1	10	0.3937	0.032802
公厘 mm	10 ⁻⁶	0.001	0.1	1	0.003937	0.003281
英寸 inch	2.54×10 ⁻⁵	0.0254	2.540	25.40005	1	0.08333
英尺 ft	0.3048	0.3048	30.480	304.801	12	1

POWER CONVERSION	瓦 w	千瓦 kw	千卡/小时 Kcal/hr	英热单位/时 Btu/h
瓦 (w)	1	0.001	0.8604	3.412
千瓦 KW	1000	1	860.4	3412.08
千卡/小时 Kcal/hr	1.1629	0.00116	1	3.9679
英热单位/时 (Btu/h)	0.293071	0.0003	0.2521	1

$$\text{K} = ^{\circ}\text{C} + 273.15$$

ENERGY	焦耳 J	千卡 kcal	千克力·米 kgf·m	千瓦小时 kW.h
焦耳 J	1	2.389×10 ⁻⁴	0.10204	2.778×10 ⁻⁷
千卡 kcal	4186.75	1	427.216	1.227×10 ⁻³
千克力·米 kgf·m	9.80665	2.342×10 ⁻³	1	2.724×10 ⁻⁶
千瓦·小时 kW.h	3.6×10 ⁶	860.04	3.67×10 ⁵	1

_____D_____M_____Y





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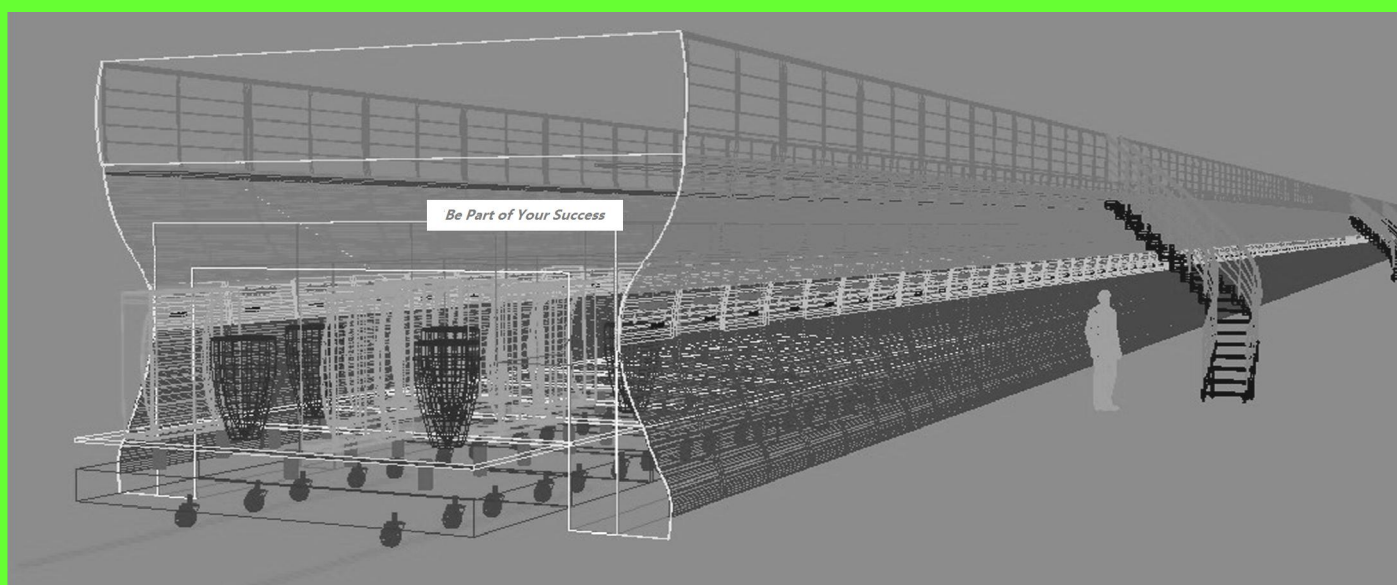
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欧 科 窑 业

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Insulator 绝缘陶瓷

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Tiles 瓷砖

Advance Ceramic 先进陶瓷