

8000t/d新型干法生产线技术

8000t/d NEW DRY PROCESS & TECHNOLOGY OF CEMENT PRODUCTION



主要技术优势

Main technical advantages

- 与2*4000t/d生产线相比投资大幅降低
- 采用天津院烧成系统开发的第三代最新技术，指标先进
- 窑系统年运转率90%以上
- 充分考虑大型化装备开发的特殊要求
- 生产线布置紧凑
- Investment significantly reduced compared with 2*4000t/d production line
- Using the 3rd generation burning system technology developed by TCDRI
- Over 90% availability annually
- Fully considering special requirement of large sized equipment development
- Compact arrangement

天津水泥工业设计研究院有限公司

Tianjin Cement Industry Design & Research Institute Co.,Ltd.

1 概述

GENERAL

2009年天津公司在贵州省惠水县建设了一条8000 /d级熟料新型干法水泥生产线，集中了公司自主研发制造的大型生料立磨、尾端扩大型回转窑、带TTF型分解炉的第三代窑尾预分解系统、第四代双段中置辊破TCS型篦冷机以及新型TCNB型窑头燃烧器等新技术和新装备，为适应高硫燃料和环保的要求，还采用了烟室料幕技术和分解炉分级燃烧的脱硝技术，是国内首条成功自主研发设计的8000t/d级新型干法生产线，是我国水泥工业技术创新和科技进步的集中展现，对贵州水泥工业的结构调整、技术进步，及我国水泥工业大型化和节能减排产生积极的推动作用。

In 2009, TCDRI built up a new dry process cement production line with capacity of 8000 tons clinker per day. It integrates self-developed large sized vertical raw mill, kiln-inlet-enlarging rotary kiln, the 3rd generation precalcining system including TTF calciner, 4th generation TCS grate cooler with middle roller crusher, new type TCNB kiln burner and similar new technology and equipment. In order to adapt high sulfur contained fuel and environmental protection requirement, kiln inlet chamber curtain technology and calciner step combustion for denitrification are utilized. It is the first self-developed 8000t/d new dry process cement production line in China. It is an integrated show of innovation and progress of Chinese cement industry, and plays positive impact to restructuring of cement industry, technical progress, large sized technology and equipment as well as energy saving and emission reduction purpose.



2 生产线主要技术指标

MAIN INDEX

8000t/d生产线主要技术指标：

- 设计能力：正常7500t/d，最大8500t/d；
- 熟料热耗：设计2968kJ/kg.cl，保证3010kJ/kg.cl；
- 熟料综合电耗：<60kWh/t.cl；
- 窑系统年运转率：≥90%；
- NOx排放量：<800mg/m³（标）。

Main technical index of 8000t/d cement production line:

- Design capacity: normal 7500t/d, max. 8500t/d
- Heat consumption: design @2968kJ/kg.cl, guarantee @3010kJ/kg.cl
- Power consumption: <60kWh/t.cl
- Annual availability: ≥90%
- NOx emission: <800mg/Nm³

3 烧成系统特点

CHARACTERISTICS

烧成系统采用三挡支撑尾端扩大回转窑、高效低阻优化型第三代预分解系统、新型高效第四代篦式冷却机以及大推力低一次风量新型燃烧器，满足8000 t/d生产线的设计要求。

Burning system uses 3-support end extending rotary kiln, high efficiency low pressure loss optimized 3rd generation precalcining system, 4th generation grate cooler and big push low volume new type burner.

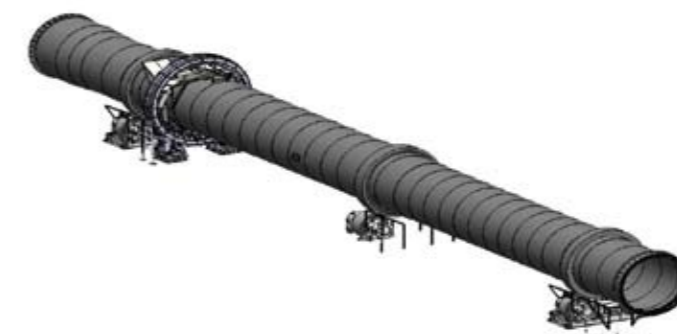
3.1 尾端扩大的回转窑

采用回转窑尾端扩大技术主要优点如下：

- 1) 有效降低回转窑和烟室的阻力，大大改善窑内通风，减少烟室飞灰损失，最大限度地发挥回转窑的潜能；
- 2) 采用高硫煤时，采取回转窑尾端扩大技术和烟室料幕等高硫煤技术，有效缓解燃煤中硫含量偏高带来的长厚窑皮或结后圈以及烟室结皮不利影响；
- 3) 三次风管阀门开度可适当加大，从而可降低系统阻力，减少了三次风管阀门的磨损。

3.1 KILN-INLET-ENLARGING ROTARY KILN

- 1) It will effectively reduce resistance of rotary kiln and kiln inlet chamber, greatly improve kiln ventilation, reduce kiln inlet chamber ash loss and maximize the potentiality of rotary kiln.
- 2) When firing high sulfur contained coal, kiln-inlet-enlarging rotary kiln and kiln inlet chamber material curtain can effectively relieve negative impact of long and thick coating in rotary kiln and inlet chamber.
- 3) Opening of tertiary air duct valve could be enlarged properly, so as to reduce system resistance and minimize wear to tertiary air duct valve.



3.2 高效低阻优化型第三代预分解系统

8000t/d生产线第三代预分解系统的主要特点:

- 通过改进撒料盒结构等措施,提高预热器系统换热效果,降低预热器出口温度;
- 通过优化旋风筒进口面积及宽高比,降低预热器出口阻力;
- 采用新型低NO_x型分解炉,提高分解炉对煤质和产量的适应性;
- 采用烟室料幕等高硫煤应用技术;
- 优化窑尾塔架立柱,降低窑尾系统土建用钢量,降低系统投资。

3.3 带中置辊破的第四代篦式冷却机

第四代无漏料行进式稳流冷却机采用自主研发的带中间辊破技术、运动导轨式、600*660mm篦板和具有专利技术的CF型稳流阀,列间密封更加厚实,具有热回收效率高、运行可靠、磨损少、易维护、使用寿命长、结构紧凑、可降低整个烧成系统布置高度、节省土建费用等显著特点。



与锤破相比,中置熟料辊式破碎机布置更灵活,高温熟料经过前端篦床的急冷,大块熟料或窑皮被中置辊破破碎后,经二段篦床继续进行二次冷却,可最大限度的支持余热发电系统的要求,出冷却机熟料温度可大幅降低。

3.2 HIGH EFFICIENCY AND LOW PRESSURE LOSS OPTIMIZED 3RD GENERATION PRECALCINING SYSTEM

- By improving spreader box to increase heat exchange efficiency of preheater and reduce preheater outlet temperature;
- By optimizing cyclone inlet area and width height ratio to reduce preheater outlet resistance;
- By using new type low NO_x emission calciner to improve calciner's adaptability to coal quality and kiln capacity;
- By using material curtain to response high sulfur contained coal;
- By optimizing vertical pillar of preheater tower to reduce steel consumption of preheater tower and civil construction cost.

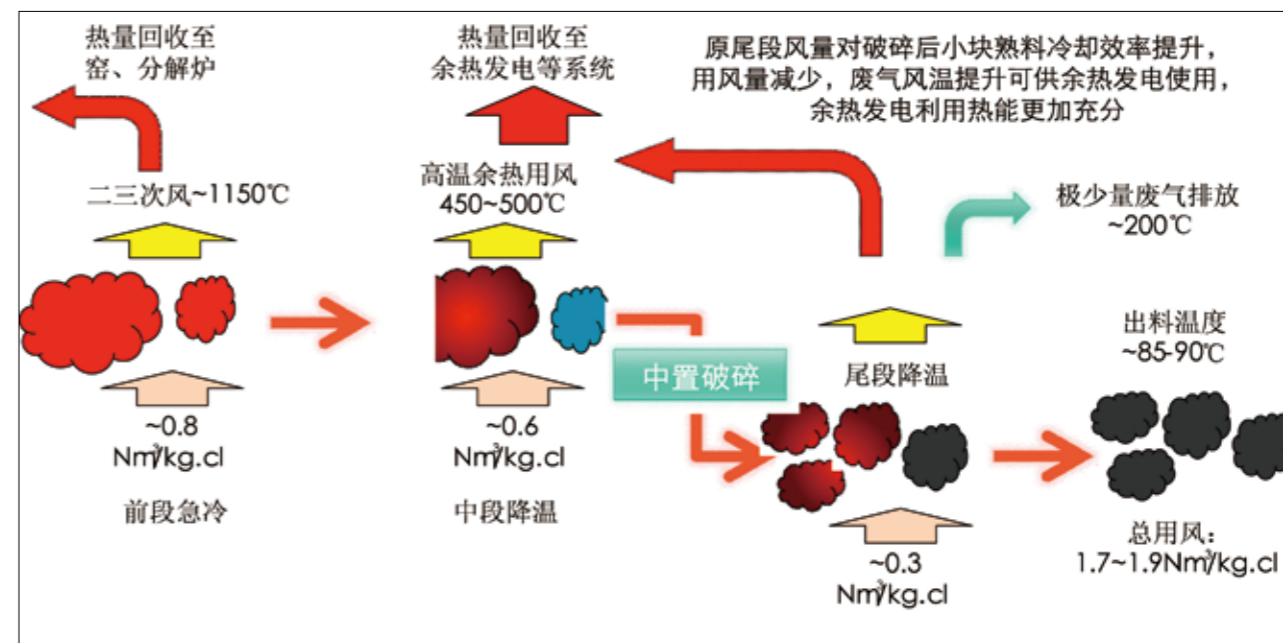
3.3 4TH GENERATION GRATE COOLER WITH MIDDLE ROLLER CRUSHER

The 4th generation no-leaking walking floor steady flow cooler is self-developed technology, including middle arranged roller crusher, movement rails, 600*660mm modular grate plate, patent CF flow control valve, which enables more compact seals and have high heat recovery efficiency, reliable operation, less wear, easy maintenance, long lifetime, compact structure. Besides, it can reduce the height of whole burning system and also save civil construction cost accordingly.



自主研发的带中间辊破的新型高效第四代篦式冷却机
Self-developed New Type High Efficiency Grate Cooler with Roller Crusher in Middle

Comparing with clinker hammer crusher, middle arranged clinker roller crusher is more flexible for its arrangement. High temperature clinker, after quenching, will be crushed. Afterwards, it could be recooled at secondary section of grate plate, so as to maximize its utilization of waste heat recovery and greatly reduce the clinker temperature.



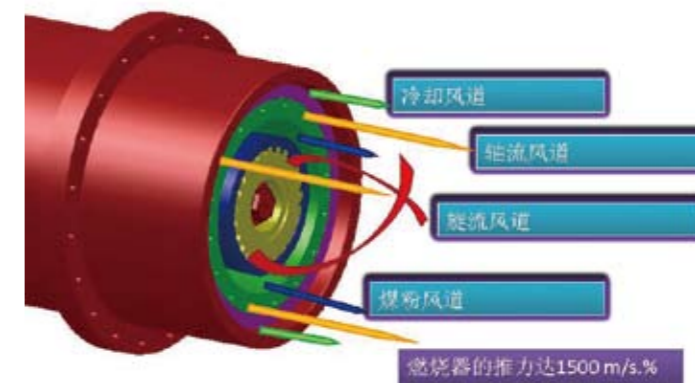
中置破碎熟料冷却过程示意图
Process Diagram of Middle Arranged Clinker Roller Crusher

3.4 大推力低一次风量新型燃烧器

窑头燃烧器具有一次风用量低、燃烧推力大等显著技术特点。其高速的出口射流,大大强化了煤粉和高温二次风的混合。燃烧器火力强,火焰形状合理,燃烧器的推力达1500 m/s.%以上,对各种煤质包括无烟煤及低热值的劣质煤的适应性强,相应可降低系统NO_x的生成量。

3.4 HIGH MOMENTUM LOW VOLUME NEW TYPE BURNER

Kiln burner is of low gas volume and high momentum technology. Its high velocity outlet flow greatly enhanced mixing of pulverized coal and high temperature secondary air. The burner of strong firepower, reasonable flame shape with momentum over 1500 m/s.%. It is widely adapted various types of coal including anthracite and bad quality coal with low heat value and reduce the emission of NO_x accordingly.

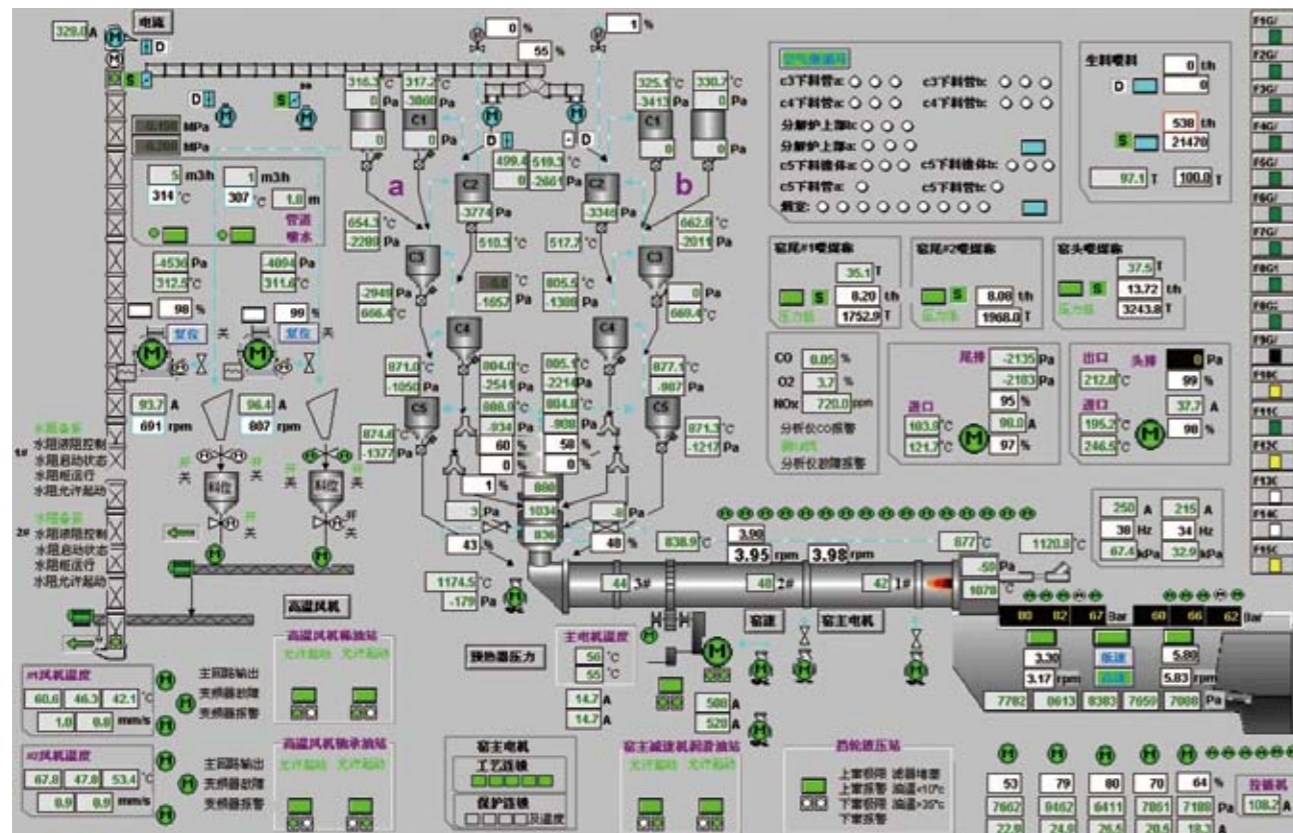


4 应用实例

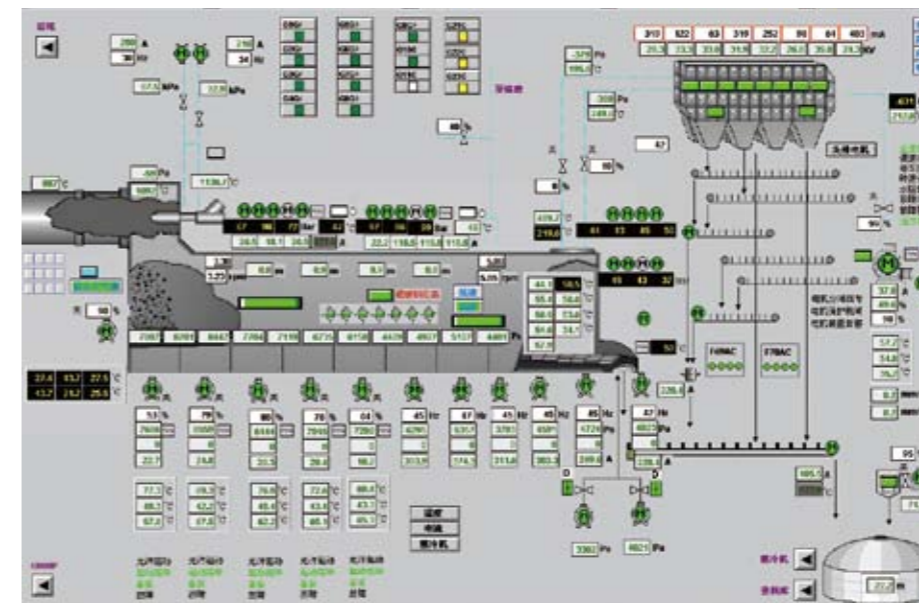
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惠水8000t/d生产线2011年8月初点火投料。8月23日投料量达500t/h以上，8月28日通过业主的达产考核。2011年12月份除月底五天因为熟料库满外，窑一直处于平稳运行状态，日产量达8000t/d以上，初步估算烧成热耗为708.8kcal/kg.cl，出窑熟料f-CaO合格，3天强度达33.9MPa，28天强度为60.0MPa。冷却机运转正常，熟料冷却效果好，热回收效率高，体现出无漏料、设备易于操作、维护的优点。

Huishui Cement Production Line (8000t/d) started commissioning at the beginning of August of 2011. On 23rd of August, the kiln feed was over 500t/h. On 28th of August, it passed the performance test on its capacity. The kiln system kept stable operation with daily capacity over 8000 tons clinker, except for 5 days kiln stop in Dec. 2011 due to full of clinker silo. By preliminary estimation, the heat consumption of this project was 708.8kcal/kg.cl with qualified clinker f-CaO, and 3-day strength achieved 33.9 MPa, 28-day strength was 60.0 MPa. Cooler worked stable and was of good cooling effect, high heat recovery efficiency, no leaking of clinker, easy operation and maintenance.



烧成窑尾操作画面
Operation Interface of Preheater System



-  低破模式：投料初期产量较低（1对破碎付，3.5rpm）
-  正常模式：7500-8500tpd产量（2对破碎付，3.5rpm）
-  高高破模式：8500tpd以上及掉窑皮情况（2对破碎付4.5rpm）

窑头篦冷机中控操作画面及中置辊破运行模式
CCR Operation Interface of Cooler and Clinker Roller Crusher

新疆青松建材有限责任公司2*8000t/d熟料新型干法水泥生产线总承包项目正处于设计、施工阶段，预计2013年能够成功投产。

Xinjiang Qingsong Building Material Co., Ltd 2*8000t/d cement production line is under design and construction stage. It is expected to be operated in 2013.



NEW DRY PROCESS
ON 8000t/d NEW D
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