

新型干法水泥生产线 技术改造

TECHNICAL MODIFICATION OF NEW DRY
PROCESS CEMENT PRODUCTION LINE



主要技术优势

Main technical advantages

- 可针对不同规模生产线提供有针对性的技改方案
- 可以对生产线进行全面、系统的诊断服务
- 对技改项目可提供全面的总承包服务
- 可靠的工艺技术方案
- Be able to provide pertinent modification solution for cement production lines with different capacity
- Be able to undertake complete and systematic diagnostic services for cement production lines
- Be able to provide complete EPC contracting service for technical modification
- Reliable technology solution

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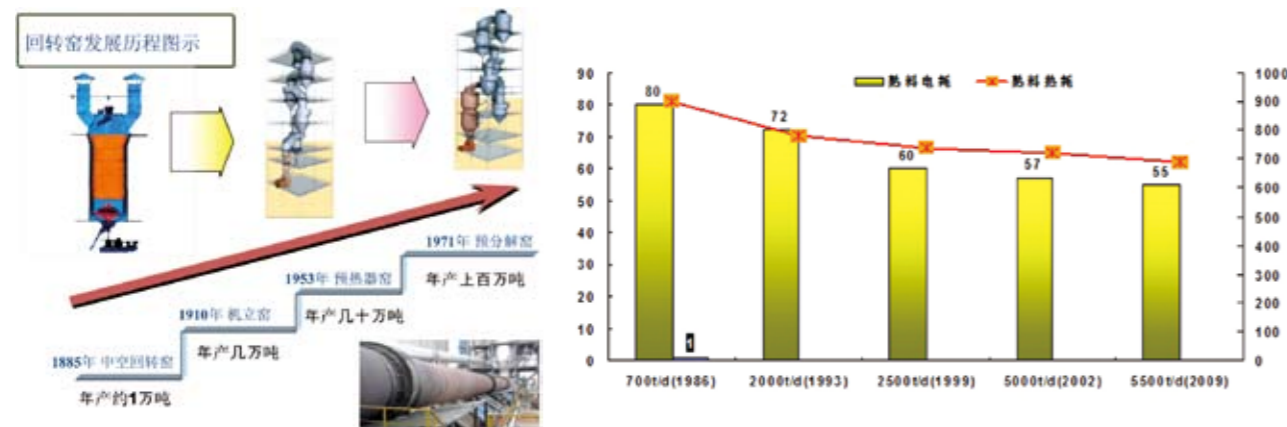
Tianjin Cement Industry Design & Research Institute Co.,Ltd.

1 概述

GENERAL

随着新型干法水泥生产技术的不断进步、节能减排要求的不断提高、以及原燃料条件可能发生的变化，大多已投产的生产线有必要进行相应的技改。技改首先必须了解生产线的实际运行情况，找出制约系统运行和性能提高的关键瓶颈点，通过技术比较和方案论证，提出有针对性的、技术可靠的改造方案。技改的目的一般有：提高系统产量、改善系统性能、生产线节能降耗、使用价格低的低品质燃料，或者以上几个方面的组合等等。

With successive improvement of new dry process cement production technology and improving requirement of energy saving and emission reduction, as well as the possible variation of raw material and fuel, most of operated cement production lines need to make corresponding technical modification. Technical modification must know the actual operational situation of cement production line, and find out the bottleneck restricting the improvement of system operation and performance. Through technology comparison and demonstration, targeted and reliable modification solution to cement production line will be proposed. The target of technical modification generally includes capacity increasing, improving system performance, energy saving and emission reduction of cement production line, using lower quality fuel or the combination of the aforesaid aspects.



回转窑发展历程及新型干法生产线指标变化
History of Rotary Kiln Development and Index Variation of New Dry Process

2 燃料对烧成系统的影响

FUEL IMPACT TO BURNING SYSTEM

燃料条件与烧成系统的设计、运行情况紧密相连，技改要根据燃料情况，主要是燃料的灰分、挥发分、低位热值、全硫含量等工业分析结果和燃尽特性，确定回转窑和分解炉对煤质的适应性。

The type and grade of fuel are closely connected with design and operation of burning system. Technical modification is to define the coal adaptability of rotary kiln and calciner based on fuel condition including ash content, volatile, low heat value, total sulphur content and similar proximate analysis result and burnout characteristics.

3 技改方案

MODIFICATION SOLUTION

根据不同生产线的技改目的，我们会提出有针对性的技改方案，在窑尾预分解系统、窑尾预热器系统、回转窑系统、窑头燃烧器、窑头篦冷机系统、煤粉制备系统及其他方面，初步探讨可能采取的技改方案。

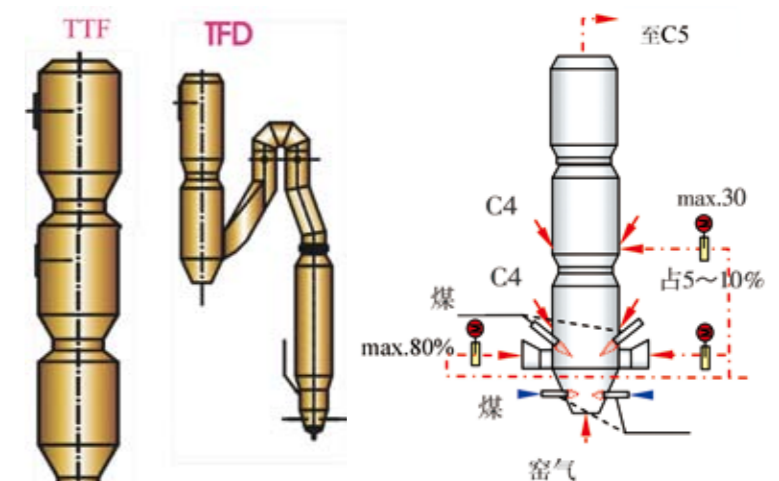
According to different target of technical modification to different capacity, we will propose pertinent modification solution to discussion the possible modification scheme of precalcining system, preheater system, rotary kiln system, kiln burner, grate cooler system and coal mill system.

3.1 窑尾预分解系统

早期设计的窑尾预分解系统的适应性通常较差，为使分解炉能很好地适应燃用低品位煤或提产的要求，技改主要采用增大分解炉容积或者上下分料措施。

PREHEATER AND PRECALCINING SYSTEM

The early designed preheater and precalcining system is of worse adaptability to fuel. In order to enable calciner to adapt to using low grade coal and increasing kiln capacity, technical modification mainly applies to increase the volume of calciner or diverting fuel feed from the lower and higher position.



分解炉改造型式及三喷腾型分解炉系统示意图
Type of Modified Calciner and Triple Spout Calciner

3.2 窑尾预热器系统

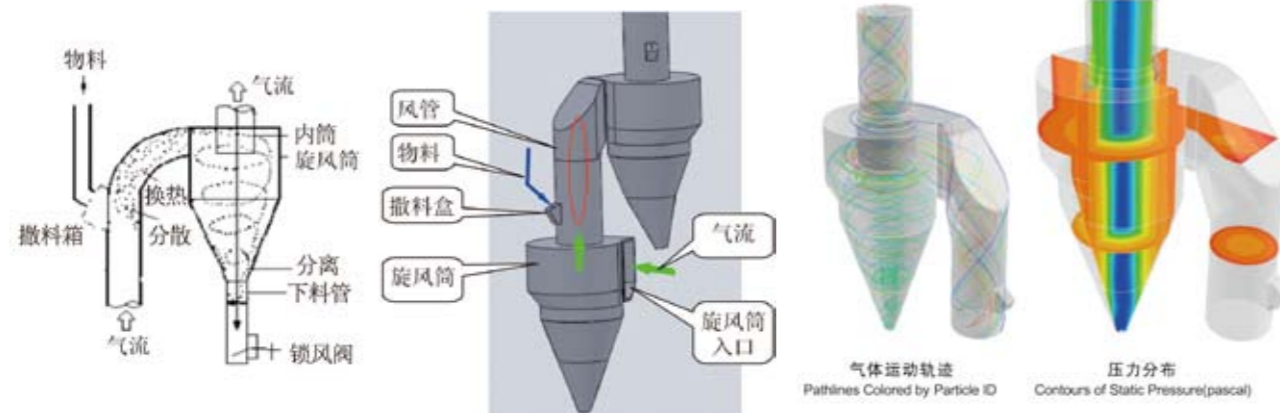
窑尾预热器系统主要问题有阻力高、分离效率低和气流换热效果差等方面。

- 加强窑尾换热效果，优先考虑使用新型撒料装置。
- 提高旋风筒的分离效率，优先考虑缩小并加长C1旋风筒内筒以及调整旋风筒的进口风速等。
- 降低旋风筒的阻力，优先考虑适当扩大旋风筒的进口面积。
- 加强密封处理，减少系统漏风。

PREHEATER SYSTEM

The main problem of preheater system is high pressure loss, low separation efficiency and bad gas solid heat exchange effect.

- Priority use of the new type spreader to improve heat exchange effect of preheater system
- Priority to reduce the diameter and extend the length of C1 dip tube and regulate the inlet gas velocity in order to increase cyclone separation efficiency
- Priority to properly enlarging inlet area of cyclone in order to reduce cyclone pressure loss
- To improve sealing and reduce system false air



窑尾预热器系统功能示意图
Functional Diagram of Preheater

3.3 回转窑系统

为配合提产改造的需要，回转窑的窑速最好与系统产量相适应，可采取适当提高窑速的方法。

3.4 窑头燃烧器

如果采用低品位煤、或生产线提产、或原有窑头燃烧器不能满足窑头煅烧乃至熟料质量的要求，建议采用低一次风量大力推力的新型窑头燃烧器，并更换窑头一次风机。

3.5 窑头篦冷机系统

第三代冷却机在国内外市场的保有率仍非常高，因此三代篦冷机技改空间很大。一直以来，冷却机是制约烧成系统提产的瓶颈问题，尤其是2006年以前投产的生产线，如何提高冷却机的产量和热回收效率是解决问题的关键。可以针对不同情况采取相应的技改方案。

3.6 煤粉制备系统

为满足烧成系统煅烧低品位煤或提产的技改需要，煤粉细度必须得到有效的控制。如果要求磨机提产幅度不大，则通常是改造或优化选粉机；如果要求磨机提产幅度较大，则需要考虑对磨机本体进行技改和优化。另外，根据烧成系统用煤要求，煤粉计量及输送系统也应当能够确保烧成系统的需要。

3.7 脱硝技术

水泥工业是NOx排放大户，国家即将出台严格的NOx排放标准，必须采取有效的技改方法。目前，在水泥行业采用较多的降低NOx排放的技改措施主要有：稳定窑操作及使用低NOx燃烧器；采用分级燃烧的低NOx型分解炉；采用选择性非催化还原（SNCR）技术。

ROTARY KILN SYSTEM

In order to meet the requirement of increasing kiln capacity, the rotation speed of kiln had better match with kiln capacity. Proper means could be used to increase the kiln speed.

KILN BURNER

In case of using low quality coal, increasing kiln capacity or existing kiln burner not fulfilling requirement of clinker burning and clinker quality, it is suggested to use new type kiln burner with high momentum and low primary air volume and replace existing primary air fan.

GRATE COOLER SYSTEM

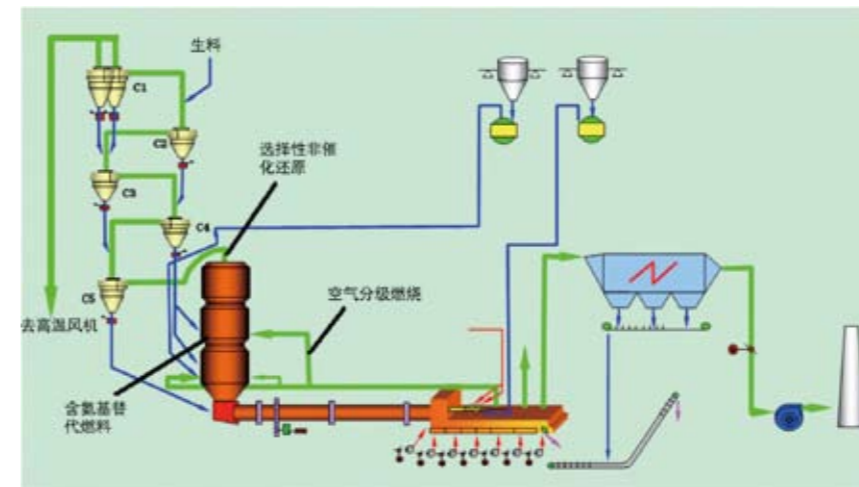
The 3rd generation grate cooler is still popular in domestic and foreign markets. It will be big market to modify the 3rd generation grate cooler. Since years, cooler is the bottleneck of increasing kiln capacity, especially for cement production lines operated before 2006. It is critical on how to improve the cooler capacity and heat recovery efficiency. Various technical modifications could be done according to different situation.

PULVERIZED COAL PREPARATION SYSTEM

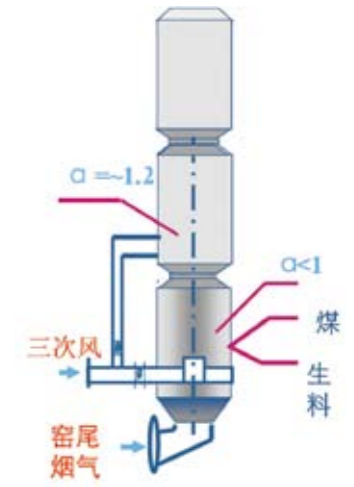
In order to be able to burn low grade coal or meet the requirement of technical modification for increasing kiln capacity, the fineness of pulverized coal must be effectively controlled. If big increase of coal mill capacity not required, it generally will modify or optimize separator. If it requires big increase of coal mill capacity, technical modification and optimization to coal mill should be considered. Besides, according to coal requirement of burning system, the coal weighing and feeding system should be able to fulfill the requirement of burning system.

DENITRATION TECHNOLOGY

Cement industry is one of the major NOx emission industries. Effective modification must be done to fulfill the coming strict NOx emission standard. Presently the main measures to reduce NOx emission is to stabilize kiln operation and use low NOx burner, use low-NOx calciner with step combustion and apply selective Non-Catalytic Reduction (SNCR) technology.



我公司分级燃烧脱硝技术



3.8 生料粉磨系统

对于生料粉磨系统，技改的目的主要有提高生料磨系统产量以满足烧成系统提产要求和降低系统电耗，前者主要是对原有磨机或选粉机系统进行小幅提产量改造，后者主要是将耗电较高的球磨系统改造为耗电较小的辊式磨系统或生料辊压机终粉磨系统。

3.9 其他

对于一条水泥生产线，各类风机的电耗占25~30%，因此做好电动机的降耗增效工作极为重要，可以对大型风机采用变频调速技术降低电耗。

RAW MILL SYSTEM

The target of technical modification to raw mill system is to increase system capacity of raw mill system so as to fulfill the requirement of increasing kiln capacity and reduce system power consumption. It will modify the existing raw mill and separator system to reach the target of increase kiln capacity. How to reduce system power consumption requires to modify existing high power consumed ball mill system to be low power consumed vertical roller mill system or roller press raw grinding system.

OTHERS

Power consumption of all types of fan consumes 25~30% of total power consumption of a complete cement production line. By such reason, how to reduce the power consumption and improve fan efficiency become very important. VVVF technology for big fan can be used as a method to reduce system power consumption.

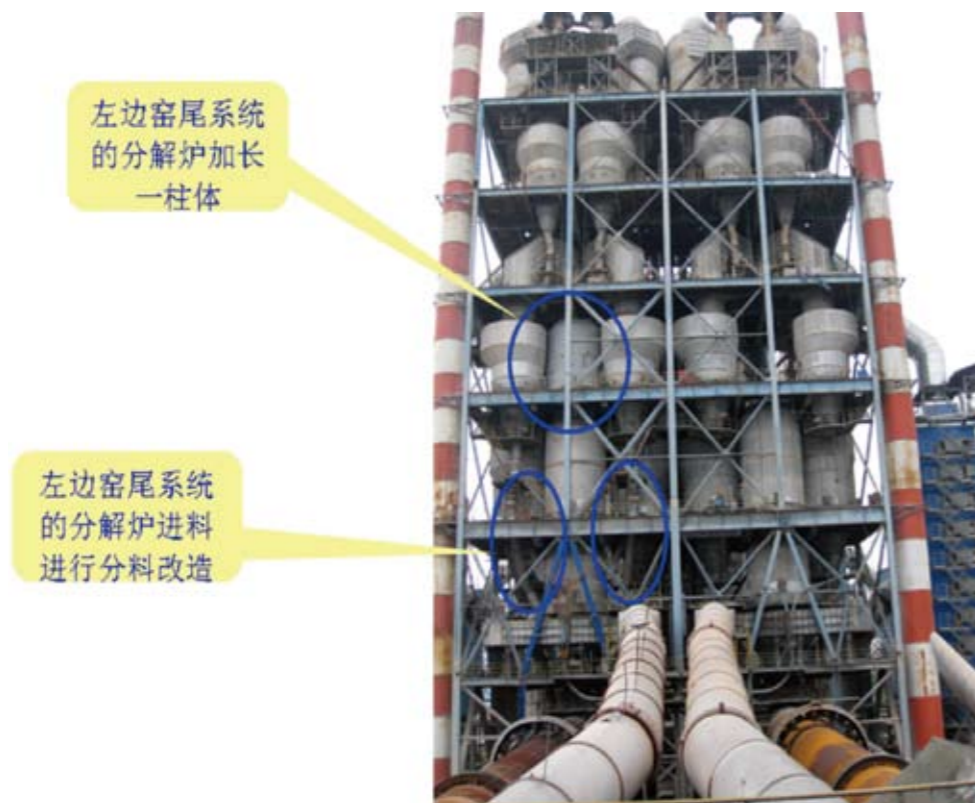
4 生产线技改实例

Example OF MODIFICATION

据不完全统计，我公司近几年完成生产线技改约25项，取得了良好的效果。

2009年我公司对九江南方水泥有限公司两条2500t/d生产线烧成系统进行煅烧低热值劣质煤技改。改造后使用挥发分为20%、热值为5000kcal/kg左右的劣质煤。

According to incomplete statistics, TCDRI annually completes 25 technical modification projects and received good effect. In year of 2009, we did technical modification to 2X2500 t/d cement production lines of JiujiangNanfang Cement Co., Ltd enabling to burn bad grade coal. After modification, the cement production lines can use bad grade coal of 20% volatile with heat value of 5000kcal/kg coal.

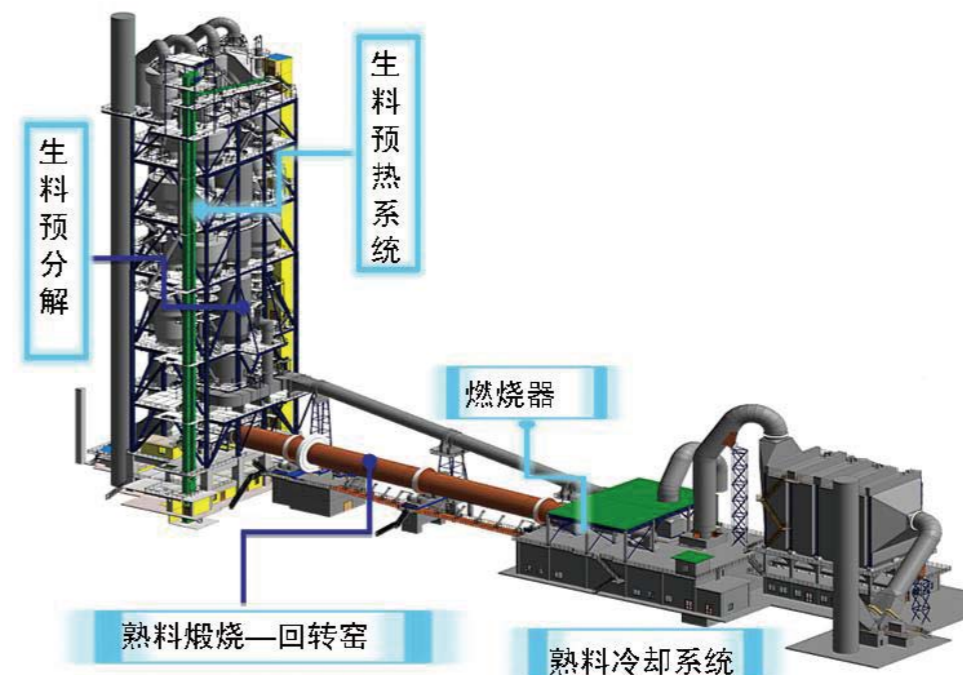


九江南方生产线技改内容示意图
Technical Modification of JiujiangNanfang Cement Co., Ltd Production Line

生产线技改内容及效果
Item and Effect of Technical Modification

序号	主要技改内容	技改效果
1	加高现有分解炉	熟料产量大于2800t/d，熟料强度略提高，标煤耗由原来117kg/t降至109kg/t，熟料综合电耗降低2 kWh/t.cl。
2	将原有撒料装置进行优化改造，	对各种煤质的适应性加强
3	对窑尾C4筒入炉物料进行上、下分料技改	分解炉温度“倒挂”现象消除
4	用低一次风量大推力的新型窑头燃烧器	二、三次风温较技改前有所提高

No	Items	Effect
1	To increase the height of existing calciner	Clinker output more than 2800t/d, clinker strength slightly improved, coal consumption reduced from 117kgce/t to 109kgce/t clinker. Clinker power consumption reduced 2 kWh/t.clinker.
2	To optimize and modify existing spreader	Enhanced adaptability to various types of coal
3	To diverter C4 feed to be fed from higher and lower position	Eliminated calciner“Temperature” and “Actual” Reversal situation
4	To use new type kiln burner with high momentum and low primary air volume	Increased temperature of secondary and tertiary air





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