

# 配制水泥工艺技术

## PROCESS & TECHNOLOGY OF PROPORTIONING METHOD IN CEMENT PRODUCTION



### 主要技术优势

#### Main technical advantages

- 较大幅度地提高水泥中混合材的掺量
- 按照用户的需求调配水泥的性能，满足水泥用户的实际需求
- 生产高性能、低能耗的粒度调配水泥
- 节省粉磨系统电耗
- 快捷、迅速地转换水泥品种
- 生产满足特种工程需要的特种水泥
- to greatly increase the content of additives in cement
- to regulate the property of cement and fulfill the actual demand of end users
- to produce high performance low energy consumption cement based on particle distribution adjusted
- to save power consumption of cement grinding
- to quickly change cement type
- to produce special cement required by special project

**天津水泥工业设计研究院有限公司**

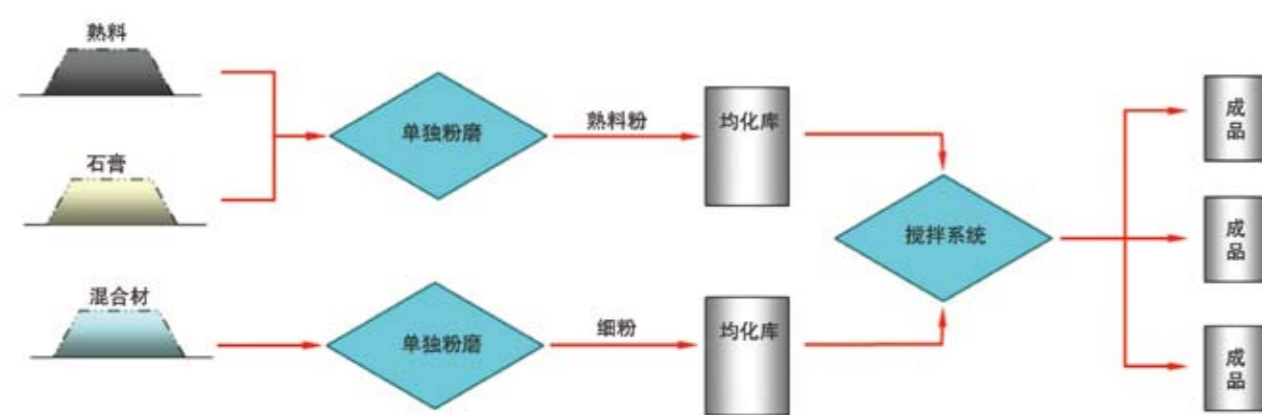
Tianjin Cement Industry Design & Research Institute Co.,Ltd.

# 1 概述

## GENERAL

配制水泥工艺技术，主要是在水泥粉磨中，将水泥熟料和混合材利用单独的粉磨设备分别粉磨，然后再利用混合设施搅拌均匀的生产工艺。我公司自2004年开始，专门成了有关课题，对配制工艺技术以及配制水泥的性能进行了大量的试验研究工作，部分成果已经在一些工程实践中进行了应用，取得了显著的效果，同时还提出了一种制备高性能水泥的新技术，并申请了发明专利。配制水泥工艺见下图所示。

The process of proportioning method in cement production is as fellow. clinker and additives are grinded separately in separate grinding mill, and then mixed homogeneously by mixing equipment. Since 2004, we keep making experiments on process and technology of proportioning method in cement production and the property of cement made in this process. Partial research results have been applied in some practical projects and received outstanding benefits. In the meanwhile, we invented a new technology for preparation of high performance cement and applied for invention patent. The process of proportioning method in cement production refers to the process flow diagram bellowed.



# 2 在不同应用领域的原理、技术特点和使用效果

## PRINCIPLE, CHARACTERISTICS AND EFFECT IN DIFFERENT FIELDS

1. 采用配制水泥工艺技术大幅度提高水泥中混合材的掺量，生产大掺量矿渣水泥、粉煤灰水泥。

● 技术特点：

> 水泥熟料和混合材的粉磨细度有不同的安排，矿渣或者粉煤灰等混合材利用单独的粉磨设备粉磨得比熟料更细，活性更高。

> 通过熟料和混合材细度的匹配，进一步激发混合材的活性效应，达到最佳的水泥性能，提高掺量。

● 效果：

> 和具有相同物料组成、相同细度的传统共同粉磨水泥相比，采用分别粉磨的配制水泥强度可提高3-5MPa左右，从而能够提高矿渣或者粉煤灰的掺量8-10%左右，对于粉煤灰水泥，水泥的需水量还可以下降1-2%。

2. 采用配制水泥工艺技术改善水泥的颗粒分布和性能，生产符合商品混凝土需要的高质量水泥。

● 技术特点：

> 通过增设新的单独粉磨系统和混料设施，利用水泥厂常用的水泥混合材磨制出用于颗粒调配的粗、细颗粒填充料，采用专门建立的颗粒分布计算程序和粒度调节方法，实现对水泥颗粒各组分配比的优化组合，达到拓宽颗粒分布和降低需水量的目的，生产符合混凝土行业需求的高质量水泥。

1) To greatly increase the content of additives in cement by using proportioning method to produce high additive content slag cement and fly ash cement

● TECHNICAL CHARACTERISTICS

> There will be different regulation of fineness of clinker and additive grinding. Slag or fly ash and similar additives will be grinded by separate grinding equipment to get finer and more active product.

● 效果：

> 能够将需水量为28-29%的窄颗粒分布水泥的需水量降低到26.5%的正常水平。

3. 采用配制水泥工艺技术生产低能耗、高性能的粒度调配水泥（申请了发明专利）。

● 技术特点：

> 水泥熟料采用立磨终粉磨、辊压机终粉磨等粉磨效率高的设备来进行粉磨，使其具有较窄的颗粒分布，集中在可水化的粒度范围内；起填充作用的少量微细颗粒和粗颗粒，可以采用粉磨效率较低的球磨机等设备来制备。

> 采用专门建立的粒度调配水泥的粒度调节控制方法，对水泥各组分物料的比例进行特殊的安排，配制成需水量低、高强度的粒度调配水泥。

● 效果：

> 这种粒度调配水泥，绝大部分熟料颗粒集中在可水化的粒度范围内，在强度上具有非常鲜明的优势，和采用传统粉磨方法生产的水泥相比，强度可提高5.0-8.0MPa，同时具有较低的需水量，可实现增加15%以上的混合材掺量。

> 根据物料要求对粉磨设备的安排、高效节能设备的推广应用，使水泥粉磨总体电耗相对传统粉磨工艺有明显的下降，实现节电5%的效果。

> By the matching fineness of clinker and additives, the activation of additives will be further stimulated and the cement can reach high performance.

● EFFECT

> Comparing with cement of same cement mixing ratio and same fineness but produced by traditional grinding technology, the proportioning method cement which ground by separate grinding equipment which increase about 3-5MPa strength. And

also it can increase 8-10% of slag or fly ash. Content for fly ash cement especially, the water requirement can be reduced by 1-2%.

**2) To widen particle distribution and improve performance by using proportioning method and produce high quality cement fulfilling the requirement of ready-mix-concrete**

● TECHNICAL CHARACTERISTICS

> By using separate grinding system and mixing equipment, and mixture to produce coarse and fine particles filler used for regulating the particle distribution of cement. Through specialized particle distribution calculation program and particle regulation method, it realizes the optimum combination of particle allocation, reaches the target of extending particle distribution and reduces water requirement, and produce high quality cement fulfilling requirement of concrete.

● EFFECT

> to reduce water requirement of narrow particle distributed cement from 28-29% to 26.5% normal level.

**3) To produce low energy consumption high performance cement based on particle distribution adjusted by using proportioning method .**

● TECHNICAL CHARACTERISTICS

> It uses grinding equipment with high work efficiency including VRM and roller press to grind clinker, which enables to have narrow particle distribution and have large quantity easy hydration particles . Minority super fine and coarse particles used as fillers can be ground by ball mill.

> It will use specialized established particle regulating method to make special arrangement to proportion of cement mix a low water requirement and high strength cement based on particle distribution adjusted.

● EFFECT

> For such cement based on particle distribution adjusted, most of clinker particles concentrate into easy hydration range with apparent advantage of strength. Comparing with cement produced from traditional process and technology, it can increase 5.0-8.0MPa in strength get a lower water requirement. In the meanwhile, it can have additional 15% additives mixing.

> To arrange grinding equipment based on material property and widely application of high efficiency with a low energy consumption which enables obvious reduction of power consumption and realize 5% saving in power consumption.



图 1 研究人员正在进行水泥的粒度调配试验  
Figure 1 Particle Distribution Experiment

(19) 中华人民共和国国家知识产权局



(12) 发明专利申请

(10) 申请公布号 CN 101798186 A  
(43) 申请公布日 2010.08.11

(21) 申请号 201010113503.1

(22) 申请日 2010.02.25

(71) 申请人 天津水泥工业设计研究院有限公司  
地址 300400 天津市北辰区引河北道 1 号  
申请人 天津中材工程研究中心有限公司

(72) 发明人 姚丕强 吴秋生

(74) 专利代理机构 天津市鼎和专利商标代理有限公司 12101

代理人 李凤

(51) Int. Cl.  
C04B 7/14 (2006.01)

权利要求书 1 页 说明书 4 页

(54) 发明名称

基于粒度调配的高性能水泥及其制备方法

(57) 摘要

本发明公开了一种基于粒度调配的高性能水泥,它由下列重量配比的组分制成:比表面积为  $350 \pm 10 \text{ m}^2/\text{kg}$  且均匀性系数  $n$  值为 1.2-1.3,特征粒径为  $10-12 \mu\text{m}$  的磨细熟料粉 70-80%,比表面积为  $1000 \pm 100 \text{ m}^2/\text{kg}$  的石灰石粉 5-10%,比表面积为  $180 \pm 10 \text{ m}^2/\text{kg}$  的矿渣粉 5-10%,比表面积为  $450 \pm 50 \text{ m}^2/\text{kg}$  的矿渣粉 5-20%,所述磨细熟料粉中含有用于缓凝的石膏组分。本发明还公开了上述高性能水泥的制备方法。本发明和传统方法生产的水泥相比,能够大幅度提高水泥的强度而保持工作性不变,在实际使用时能够大幅度增加混凝土中矿物掺和料的掺量,从而大大节省混凝土的配制成本,并显著改善混凝土的耐久性能。

CN 101798186 A

图2 申请的有关配制水泥专利

Figure 2 Applied Patent on Cement based on particle distribution adjusted

### 3 配制水泥工艺技术的应用实例

## APPLICATION REFERENCE OF proportioning method CEMENT

配制工艺技术，目前在大掺量矿渣水泥的生产方面有很多实际应用，我公司设计或者提供设备的企业主要有：安徽朱家桥粉磨站、广东东莞华润粉磨站、甘肃酒钢宏达日产5500吨水泥生产线、浙江豪龙控股集团有限公司衢州日产4000吨生产线、金刚水泥（辽宁铁岭）有限公司日产5000吨生产线等等，获得了良好的经济效益。

使用配制工艺技术生产大掺量粉煤灰水泥正在成为一种新的趋势，上海建材资源综合利用示范基地项目，山西西山煤电有限公司西山日产5500吨熟料高掺量粉煤灰水泥项目，正在计划采用配制工艺技术生产高掺量粉煤灰水泥。

利用配制工艺对水泥颗粒分布和性能调节方面，以及直接生产粒度调配水泥是未来水泥工业精细化生产的主要方向，前景光明。

Proportioning method cement mainly applied in slag cement such as below Anhui Zhujiqiao Grinding Plant, China Resources DongguanGrinding Plant, Gansu JiugangHONGda Cement Co., Ltd (5500t/d), Zhejiang Haolong Stock Group Ltd Quzhou Cement Co., Ltd (4000t/d), Jin'gangTieling Cement Co., Ltd (5000t/d).

It is a new tendency to add a great of fly ash to proportioning method cement. It applies Shanghai Building Material Comprehensive Utilization Project. Shanxi Xishan Power Co., Ltd Fly ash Project (5500t/d) apples high content of fly ash as additive.

It is the main direction and good prospect to using proportioning method to adjust particle distribution and performance, and directly produce cement based on particle distribution adjusted.



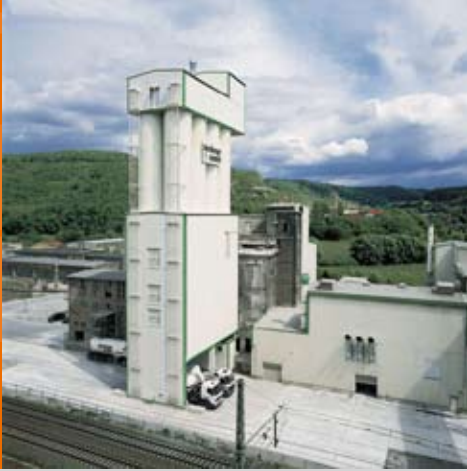
图3 配制工艺使用的混合机的外形图  
Figure 3 Sketch of Mixer



图4 混合机的内部结构  
Figure 4 mixer



图5 配制工艺技术的多仓式配料库（内设混合机）  
Figure 5 Multi-chamber Mixing Silo (containing mixer)



联系我们  
Contact Us

天津

地址：天津市北辰区引河里北道1号  
邮编：300400  
电话：0086(22)26915233  
传真：0086(22)26915452  
网址：[Http://www.sinoma-tcdri.cn](http://www.sinoma-tcdri.cn)

Tianjin

Address: No.1, Yinheli Bei Road, Beichen District,  
Tianjin P.R. China  
Post code: 300400  
Tel: 0086(22)26915233  
Fax: 0086(22)26915452  
Website: [Http://www.sinoma-tcdri.cn](http://www.sinoma-tcdri.cn)

北京

地址：北京市经济技术开发区隆庆街7号  
邮编：100176  
电话：0086(10) 67285071  
传真：0086(10)67285001  
网址：[Http://www.cbmi.com.cn](http://www.cbmi.com.cn)

Beijing

Address :7th, LONGQING Road, Beijing Economic and Technological  
Development Area, P.R. China  
Post code: 100176  
Tel: 0086(10) 67285071  
Fax: 0086(10)67285001  
Website: [Http://www.cbmi.com.cn](http://www.cbmi.com.cn)