

水泥窑协同处置 污泥技术

Technology for sludge co-processing
in cement kiln



主要技术优势

Main technical advantages

- 燃烧温度高，物料在燃烧区停留时间长，有机物分解彻底；
- 回转窑热容量大，工作状态稳定，处理污泥的能力大；
- 水泥窑的碱性环境抑制酸性气体的排放；
- 水泥熟料对重金属固化效果好，重金属稳定化程度高，对污泥的适应性强；
- 无机矿化利用，有机质替代燃料，资源化利用程度高；
- 水泥窑系统有废热资源可供利用；
- 总体投资少、运行费用低、二次污染少，处理彻底；
- High temperature combustion, long residence time for material stay in combustion zone, thorough decomposition of organic matter;
- Rotary kiln with big thermal capacity, stable operation status, big capacity for sludge disposal;
- Alkaline environment of cement kiln inhibit the emission of acid gas ;
- Clinker has better solidification effect to heavy metal, a high degree stabilization of heavy metal , and strong adaptability of sludge;
- Inorganic matter mineralization reuse, organic matter as alternative fuel, with high degree resources recovery;
- Waste heat resources are available in cement kiln system;
- Overall, less investment , low operation cost, less secondary pollution, and thorough treatment;

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1 概况

General situation

中材国际工程股份公司天津分公司从上个世纪九十年代投入大量资金进行水泥窑协同处置废弃物技术及装备开发研究。在研发过程中，先后得到国家科技支撑计划项目（《工业及城市废弃物在水泥窑中的处置技术及装备研究》课题编号：2008BAJ05B03）、国家水体污染与控制重大专项（《水泥窑干化焚烧污泥技术与装备开发》课题编号：2010ZX07319-002）的支持，研发的水泥窑协同处置废弃物技术装备大量应用在水泥工程中，为企业创造了很好的经济效益与社会效益。

已经完成了北京水泥厂处置500t/d污泥工程开发设计及生产调试服务、广州越堡水泥有限公司处置600t/d污泥处置工程开发设计及生产调试、江苏天山水泥集团有限公司溧阳分公司120t/d污泥处置工程（一期）开发设计及生产调试、上海建材集团有限公司白龙港污水处理厂1800t/d污泥处置工程初步设计。

From the last 1990s, Sinoma International Engineering (Tianjin) Co., Ltd has invested a lot of money in research and development for waste co-processing in cement kiln technology and equipment. During the development process, has been support by national science and technology support project "technology and equipment research on industrial & municipal waste disposal in cement kiln" (project ID: 2008BAJ05B03) and major national water pollution & control project "technology research and equipment development on drying & incineration sludge in cement kiln" (project ID: 2010ZX07319-002). Waste co-processing in cement kiln technology and equipment has largely application in cement projects, and create good economic and social benefits for the customers.

Complete projects as follows: 500t/d sludge disposal project development design & production commissioning services for Beijing cement plant; 600t/d sludge disposal project development design & production commissioning for Heidelberg Guangzhou Co., Ltd; 120t/d sludge disposal project (first phase) development design & production commissioning for Jiangsu Mount Tianshan cement group Co., Ltd Liyang sub branch; 1800t/d sludge disposal project preliminary design for Shanghai building material group Co., Ltd-Bailonggang sewage treatment plant .

2 水泥窑协同处置技术优势

Technical advantages of waste co-processing in cement kiln technology

- 燃烧温度高，物料在燃烧区停留时间长，有机物分解彻底；
- 回转窑热容量大，工作状态稳定，处理污泥的能力大；
- 水泥窑的碱性环境抑制酸性气体的排放；
- 水泥熟料对重金属固化效果好，重金属稳定化程度高，对污泥的适应性强；
- 无机矿化利用，有机质替代燃料，资源化利用程度高；
- 水泥窑系统有废热资源可供利用；
- 总体投资少、运行费用低、二次污染少，处理彻底。

- High temperature combustion, long residence time for material stay in combustion zone, thorough decomposition of organic matter;
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3 水泥窑协同处置污泥技术

Sludge co-processing in cement kiln technology

1. 污泥直接入窑技术

湿污泥通过接收储存，再经过专业的输送装置直接送入水泥窑系统，彻底焚烧处置。污泥输送储存过程中的臭气直接入窑焚烧，无臭气外泄。

sludge direct feeding in kiln technology

Wet sludge after receiving and storage, then directly fed into cement kiln system by professional delivery device for complete incineration. Odor produced from delivery process will be directly combusted the kiln, no odor leakage.

工艺流程 Technological process



技术特点

特别适合于少量污泥的处理处置技术。以5000t/d水泥熟料生产线为例，污泥处置能力为100-150t/d（以含水率80%计）。

Technological characteristics

This technology is especially suitable for small amount of sludge disposal. Take 5000t/d cement clinker production line as example, 100-150 t/d sludge disposal capacity (calculate as 80% moisture content)

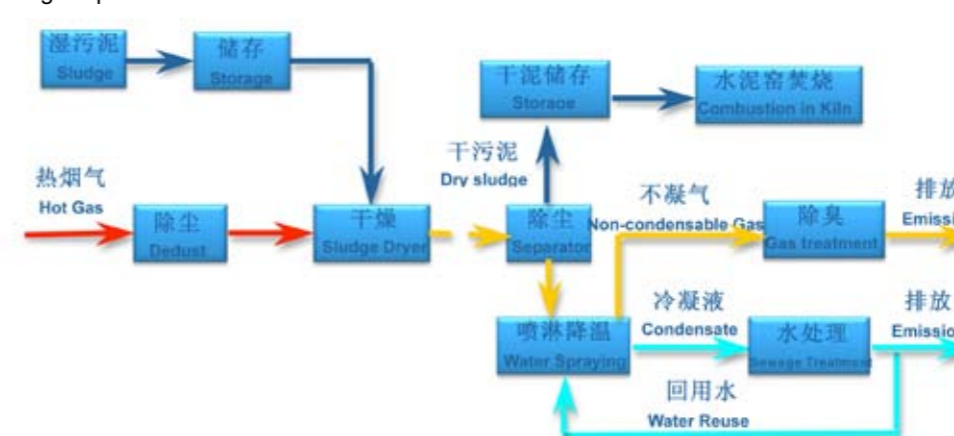
2. 烟气直接干化污泥

利用水泥生产过程中的废热烟气作为热源，直接与湿污泥接触换热，降低污泥的含水率。干化后的污泥呈细粉状，作为替代燃料送入分解炉焚烧处置。污泥输送储存过程中的臭气直接入窑焚烧；干化尾气经喷淋降温，送入生物滤塔除臭后达标排放，无臭气外泄。冷凝液经废水处理系统处理后，循环使用或排放。

Exhaust gas directly dry sludge

The use of waste hot gas produced from the cement production as heat source, direct contact and exchange heat with wet sludge, to reduce the moisture content of sludge. After drying the sludge was fine powdery, as alternative fuel fed into calciner for disposal. Odor produced from sludge transportation & storage processes will be directly combusted in kiln; drying waste gas after spray cooling, fed biological filtering tower for deodorization, discharged after reach the standard with no odor leakage. Condensate was treated by the sewage treatment system, recycling or discharge.

工艺流程 Technological process



技术特点

废热烟气直接与湿污泥接触换热，工艺系统简单，烘干效率高。工艺操作灵活，能够适应不同进泥含水率，出干燥机污泥含水率可在10%–30%调整。

Technological characteristics

Waste hot gas directly contact and exchange heat with wet sludge, use simple process system and high drying efficiency. Process operation is flexible, can be suitable with different moisture content of sludge, moisture content of sludge out of dryer can be adjust between 10% to 30%.

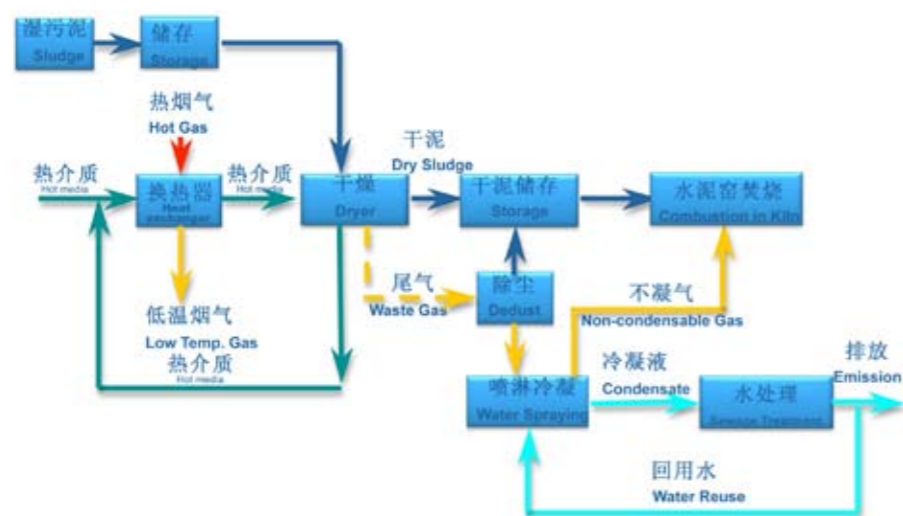
3.烟气间接干化污泥

利用水泥生产过程中的废热烟气作为热源，通过换热装置将热量转换给载热媒质。在干化机内污泥与载热媒质不直接接触，被载热媒质加热、脱水后，作为替代燃料送入分解炉焚烧处置。污泥输送储存过程中的臭气直接进入窑焚烧；干化尾气经喷淋降温，送入生物滤塔除臭后达标排放，无臭气外泄。冷凝液经废水处理系统处理后，循环使用或排放。

Exhaust gas indirectly dry sludge

The use of waste hot gas produced from the cement production as heat source, through the heat exchange device transfer the heat to heat media. Sludge and heat media indirectly contact in dryer, after heated and dehydration, the sludge was fed into claner for disposal. Odor produced from sludge transportation & storage processes will directly combusted in kiln; drying waste gas after spray cooling, feeding into biological filtering tower for deodorization, discharged after reach the standard with no odor leakage. Condensate was treated by the sewage treatment system, recycling or emission.

工艺流程 Technological process



技术特点

载热媒质不与湿污泥直接接触，尾气处理工艺简单。工艺操作灵活，能够适应不同进泥含水率，出干燥机污泥含水率在10%~30%左右调整。

Technological characteristics

Heat media indirectly contact with wet sludge, use simple waste gas process system. Process operation is flexible, can be suitable with different moisture content of sludge, moisture content of sludge out of dryer can be adjust between 10% to 30%.

4.臭气处理

针对不同处理处置工段和工艺采取不同的臭气处理技术，合理有效地进行净化处理，实现臭气的达标排放。污泥接收储存车间产生的含臭气体，集中收集后送入水泥窑焚烧；干化过程产生的臭味气体，采取化学法、和或生物除臭技术进行处理。

odor treatment

Take different odor treatment technology aimed at different disposal section and process, rational and effective purification treatment, to meet the odor emission standard. The odor gas produced from sludge receiving and storage worked, after concentrate collection fed into cement kiln for combustion; odor produced from the drying process will use chemical and or biological deodorization technology for treatment.



技术特点

结合水泥生产的工艺特点，针对不同污泥处理处置工段和污泥干化工艺，采取适宜高效的臭气处理技术，净化后的尾气排放满足《恶臭污染物排放标准》GB 14554–93中废气排放二级标准。

Technological characteristics

Combine the process characteristics of cement production, aimed at different sludge disposal sections and sludge drying process, use suitable high efficiency odor treatment technology, waste gas emission after purification should meet the secondary standard for “odor pollutant emission standard”(GB 14554-93)

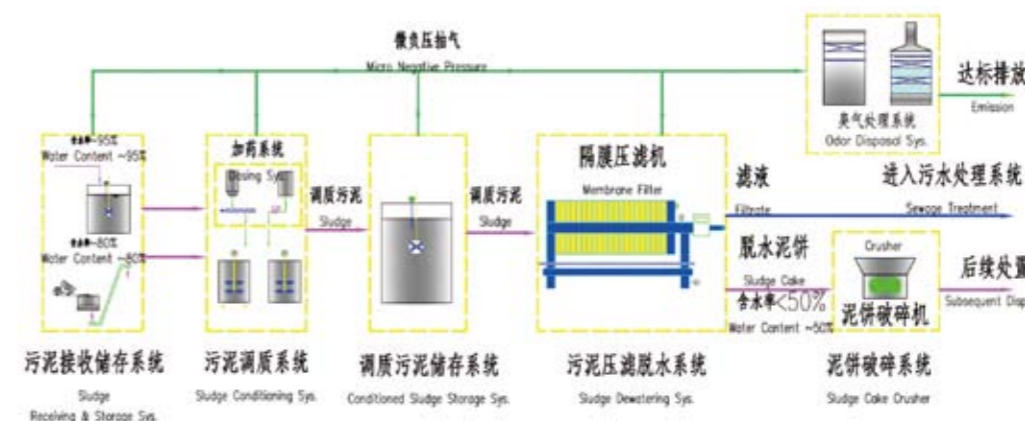
5.污泥深度脱水技术

在污泥调质罐内加入化学药剂，经搅拌后，用泵打入板框压滤机压滤脱水，脱水后的污泥水份小于50%，送入破碎机破碎，然后用胶带输送机送入储库储存。污泥脱水产生的废水，进入水处理系统处置，达标排放。

sludge deep dehydration technology

Add chemical agent into sludge mixing tank, after mixing, pumping into plate-and-frame filter press for filter pressing and dehydration, after dehydration, the moisture content of sludge is less than 50%, delivery into crushing in crusher, then delivery to storage in silo by belt conveyor. Waste water produced from the sludge dehydration will be sent into water treatment system for treatment, emission after reach the standard.

工艺流程 Technological process



技术特点

污泥经深度脱水后，泥饼含水率可降至42%–50%，干固体添加量少于7%。污泥深度脱水工艺可以放在污水处理厂使用，也可以放在水泥厂与上述污泥直接进入窑、烟气直接干化和烟气间接干化工艺相结合。深度脱水工艺可以去除污泥中的大部分水分，因此能够显著提高水泥窑的污泥处置量。

Technological characteristics

Sludge after deep dehydration, moisture content of the sludge cake can be reduced to 42% to 50%, dry solids additive amount will less than 7%. Sludge deep dehydration process can be used in sewage treatment plant, also can be placed in cement plant, combined with the above sludge directly feeding into the kiln, combine the waste gas directly drying and indirectly drying process. Deep dehydration process can remove most of the moisture content in the sludge, so it will significantly improve the sludge disposal amount in cement kiln.

4 工程实例

Project examples

江苏溧阳天山水泥公司污泥处置工程（一期）设计能力：120t/d 2011年7月投入运行
Sludge disposal project for Jiangsu Liyang Mount Tianshan cement company (phase one) Design capacity: 120t/d, put into production in July, 2011.



污泥接收及储存系统 Sludge receiving and storage system
全封闭的污泥接收单元 Fully sludge sealed unit
污泥运输车卸车 Sludge carrier vehicle unloading
污泥接收仓及输送泵 sludge receiving bin & delivery pump

广州越堡水泥有限公司污泥处置工程 设计能力：600t/d 2009年9月投入运行
Heidelberg Guangzhou Co., Ltd sludge disposal project Design capacity: 600t/d, put into production in Sep. 2009.



污泥干化及分离收集 Sludge drying and separating collection
干化尾气除臭 drying waste gas for deodorization
干化前后污泥形态 sludge before and after drying

北京水泥厂污泥处置工程 设计能力：500t/d 2010年6月投入运行
Beijing cement plant sludge disposal project Design capacity: 500t/d, put into production in June, 2010.



协同处置污泥生产线 Sludge disposal production line
湿污泥储存输送系统 Wet sludge storage and delivery system
污泥干化系统模拟图 Simulation diagram of Sludge drying system



污泥深度脱水试验平台
sludge deep dehydration testing platform



脱水泥饼形态
Shapes of dehydration sludge cake

5 专利和获奖情况

Patent and awarding

利用水泥窑高温烟气作为热源进行换热的方法
ZL 200710060550.2
Heat exchange method of high temperature hit gas from cement kiln as heat source.



“水泥窑协同处理污泥的技术研究及应用”鉴定为国际领先水平
“Sludge co-processing in cement kiln technology research and application” identified as the international advanced level



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