

炼钢转炉修补 新技术

New technology of
Converter Lining Repairing



联合荣大企业集团
Allied Rongda Enterprises

公司简介

Company profile



董事长 章荣会 博士
President Dr. Perry Zhang

联合荣大企业集团是一家具有20年经验的综合性高科技公司，专业提供各种耐火材料、特种混凝土材料、地坪材料及相关材料施工工程服务，产品广泛应用于冶金、石化、电力等行业，并远销海外。

联合荣大总部位于北京市怀柔区，旗下拥有北京联合荣大工程材料股份有限公司（北京市高新技术企业）、北京联合荣大工程材料股份有限公司西安分公司、北京联合荣大工程材料技术研究院有限公司、北京联合荣大建材有限公司、南京联合荣大工程材料有限责任公司（江苏省高新技术企业）、成都联合荣大工程材料有限责任公司，同时在济源、阳泉等地区有长期合作的代加工基地。

联合荣大现有研发、生产、销售等专业人才350余名，拥有材料与装备专利58余项（其中：发明专利23项），集团整体通过ISO9001质量管理体系认证，和商标被评为北京市著名商标。

联合荣大奉行“高效率帮助客户解决问题”的服务宗旨，坚持“高素质人才、高效率管理、高品质产品、高技术服务”的经营理念，竭诚为广大客户提供优质服务！

Allied Rongda Enterprises is a comprehensive high-tech company with 20 years of experience, specializing in providing various refractories, special concrete materials, floor materials and engineering services. Its products are widely used in metallurgy, petrochemical, power plant and other industries, and have been exported to many countries and districts.

Allied Rongda Enterprises headquarters is located in Huairou district, Beijing. It owns Beijing Allied Rongda Engineering Material Co., Ltd (Beijing high-tech enterprise), BAREMCO Xi'an Branch, Taiyuan Branch, Beijing Allied Rongda Technology Research Institute Co., Ltd, Beijing Allied Rongda Building Materials Co., Ltd, Nanjing Allied Rongda Engineering Material Co., Ltd (Jiangsu Province high-tech enterprise), Chengdu Allied Rongda Engineering Material Co., Ltd., and builds long-term cooperation producing base at Yangquan (Shanxi Province) and Jiyuan (Henan Province).

Allied Rongda has more than 350 professional staff in R&D, production, marketing, etc. It has accumulated more than 58 patents (including 23 invention patents) covering materials and equipment. Allied Rongda has passed ISO9001 Quality Management System certification. And RD trademark  and  are appraised as famous brand by Beijing municipal authority. Adhering to the principle of service "help customers solve problems with high efficiency", and insisting on the business philosophy "High-level talents, High-efficiency management, High-Quality Products, High-Technology Service", Allied Rongda dedicated to provide reliable and quality services to our customers!



高素质人才 · 高效率管理 · 高品质产品 · 高技术服务

High-level talents High-efficiency management High-Quality Products High-Technology Service

环保型“水基”大面自流料

Environmental-friendly "water-based"
self-flowing pads material

Part One

环保型“水基”大面自流料

Environmental-friendly "water-based" self-flowing pads material

环保型“水基”大面自流料，采用环保液体结合剂，不含碳及低熔点物质，材料流动性好、烧结过程无毒害烟气、烧结时间短且使用寿命长。

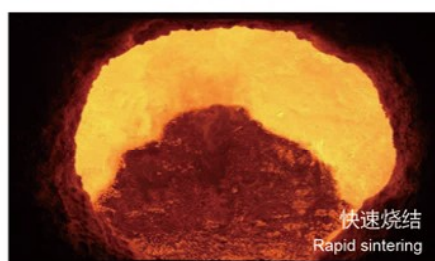
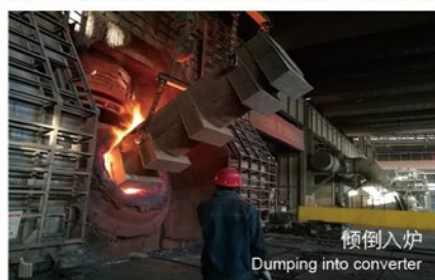
Environmental-friendly "water-based" self-flowing pads material, which does not contain carbon and low melting point material, uses the environmental liquid binder. The material has many advantages, such as good fluidity, no poisonous gas during the sintering, as well as short sintering time and long service time.

特性 Characteristics

- ◆ 环保无污染，烧结过程不会产生有毒气体；
 - ◆ 材料流动性好，炉内自流铺展，无需反复摇炉；
 - ◆ 烧结时间短，1吨料不超过20min；
 - ◆ 烧结充分，杜绝夹心层导致的喷溅隐患；
 - ◆ 不含沥青，不会向钢水中带入C、S；
 - ◆ 陶瓷结合，氧化气氛结合强度不受影响；
 - ◆ 使用寿命可达传统补炉料3倍或以上。
-
- ◆ Environmental protection, no poisonous gas during sintering process
 - ◆ Good fluidity, self-flowing spread in the converter, no need to shake the converter repeatedly
 - ◆ Short sintering time, not more than 20min per ton
 - ◆ Sintering fully and prevent the potential splash hazard caused by sandwich layer
 - ◆ No asphalt, carbon and sulphur been taken into molten steel
 - ◆ Ceramic bonded, oxidation atmosphere bonding strength is not affected
 - ◆ Service life can be up to 3 times or more than the traditional material

现场加液体结合剂搅拌好后倾倒入炉内

After mixing the liquid binder, then pour it into the converter

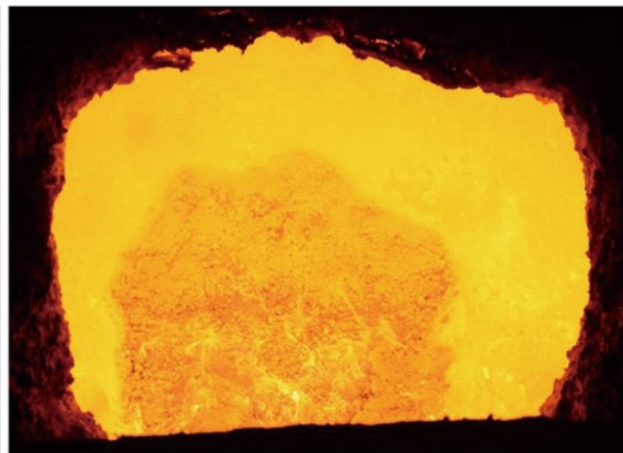


环保型“水基”大面料入炉烧结

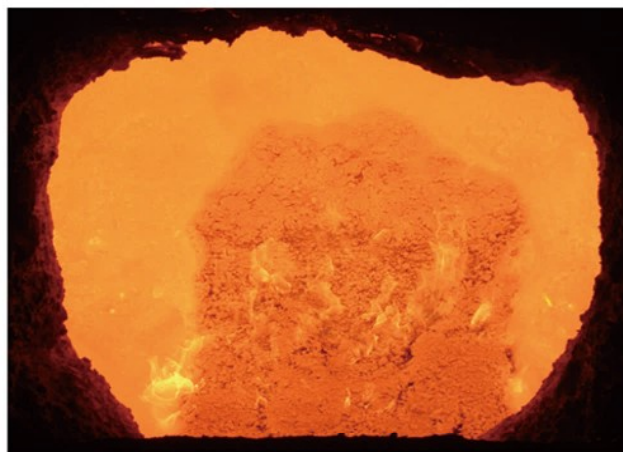
Spreading and sintering of "water-based" pads material in converter



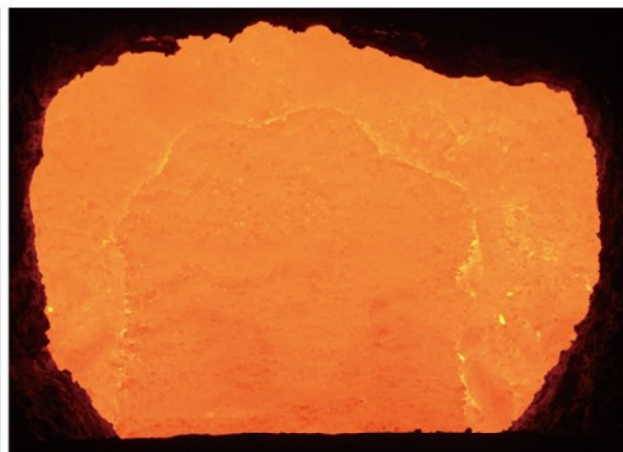
3分钟min



5分钟min



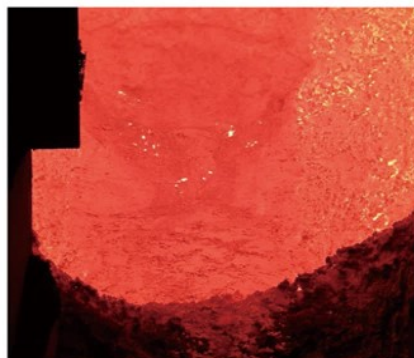
10分钟min



15分钟min

炉内部位烧结情况

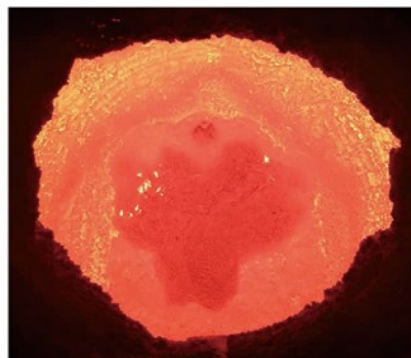
Sintering in the converter



前大面Front



后大面Back



炉底Bottom of the converter

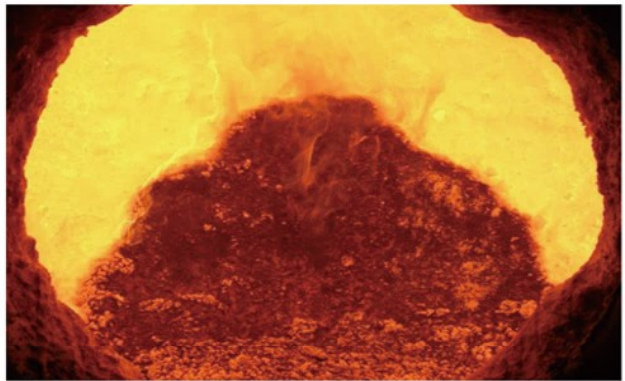
烧结烟气对比：转炉前大面修补

Sintering exhaust gas comparison: Repair front converter



传统大面料烧结20min后依然冒出有毒烟气

Traditional material repairing: still exhaust poisonous smoke after 20min sintering.



“水基”大面自流料只逸出少量水蒸气

"Water-based" self-flowing pads material sintering escape a small quantity of steam



联合荣大的环保型“水基”镁质大面料用于某厂240t转炉大面修补，现场没有任何烟尘，烧结时间是黑料的一半，使用寿命是黑料的两~三倍以上！（扫描二维码看视频）

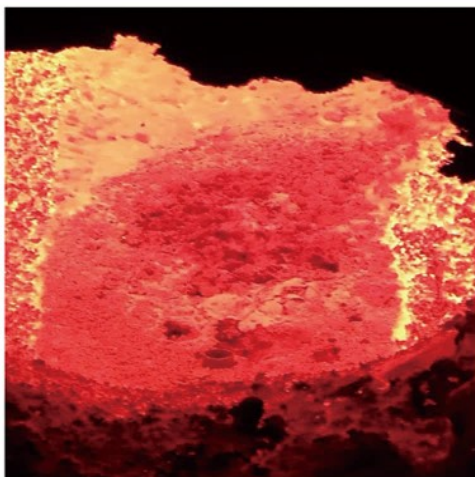
Allied Rongda environmental friendly type "water-based" magnesium pads material used in 260 tons converter of a plant to repair the pads, without any smoke and dust at the site, sintering time is half of the black material, the service life is two ~ three times more than black material! (Please scan the two-dimensional code to see the video)



出钢口浇注修补 Casting repairing for taphole

修补并提高出钢口寿命

Repair and prolong the service life of taphole



出钢口使用寿命由平均80炉提高到145炉

The average service life of taphole increased from 80 heats to 145 heats

出钢口填充浇注修补

Filling casting repairing for taphole



最高使用寿命达到235炉

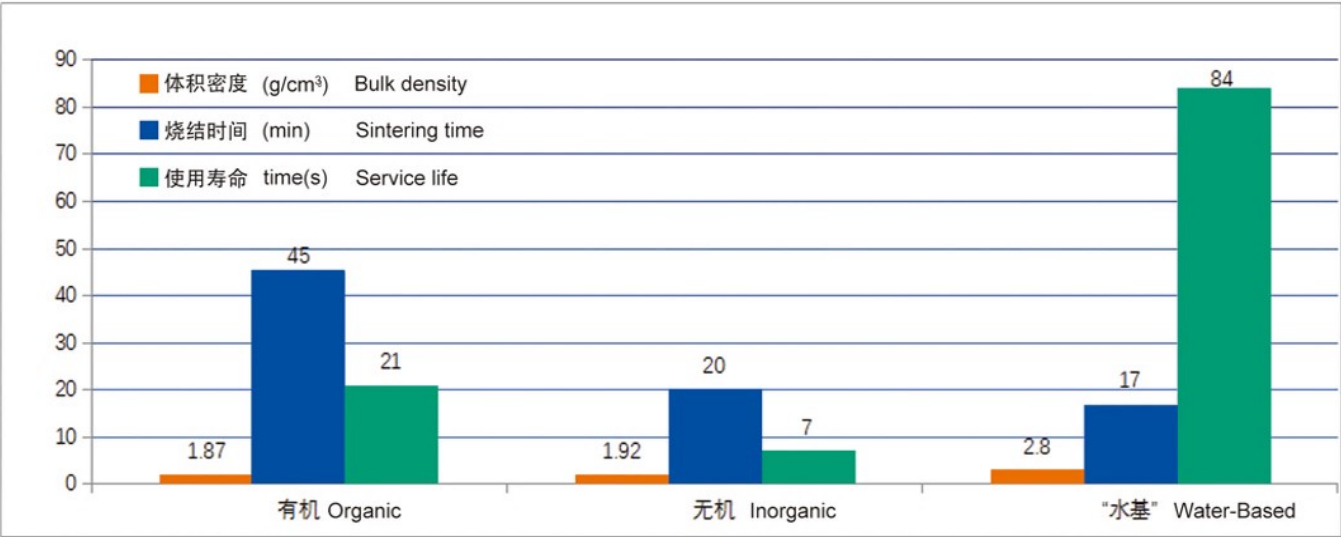
The maximum service life is about 235 heats

技术指标 Technical index

型号 Type	化学成分 (%) Chemistry				体积密度 (g/cm³) B.D	烧后抗折强度 (MPa) MOR		流动性 (mm) Mobility
	MgO	C	SiO ₂	S	1000°Cx3h	1000°Cx3h	1550°Cx3h	常温
RBL-W1	≥85	—	≤12	—	≥2.8	≥8	≥8	≥240

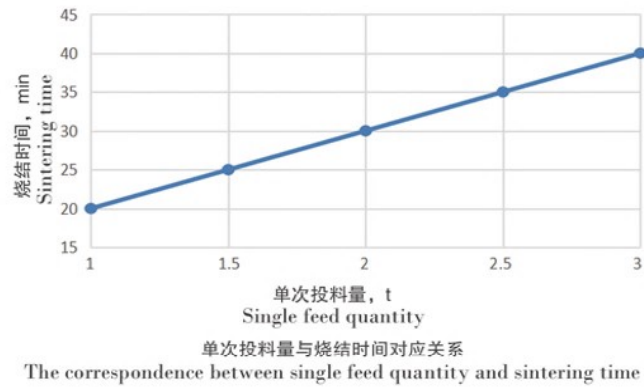
有关技术参数可根据具体使用环境临时约定
The related technical parameters should be confirmed temporarily according to the specific use environment

几种转炉大面自流料典型性能对比
Comparison of typical performance of several kinds of refractories for converter repairing

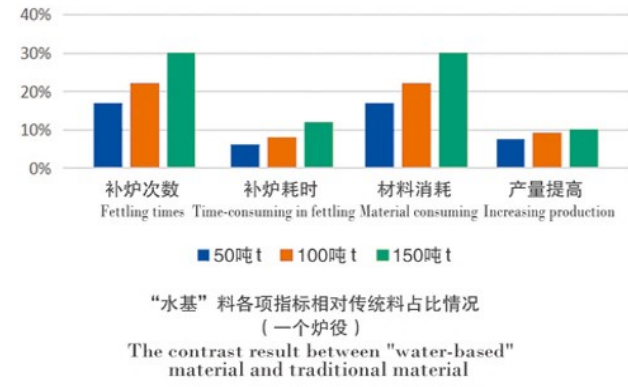


烧结时间/效益对比 Comparison of sintering time and profit

烧结时间 Sintering time



效益对比 Comparison of profit



某炼钢厂采用联合荣大“水基”大面料增产增效计算

Comparison of Allied Rongda“water-based”self-flowing pads and traditional black material

	某厂3座120吨转炉，每炉出钢125吨 单炉日出钢38炉，每炉冶炼时间45分钟 吨钢综合盈利700元 3 converters (each 120 -ton), 125 tons per steel tapping Each converter 38 heats /day, 45 minutes/heat. The comprehensive profit is 700 Yuan per ton steel.		某厂3座120吨转炉，每炉出钢145吨 单炉日出钢30炉，每炉冶炼时间38分钟 吨钢综合盈利1000元 3 converters (each 120- ton), 145 tons per steel tapping Each converter 30 heats /day, 38 minutes/heat. The comprehensive profit is 1000 Yuan per ton steel.	
项目 Items	传统大面料 Black material	“水基”大面料 “Water-based” self-flowing pads	传统大面料 Black material	“水基”大面料 “Water-based” self-flowing pads
单次补炉大面料用量，吨 Repair material using quantity,ton	1	1	1	1
补炉与烧结时间，分钟 Repair and sinter time,min	8+50	8+15	8+40	8+15
寿命，次 Service life,time(s)	23	69 (3倍)	10	30 (3倍)
材料单价，元/吨 Price,Yuan/ ton	3000	9500	3000	9500
日补炉次数，次 Repair heat /day,time	1.17	0.39	3	1
大面料消耗，吨 Pads material using quantity/heat,ton	1.17	0.39	3	1
大面料造价，元 Actual cost price/ton,Yuan	3510	3705	9000	9500
减少排渣，吨 Reduce Slag discharge,ton		0.78		2
日修补耗时，分钟 Daily repair time,min	68	9	144	23
日节约时间，分钟 Daily saving time,min		59		121
日增产炉数，炉次 Daily increase heat number,heat	0	1 (1.3)		3 (3.18)
日增产，吨 Daily increase output quantity,ton	0	125		435
日增加利润，元 Daily profit increase,Yuan	521.6	87,500		435,000
减少碳排放 Carbon emission reduction	沥青+生产原料的过程碳排放 Asphalt+ Carbon emissions during the raw materials production		沥青+生产原料的过程碳排放 Asphalt+ Carbon emissions during the raw materials production	
	3座炉子日增产2炉钢375吨，日综合利润26.5万元， 月效益795万元 3 converter, daily increasing 2 heats, total 375tons of steel The daily comprehensive profit is 260,500 Yuan and monthly profit is 7.95 million Yuan.		3座炉子日增产9炉钢，日综合利润130.5万元， 月效益3915万元 3 converter, daily increasing 9 heats, total 375tons of steel The daily comprehensive profit is 1,305,000 Yuan and monthly profit is 39.15 million Yuan.	

减排
Emission reduction

环保
Environmental protection

增产
Increase production

增效
Increase efficiency

典型案例 Classic case

序号 No.	客户名称 Customer Name	标称容量，t Nominal capacity	单次修补用量，t Repair using quantity/time
1	南钢 Nanjing Iron and Steel	35	0.8
2	新疆八一 Xinjiang Ba-Yi Iron and Steel	120	2-3
3	广东韶钢 Guangdong Shaoguan Iron and Steel	130	1.5
4	湖南华菱涟钢 Hunan Hualing Lianyuan Iron and Steel	210	2-3
5	新余钢铁 Xinyu Iron and Steel	210	3-4
6	包钢 Baotou Iron and Steel	240	2-3
7	邢钢 Xingtai Iron and Steel	50	1-2
8	邢钢 Xingtai Iron and Steel	80	2-3
9	凌钢 Lingyuan Iron and Steel	120	2
10	凌钢 Lingyuan Iron and Steel	35	0.8
11	唐钢中厚板材 Tangshan Middle-thick Plate Plant	120	1-2

转炉遥控喷注修补技术

Remote control shotcrete repairing technology of converter

Part Two

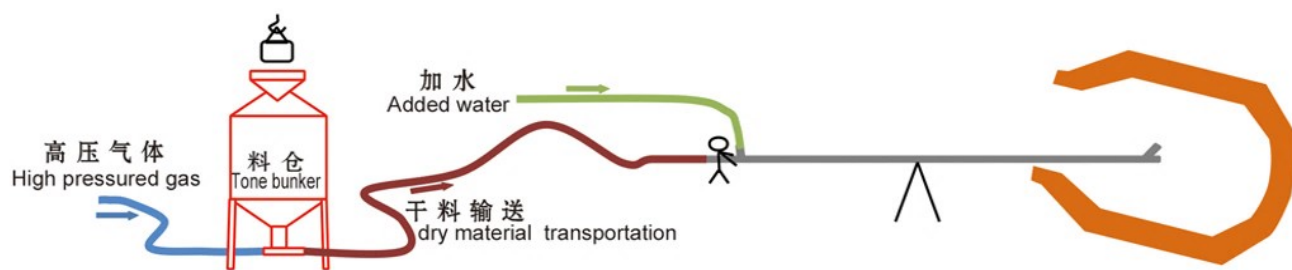
喷注即加水搅拌好的浇注料用喷涂法实现浇注，是一种使用特制装置把搅拌好的浇注料通过管道实现远距离输送，在接近喷嘴部位引入速凝剂，浇注料喷出的同时与速凝剂发生反应，瞬间失去流动性，与修补面紧密粘接在一起的新型施工技术。相对于传统的干法或半干法喷涂，喷注料密度接近浇注料，且喷涂过程反弹极少。

The mixed castable is sprayed used a special equipment through the pipeline to achieve long-distance transport, and accelerator is added in the region closed to the nozzle. The accelerator reacts with injection material when it is sprayed, so that it instantaneous loss of fluidity. The material is bonded with the repairing face. Compared with the traditional repairing methods, the bulk density of shotcrete is similar to casting, the rebound rate is low.

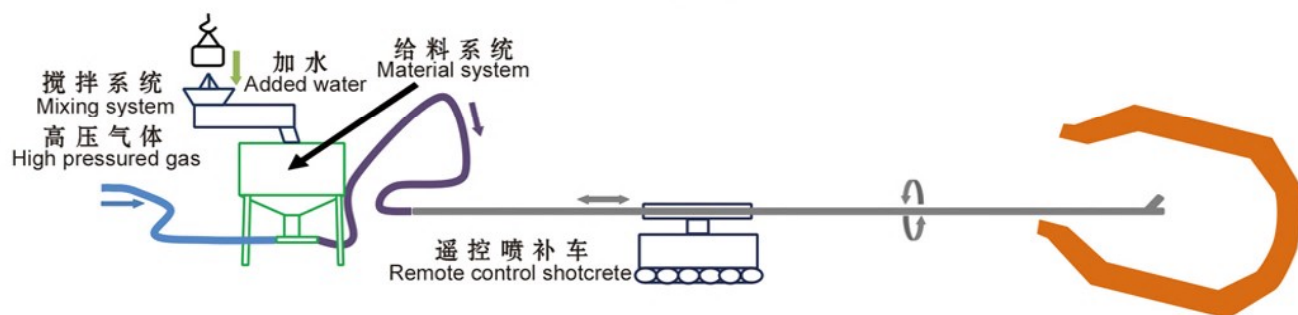
干法喷补技术与湿法喷注技术对比

The contrast results between dry gunning technology and wet shotcrete

项 目 Items		干法喷补 Dry gunning	湿法喷注 Shotcrete
配 料 Ingredients		无减水剂、防爆剂 No reducing agent and anti-explosive agent	有减水剂、防爆剂 Reducing agent and anti-explosive agent
施 工 Construction	加 水 Adding water	需水量大，加量不可控，随意性大 Large water demand, uncontrollable quantity and high randomness	需水量少，约5%；搅拌机中定量加入 Few water, 5%, added to blender quantitatively
	搅 拌 Mixing	料与水混合时间短且不均匀 Short mixing time and nonuniform	预混搅拌均匀 Premixed and stirred well
	环 境 Environment	粉尘大 Very dusty	无粉尘 No dust
	反弹率 Rebound rate	反弹 $\geq 15\%$ Rebound rate $\geq 15\%$	反弹 $\leq 5\%$ Reflective rate $\leq 5\%$
使用效果 Using effects		大颗粒反弹多，料中细料、结合剂富集，上墙材料与原设计配方严重不符 The gunning is not meet to the original design formula, because of the coarse particles rebounding	喷注体材料与设计配方高度一致，性能有保障 The shotcrete is similar to the original formula, Performance guaranteed
		结构疏松，密度低，不耐冲刷、侵蚀，寿命低，施工安全性低 Loose structure, low bulk density, short service life, and low construction safety	结构致密，耐冲刷，抗侵蚀，寿命长，施工安全性高 Dense structure, scouring resistance, anti-erosion, long service life and high construction safety



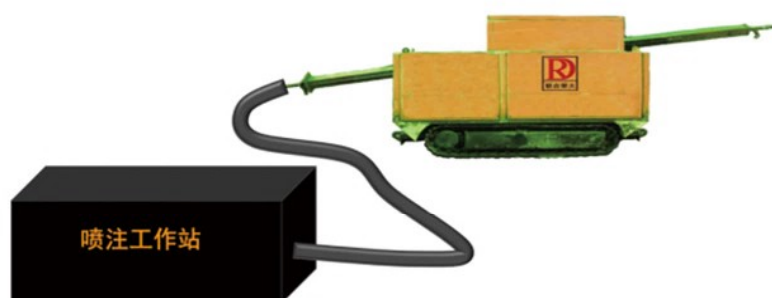
干法喷补示意图
The sketch of dry gunning methord



喷注修补示意图
The sketch of shotcrete

湿法喷注设备

Wet shotcrete equipment

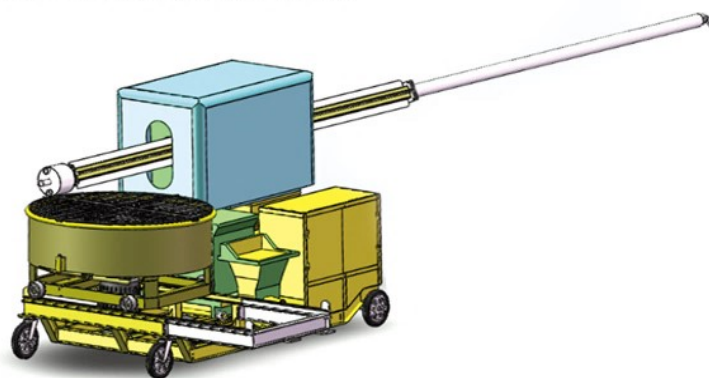


遥控喷注修补设备工艺
Remote shotcrete repairing technology



扫描二维码，看模拟动作视频

(Please scan the two-dimensional code to see the video)



转炉喷注车2.0版
Converter shotcrete vehicle version2.0

干法喷涂设备

Dry gunning equipment



喷枪
Spray gun



喷补罐
Gunning tank



人工喷补操作
Manual gunning operation

转炉干法喷涂施工现场
Converter dry gunning working site



扫描二维码，看视频
(Please scan the two-dimensional code to see the video)

湿法喷注施工现场

Wet shotcrete working site



湿法喷注工厂试验
Wet shotcrete of factory test



扫描二维码，看视频
(Please scan the two-dimensional code to see the video)



喷注料固化后拆除
Removal of shotcrete material after solidifying.



扫描二维码，看视频
(Please scan the two-dimensional code to see the video)

施工现场

Working site pictures

Part Three



“水基”大面料入炉
"water-based" pads material into the furnace



出钢口灌缝修补前准备工作
Preparation work before tapping hole pouring repair



“水基”大面料上料搅拌
“water-based” pads material feeding and mixing



转炉炉前测厚
Converter thickness measurement



搅拌设备安装调试
Mixing equipment installation and commissioning



“水基”大面料搅拌
“water-based” pads material mixing

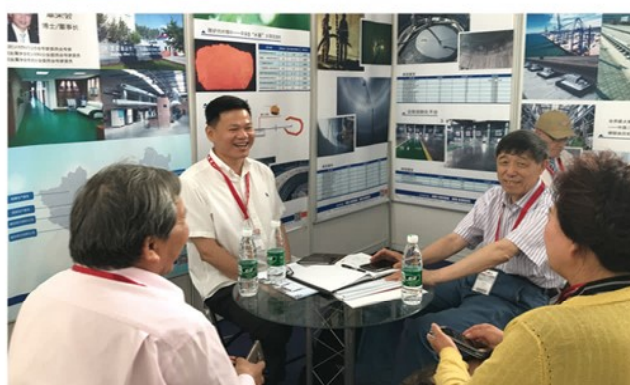


出钢口更换前清理
Clearance before steel- tapping hole change

专家鉴定、行业会议

Expert appraisal Industry conferences

Part Four



集团管控 · 集中研发 · 技术共享

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