

**北京金煤创业科技股份有限公司**  
BeiJing JinMei Entrepreneur Co., Ltd.

**陶瓷复合磨机配件**  
MMC-Mill spare parts

# 公司简介

## Company profile

北京金煤创业科技股份有限公司于2006年成立，2016年改制为股份制公司并成功登陆新三板。公司总部坐落在中国北京中关村科技园古城基地。是集研发，生产，出口销售的互联网+新材料制造企业。

公司主营金属基陶瓷复合材料，耐磨耐热材料，冶金、矿山、水泥、燃煤热电厂设备配件等。产品：高铬陶瓷复合铸造耐磨材料，马氏体钢陶瓷复合铸造耐磨耐冲击材料及各类高锰钢陶瓷复合材料，金属基陶瓷纤维复合材料，ZTA陶瓷机械零部件。

Beijing JinMei Entrepreneur Co., Ltd (DJM) was established in 2006, Headquarter located in Zhongguancun High-tech Park in Beijing, China. DJM was restructured into Joint-Stock company & listed on NEEQ in 2016. DJM's a research and development, production, export sales of Internet + new materials manufacturing enterprises.

DJM is focusing on Metal Matrix Ceramic Composite (MMCC) material, wear-resistant and heat-resistant material.

Products: High chromium cast iron ceramic composite castings, Martensite steel ceramic composite castings, high manganese steel ceramic composite castings, and Metal matrix ceramic fibre composite casting materials, ZTA ceramic mechanical parts. Products are widely used in metallurgical industry, mining, cement, Coal-fired thermal power plant as spare parts.

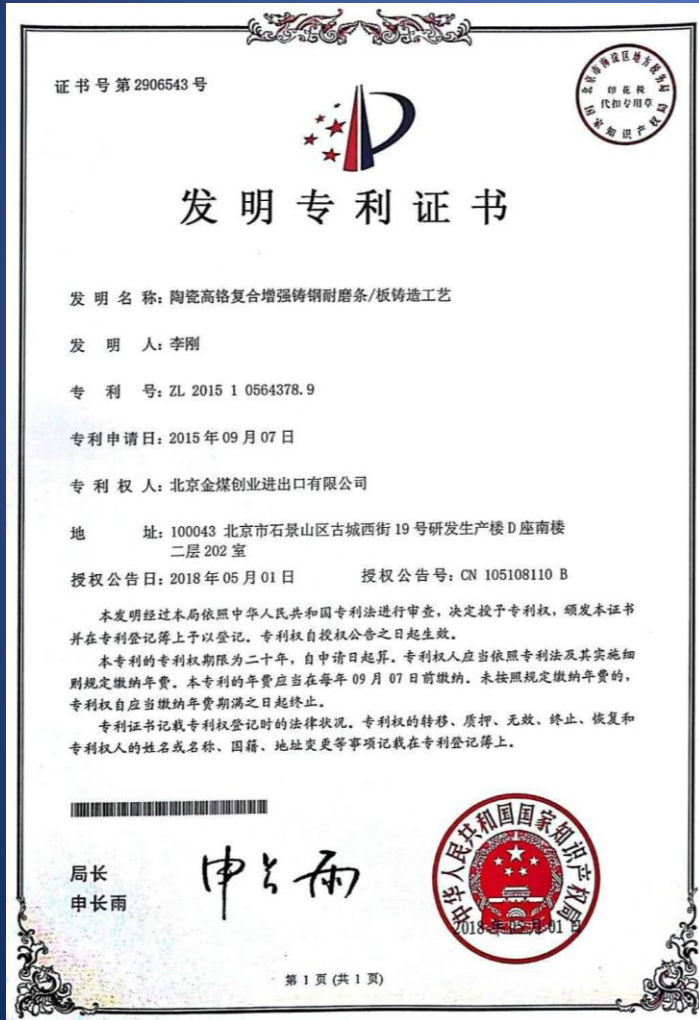


# 发明专利证书

## Patent certificate

陶瓷高铬复合增强铸钢耐磨条板铸造工艺  
Metal Matrix ceramic composite casting

陶瓷高锰钢复合耐磨件铸造工艺  
High Mn Steel Matrix ceramic composite casting



# MMC-Cr 高铬铸铁陶瓷复合耐磨材料

MMC-Cr ( High Chromium cast iron matrix ceramic insert casting wear-resistant material)

## MMC-Cr ( High Chromium cast iron matrix ceramic insert casting wear-resistant material)

That is, the reinforcement phase - ceramic particles are fused and cast in the easily worn parts of metal parts with high chromium cast iron as the base material. The metal-ceramic composite layer is formed by the metallurgical combination of ceramic particles and casting alloy. The metallurgical bonding of ceramic particles with metal is realized by the heat of metal liquid. The hardness of ceramic-ceramic composite layer formed by ceramic particles and matrix metal shows a step distribution. The hardness of ceramic particles in the composite layer can reach 3-4 times of the hardness of high chromium cast iron material, so as to achieve the anti-wear effect; Compared with ordinary high chromium cast iron, the service life of the product is greatly extended.

The hardness of the High chromium iron ceramic composite layer is distributed in steps :

Ceramic particles hardness= HV2100

Hardness of metal around ceramic particles = 60-65HRC

Hardness of Basis material =High chromium iron = 58-62HRC

Suitable for use under low impact and high wear conditions

## MMC-Cr 高铬铸铁陶瓷复合耐磨材料

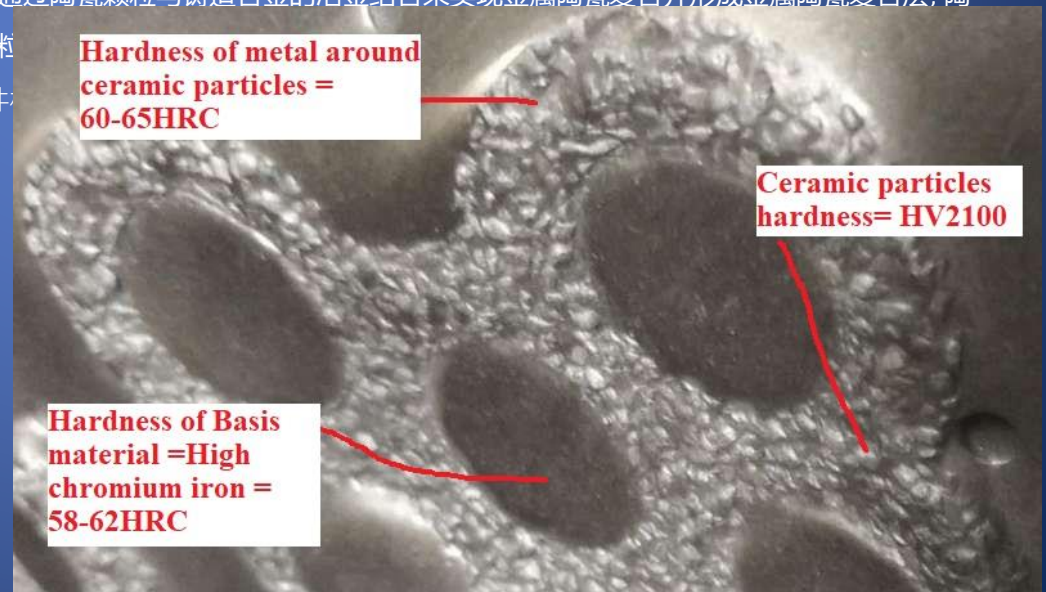
即在高铬铸铁为基材的金属部件易磨损部位熔铸增强相-陶瓷颗粒.通过陶瓷颗粒与铸造合金的冶金结合来实现金属陶瓷复合并形成金属陶瓷复合层;陶瓷颗粒与金属的冶金结合是通过金属液体的热量来实现的;陶瓷颗粒硬度为高铬铸铁材料硬度的3-4倍,从而实现抗磨的效果;与普通高铬铸铁件相比,高铬陶瓷复合层的硬度呈阶梯分布:

陶瓷颗粒硬度= HV2100

陶瓷颗粒周围的金属硬度= 60-65HRC

基材硬度=高铬铸铁= 58-62HRC

适合在低冲击和高磨损条件下使用



# MMC-M 马氏体钢陶瓷复合耐磨材料

## MMC-M (Martensite steel matrix ceramic Insert casting Wearparts)

### MMC-M (Martensite steel matrix ceramic insert casting wear-resistant material)

That is, the reinforcement phase - ceramic particles are cast in the easily worn parts of the metal parts with martensitic steel as the base material. The metal-ceramic composite layer is formed by the metallurgical combination of ceramic particles and casting alloy. The metallurgical bonding of ceramic particles with metal is realized by the heat of metal liquid. The hardness of ceramic-ceramic composite layer formed by ceramic particles and matrix metal is distributed in a step: give full play to the characteristics of high strength and high hardness of martensitic steel, reduce the plastic deformation of metal parts, and improve the impact resistance; Combined with the high wear resistance of ceramic particles, the anti-wear performance of the working surface is improved. The result is a metal component that is both wear resistant and impact resistant. Due to the selection of martensitic steel as the base material, so that the composite material has a good welding, and processing properties, while the product is suitable for flame gas cutting, grinding wheel saw, shear, water cutting, plasma and other cutting methods, welding without preheating or subsequent heating treatment; Compared with ordinary high chromium cast iron, the service life of the product is greatly improved.

The hardness of the Martensite Steel ceramic insert composite layer is distributed in steps:

Ceramic particles hardness= HV2100

Hardness of metal around ceramic particles = 60-65HRC

Hardness of Basis material =Martensite Steel = 48-53HRC

It is suitable for use under high impact and high wear conditions and can be welded

### MMC-M 马氏体钢陶瓷复合耐磨材料

即在马氏体钢为基材的金属部件易磨损部位熔铸增强相-陶瓷颗粒.通过陶瓷颗粒与铸造合金的冶金结合来实现金属陶瓷复合并形成金属陶瓷复合层; 陶瓷颗粒与金属的冶金结合是通过金属液体的热量来实现的; 陶瓷颗粒与基体金属形成金属陶瓷复合层的硬度呈阶梯分布: 充分发挥马氏体钢的高强度及高硬度特点, 减少金属部件的塑性变形, 提高抗冲击能力; 结合陶瓷颗粒的高耐磨特性, 提高工作面的抗磨性能, 从而获得即耐磨且抗冲击的金属部件。

因选用马氏体钢为基材, 从而使复合材料具有很好的焊接, 及加工性能, 同时, 切割, 焊接时无需对其进行预热或后续加热处理; 与普通高铬铸铁件相比, 产品马氏体钢陶瓷复合层的硬度分布:

陶瓷颗粒硬度= HV2100

陶瓷颗粒周围的金属硬度= 60-65HRC

基体硬度=马氏体钢硬度= 48-53HRC

适合在高冲击、高磨损条件下使用, 可焊接



# 陶瓷金属复合立磨辊套及碾底衬板技术介绍

## vertical mill roller & pan technology introduction



一般LM, ZGM, HP和CKP立磨的辊子及衬板, 一般原设备制造商均采用高Cr合金铸造, 其断裂的危险较大, 耐磨寿命自然较低。针对这一情况, DJM 选用高铬(或马氏体钢)陶瓷复合铸造工艺, 即衬板的基体采用塑性马氏体钢或高铬铸铁, 其有一定的弹性伸长, 因而具有抗断裂的完全安全性, 同时在基体上嵌铸具有高耐磨性的陶瓷加强筋, 因而大大提高衬板的耐磨性。陶瓷复合材料衬板的寿命与一般高铬衬板相比, 寿命可大幅提高。

DJM choose High Cr cast iron(or Martensite steel) base ceramic composite materials, which is the liner basement with High Cr cast iron(or Martensite steel), it has better elongation, thus has completely safety of resistance to fracture and embed high wear resistance of ceramic reinforcement into the basement, to get great improvement wear resistance. The life of the ceramic composite liner, compared with common High Cr liner, the product life has been greatly improved.

# 专利技术证书 (辊套)

## Patent certificate (Mill Roller)

证书号第 4203849 号

### 实用新型专利证书

实用新型名称: 蜂窝 ZTA 陶瓷复合高铬铸铁辊套结构

发明人: 李刚

专利号: ZL 2015 2 0043313.5

专利申请日: 2015 年 01 月 22 日


专利权人: 北京金煤创业进出口有限公司

授权公告日: 2015 年 07 月 22 日

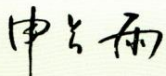

本实用新型经过本局依照中华人民共和国专利法进行初步审查, 决定授予专利权, 颁发本证书并在专利登记簿上予以登记。专利权自授权公告之日起生效。

本专利的专利权期限为十年, 自申请日起算。专利权人应当依照专利法及其实施细则规定缴纳年费。本专利的年费应当在每年 09 月 25 日前缴纳。未按照规定缴纳年费的, 专利权自应当缴纳年费期满之日起终止。

专利证书记载专利权登记时的法律状况。专利权的转移、质押、无效、终止、恢复和专利权人的姓名或名称、国籍、地址变更等事项记载在专利登记簿上。





局长  
申长雨

2015 年 03 月 25 日

第 1 页 (共 1 页)

(19) 中华人民共和国国家知识产权局

(12) 实用新型专利

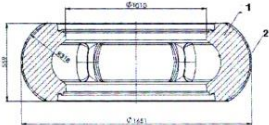
(10) 授权公告号 CN 204227017 U  
(45) 授权公告日 2015.03.25

(21) 申请号 201520043313.5  
(22) 申请日 2015.01.22  
(73) 专利权人 北京金煤创业进出口有限公司  
地址 100043 北京市石景山区古城西街 19 号研发生产楼 D 座南楼二层 202 室  
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代理人 董芙蓉  
(51) Int. Cl.  
B02C 15/00(2006.01)

权利要求书1页 说明书2页 附图3页

(54) 实用新型名称  
蜂窝 ZTA 陶瓷复合高铬铸铁辊套结构

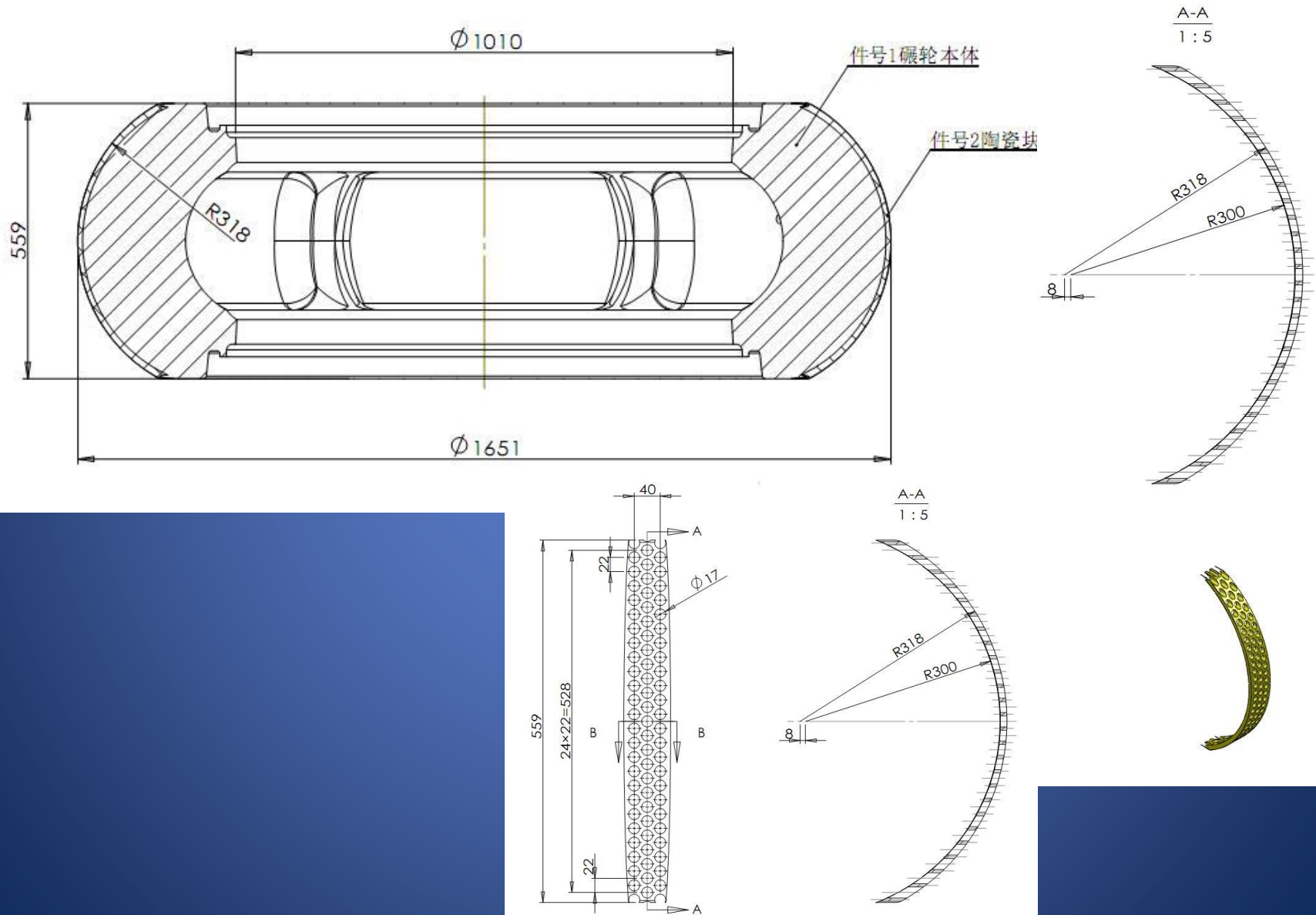
(57) 摘要  
本实用新型涉及一种陶瓷复合高铬铸铁辊套结构, 包括辊套本体, 在辊套本体的工作面上镶嵌有数块陶瓷层, 所述陶瓷层为陶瓷芯块, 其中所述陶瓷芯块大体呈一弧形的片状结构, 且陶瓷芯块的端面上设置数个透孔, 陶瓷芯块宽度方向的端面边缘上设置数个凹槽, 透孔与凹槽轴向平行, 本实用新型使高铬铸铁辊套的耐磨性能及抗裂性能大大提高, 即提高了高铬铸铁辊套的耐磨强度, 又有效阻止了裂纹的产生及扩展, 增加了高铬铸铁辊套的使用时间, 减少了更换高铬铸铁辊套的次数, 提高了生产效率, 节约了生产成本。



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# 辊套陶瓷结构图

## Structure drawing of Ceramic composite roller



## 陶瓷布局及安装

installation and use effect of Ceramic core for ceramic insert casting Roller

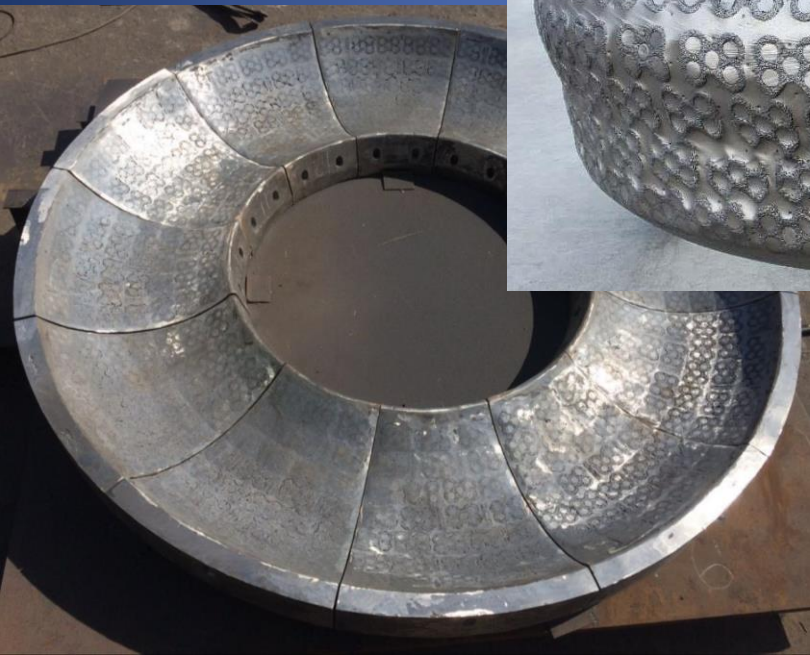


# 陶瓷金属复合立磨配件

Metal ceramic composite vertical mill spare parts



Roller



Mill Pan



# 陶瓷金属复合立磨配件

Metal ceramic composite vertical mill spare parts



# 立磨辊套使用实例

## the use of examples-Mill Roller

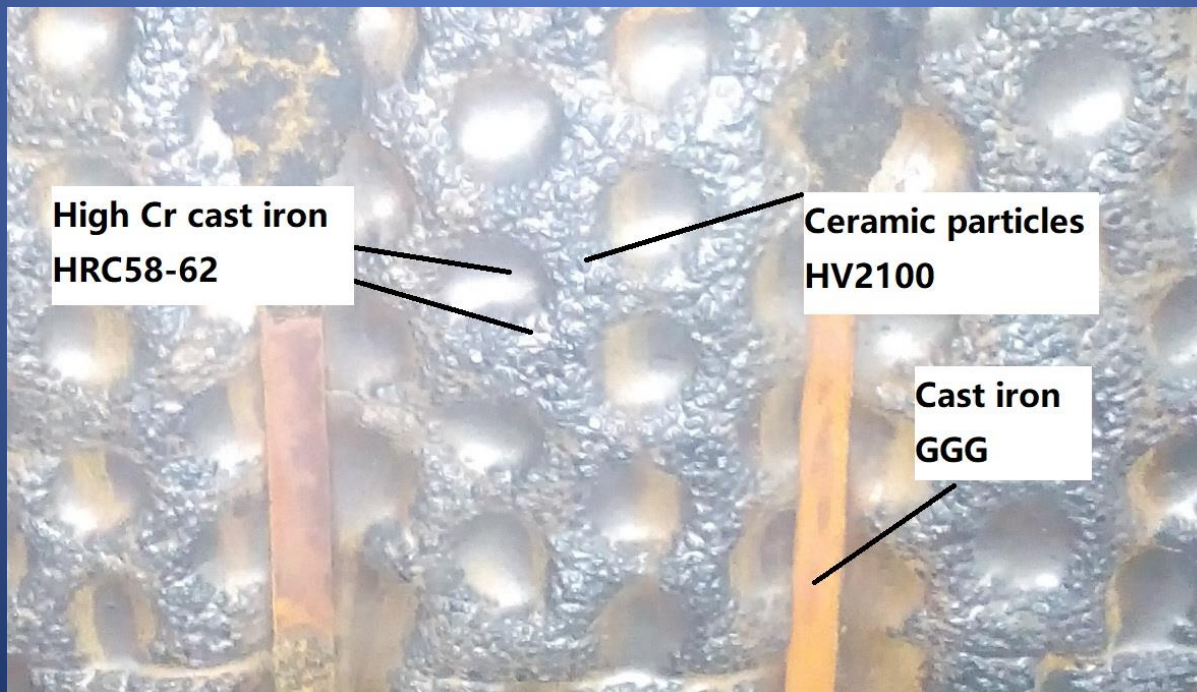
- 物料=4500大卡煤 (HGI=60)
- 进料粒度= 30-50mm
- 磨损形式=高应力碾碎式磨粒磨损 (grinding abrasion)
- 使用者及设备=燃煤热电厂ZGM95G立磨辊套
- 高铬铸铁辊套使用寿命= 6000-8000小时 每千小时磨耗=10-15mm
- DJM高铬陶瓷复合辊套使用寿命=15000小时以上 每千小时磨耗=2-3mm



# 球铁基陶瓷复合立磨辊套

## Roller of GGG + High Cr Cast Iron + ZTA Ceramic particles

- 为进一步提高其耐磨寿命，DJM 选用球铁基高铬陶瓷复合材料，即：在高铬材料中熔铸陶瓷颗粒形成高铬陶瓷金属复合材料层，选用球铁为辊套基体，在辊套表面熔铸高铬陶瓷复合层，这层复合层的耐磨性能可达高Cr材料的3-4倍，同时这一复合层的厚度可制成达到原备件厚度的1/3，并可根据原磨损曲线有针对性的制作，球铁高铬陶瓷辊套和衬板磨煤时平均磨损量（磨损深度）每1000小时为2-4mm，而高铬辊套和衬板磨煤时平均磨损量（磨损深度）每1000小时为5-9mm，球铁高铬陶瓷辊套/衬板是高铬产品的三倍以上。
- In order to further improve its wear resistance life, DJM selects a ductile iron based high chromium ceramic composite material, namely: High chromium ceramic metal composite material layer is formed by casting ceramic particles in high chromium material, ductile iron is selected as the matrix of roll sleeve, and high chromium ceramic composite layer is cast on the surface of roll sleeve. The wear resistance of this composite layer can reach 3-4 times that of high Cr material, and the thickness of this composite layer can be made to reach 1/3 of the thickness of the original spare part, and can be made according to the original wear curve. The average wear (wear depth) of the high chromium ceramic roller sleeve and liner is 2-4mm per 1000 hours, while the average wear (wear depth) of the high chromium roller sleeve and liner is 5-9mm per 1000 hours, and the high chromium ceramic roller sleeve/liner is more than three times that of the high chromium products.



# 球铁基陶瓷复合立磨辊套

Roller of GGG + High Cr Cast Iron + ZTA Ceramic particles



## 球铁基陶瓷复合立磨辊套

Roller of GGG+High Cr Cast Iron+ZTA Ceramic particles



## 高铬陶瓷复合立磨辊套

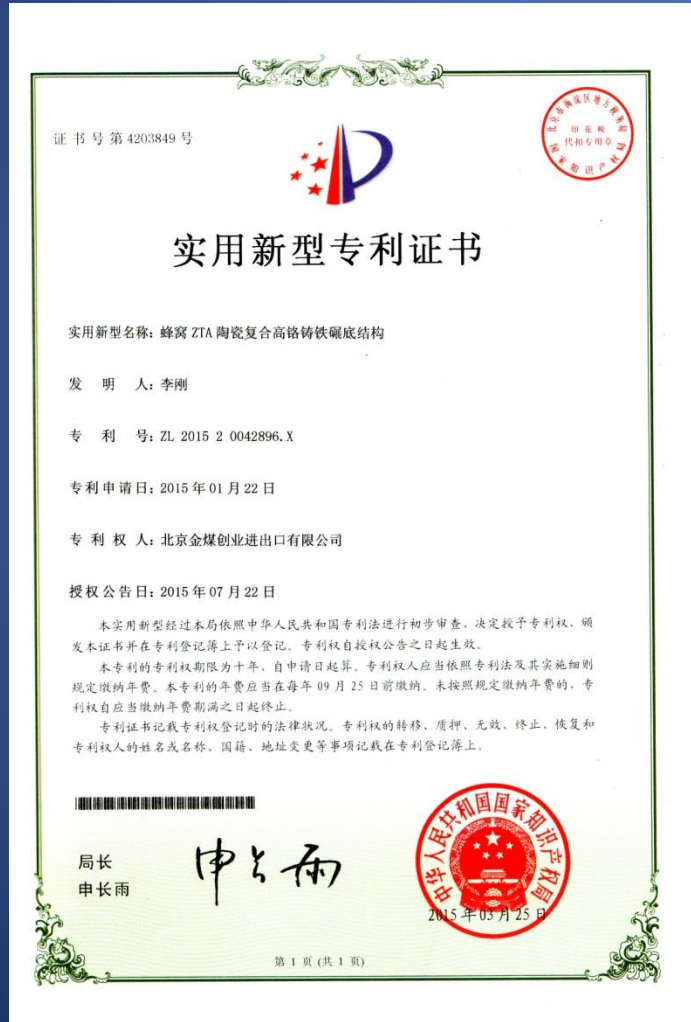
Roller of High Cr Cast Iron +  
ZTA Ceramic particles

## 球铁基陶瓷复合立磨辊套

Roller of GGG+High Cr Cast  
Iron+ZTA Ceramic particles

# 专利技术证书 (碾底衬板)

## Patent certificate (Mill Pan liner)



(19) 中华人民共和国国家知识产权局



(12) 实用新型专利



(10) 授权公告号 CN 204485946 U  
(45) 授权公告日 2015.07.22

(21) 申请号 201520042896.X

(22) 申请日 2015.01.22

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代理人 董芙蓉

(51) Int. Cl.

B02C 15/00(2006.01)

B22D 19/04(2006.01)

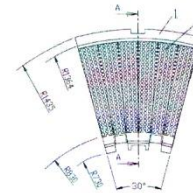
权利要求书1页 说明书2页 附图3页

(54) 实用新型名称

蜂窝 ZTA 陶瓷复合高铬铸铁碾底结构

(57) 摘要

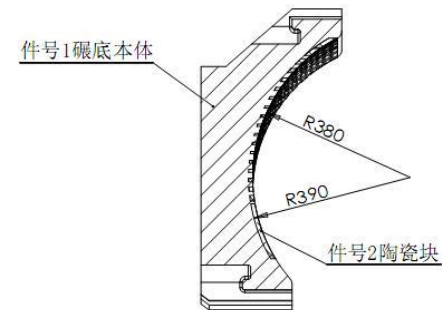
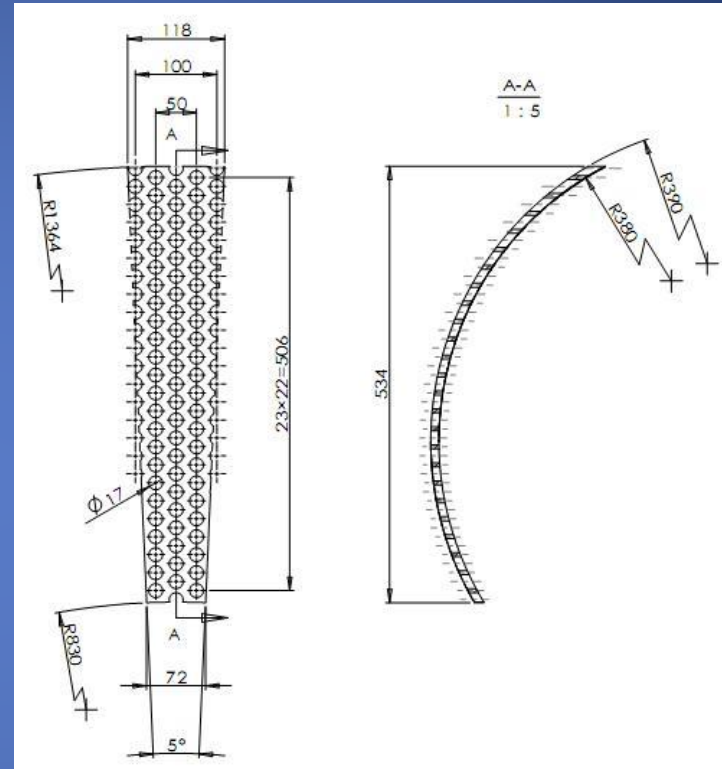
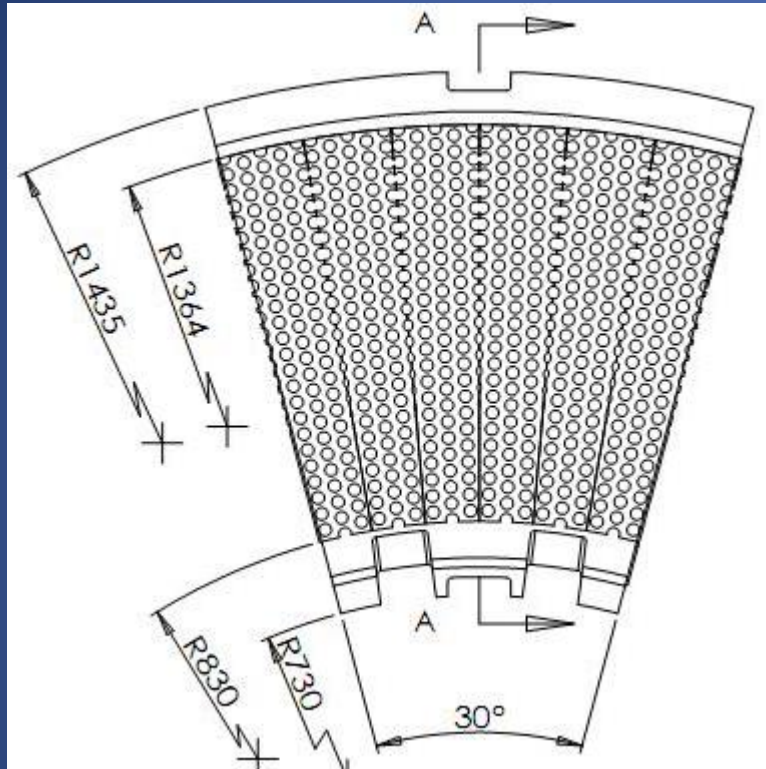
本实用新型涉及一种陶瓷复合高铬铸铁碾底结构, 包括碾底本体, 在碾底本体的工作面上镶嵌有数块陶瓷层, 所述陶瓷层为陶瓷芯块, 其中所述陶瓷芯块大体呈一弧形的片状结构, 陶瓷芯块的端面上设置数个透孔, 本实用新型使高铬铸铁碾底的耐磨性能和抗裂性能大大提高, 即提高了高铬铸铁碾底的耐磨强度, 又有效阻止了裂纹的产生及扩展, 增加了高铬铸铁碾底的使用时间, 减少了更换高铬铸铁碾底的次数, 提高了生产效率, 节约了生产成本。



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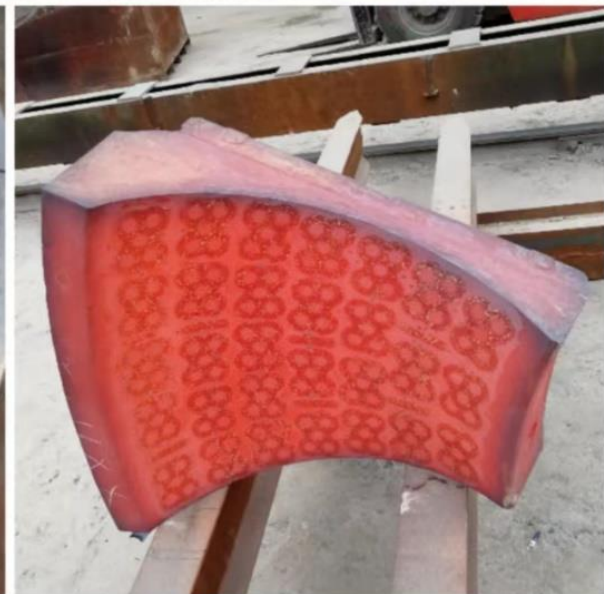
# 碾底衬板陶瓷结构图

## Structure drawing of Ceramic composite liner



## 陶瓷布局及安装

installation and use effect of Ceramic core for ceramic insert casting Liner



# 碾底衬板外观图

## Partial enlargement of appearance

附图-3-2 高铬陶瓷复合 ZGM 衬板外观图

Picture 3-2 Metal Ceramic Composite Liner (ZGM Liner of High Cr cast iron +ZTA ceramic)





# 立磨衬板使用实例

## the use of examples-Mill Liner

- 物料=4500大卡煤 (HGI=60) 使用6700小时后MMC Liner after 6700 hour
- 进料粒度= 30-50mm
- 磨损形式=高应力碾碎式磨粒磨损 (grinding abrasion)
- 使用者及设备=燃煤发电厂ZGM95G立磨碾底衬板
- 高铬铸铁衬板使用寿命= 6000-8000小时 每千小时磨耗=10-15mm
- DJM高铬陶瓷复合衬板使用寿命=1200-20000小时 每千小时磨耗=2-3mm



# 陶瓷金属复合立磨导向板技术介绍

## vertical mill guide plate technology introduction

- DJM chooses high-chrome cast iron (or martensite steel) ceramic composite material to make the pulverizer guide plate: in the high chromium cast iron (or martensite steel) material embedded ceramic particles on the surface to form ceramic metal composite material layer, the wear resistance of the composite layer can be improved greatly than the high Cr material, and the thickness of the composite layer can be made 1/3 of the thickness of the original part and can be produced according to the original wear curve. The particles are cracked and confined to the particles themselves without extending to the substrate, resulting in high wear and impact resistance. The average wear and tear (wear depth) of the metal ceramic vertical grinding plate is 0.5-2mm per 1000 hours, and the ceramic guide plate is greatly improved than high chromium product.
- High Cr cast iron + ZTA ceramic particles
- Martensite steel + ZTA ceramic particles

附图-4-2 陶瓷复合导向板外观图

Picture 4-2 external view



# 陶瓷金属复合立磨配件

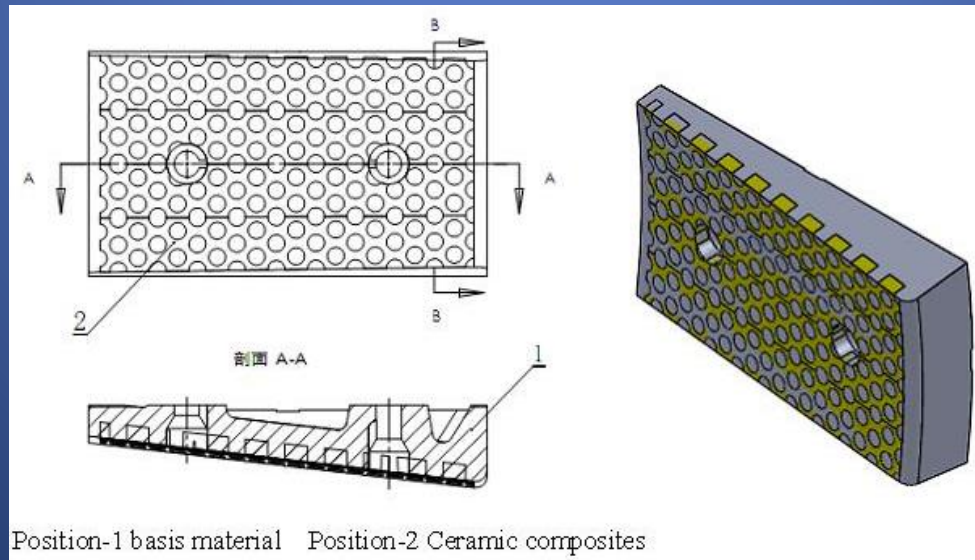
Metal ceramic composite vertical mill spare parts



# 陶瓷金属复合磨机衬板技术介绍

## DJM Metal ceramic composite mill liner technology introduction

- 为进一步提高球磨机衬板耐磨寿命，DJM 选用高锰钢（或马氏体钢）陶瓷复合材料，即在高锰钢（或马氏体钢）材料表面嵌铸陶瓷颗粒形成陶瓷金属复合材料层，这层复合层的耐磨性能可达高锰钢材料的2-3倍，同时这一复合层的厚度可制成达到原备件厚度的1/3，并可根据原磨损曲线有针对性的制作，即使某些颗粒出现裂纹，也只局限于颗粒本身而不扩展至基体，从而获得高耐磨且耐冲击的效果。
- To improve its wear life of the ball mill liners, DJM adopts the composite material of High Mn Steel ( or Martensite steel) and ceramic, namely, the ceramic particles are casted into the surface of alloy to form a composition of ceramic-metal. Its ability of wear resistance is 2-3 times of old Material, the thickness is 1/3 of the original one and can be manufactured according to the original wear curve, even the crack happens to some particles, it will not extend to the base material, thereby obtaining the capacity of high abrasion and impact resistance. The life span of Ceramic composite liner is more than two times of Mid-alloy liner, and more than 2-3 times of high manganese steel liner.



# 金属陶瓷复合铸造自(半)磨机衬板技术介绍

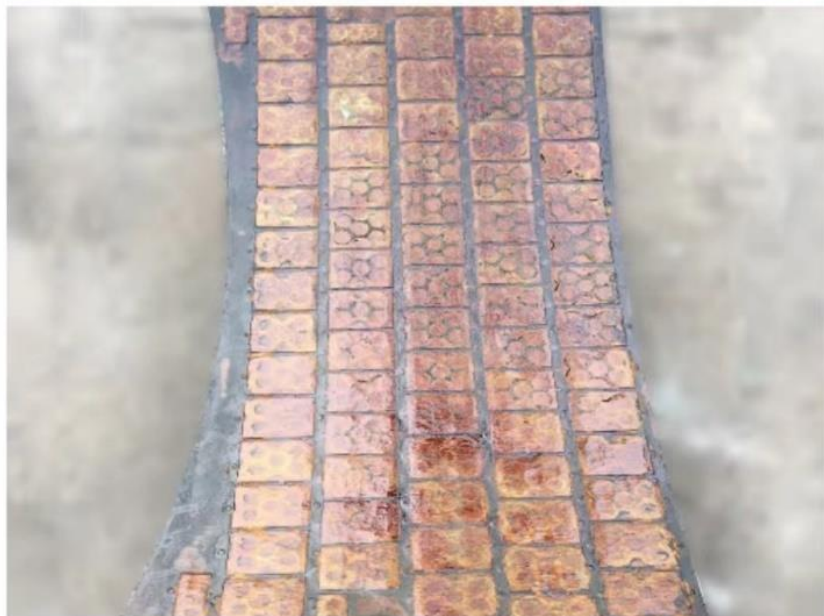
## Metal ceramic composite shell liner of SAG mill technology introduction

为进一步提高衬板耐磨寿命，DJM 选用（高锰钢）或马氏体钢陶瓷复合铸造工艺生产衬板，即在（高锰钢）或马氏体钢材料表面熔铸陶瓷颗粒形成陶瓷金属复合材料层，这层复合层的耐磨性能可达高锰钢材料的2-3倍，同时这一复合层的厚度可制成达到原备件厚度的1/3，并可根据原磨损曲线有针对性的制作，从而获得高耐磨且耐冲击的效果。（高锰钢）或马氏体钢陶瓷复合铸造衬板使用寿命是高锰钢产品的2倍以上。

- In order to further improve the wear resistance life of the liner plate of SAG Mill, the liner is produced by the selection of high manganese steel or martensite steel ceramic composite casting process. That is, the ceramic metal composite layer is formed by casting ceramic particles on the surface of (high manganese steel) or martensite steel. The wear resistance of this composite layer is 2-3 times that of high manganese steel. At the same time, the thickness of the composite layer can be made into a third of the thickness of the original spare parts, and can be made according to the original wear curve



半自磨机溜槽衬板  
downspout Liner of SAG mill



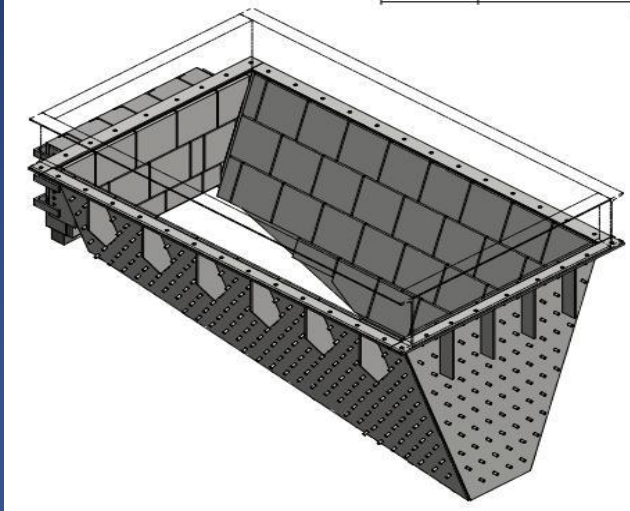
# 溜槽 (downspout) / 衬板 (Liner)



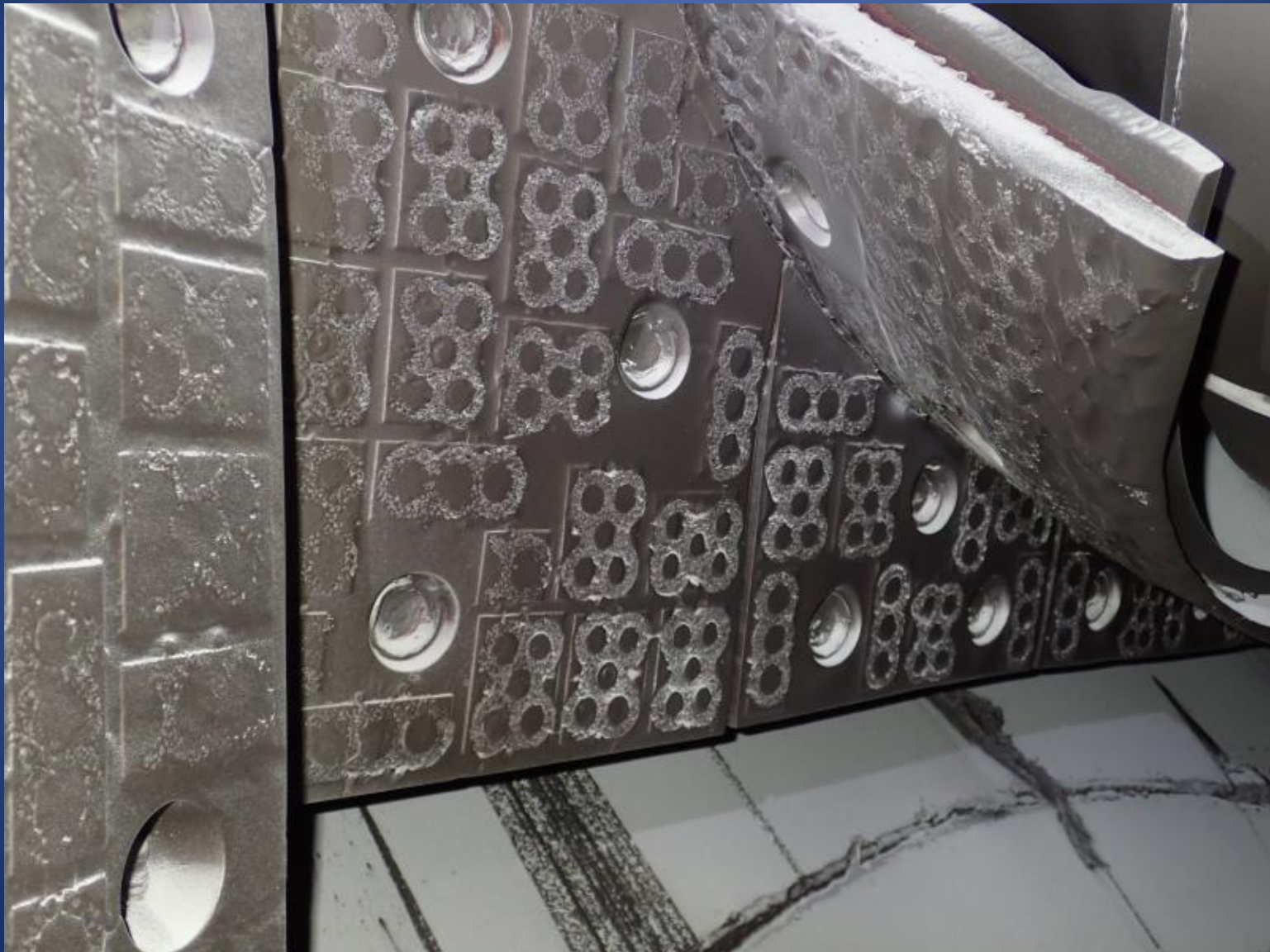
# 溜槽 downspout



# 使用实例- 料仓 (storage bin)



## 使用实例- 衬板 (Liner)



谢谢!  
Thanks!

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