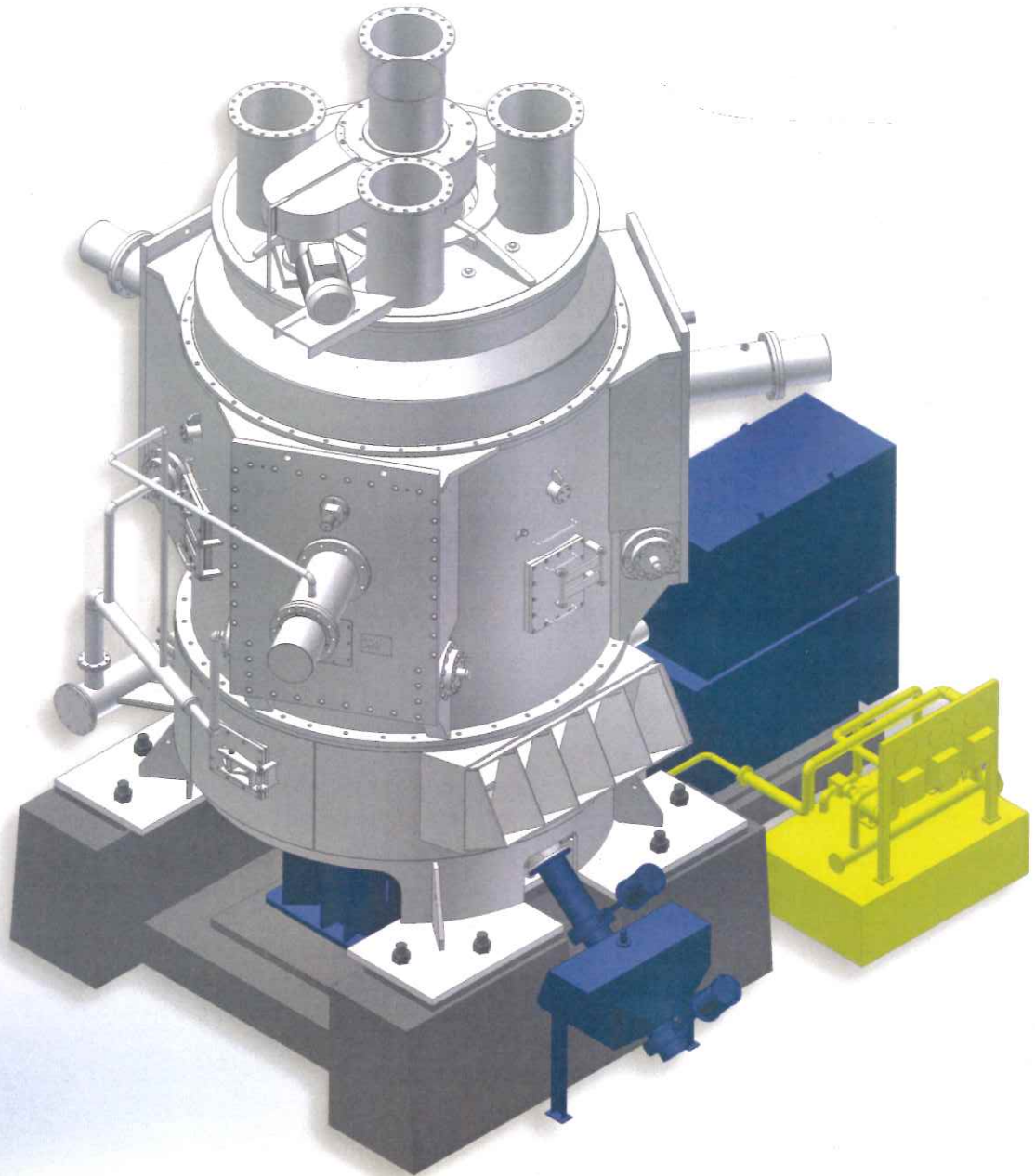


# HP



## 碗式磨煤机

HP BOWL MILL



**上海电气上重碾磨特装设备有限公司**  
SHANGHAI ELECTRIC SHMP PULVERIZING & SPECIAL EQUIPMENT CO., LTD.

**上海重型机器厂有限公司**  
SHANGHAI HEAVY MACHINERY PLANT CO., LTD.



TABLE OF CONTENTS 目录

|                   |  |    |
|-------------------|--|----|
| 前言                | Foreword   | 03 |
| HP碗式磨煤机简图         | HP bowl mill sketch                                  | 04 |
| 带静态分离器            | Equipped with static classifier                      | 04 |
| 带动态分离器            | Equipped with dynamic classifier                     | 05 |
| HP碗式磨煤机的结构特点及技术优势 | Structure characteristic and technologic superiority | 06 |
| 碾磨系统              | Grinding system                                      | 06 |
| 分离系统              | Classification system                                | 07 |
| 石子煤调节系统           | Pyrite regulating system                             | 08 |
| HP碗式磨煤机的适用范围      | Application scope of HP bowl mill                    | 09 |
| HP碗式磨煤机采用的技术标准    | Technologic criterion of HP bowl mill                | 10 |
| 职能体系              | Function system                                      | 11 |
| 设计开发              | Design and development                               | 11 |
| 加工制造              | Manufacture  | 12 |
| 质量保证              | Quality assurance                                    | 13 |
| 售后服务              | After-sale service                                   | 14 |



前言 FOREWORD

新一代HP磨煤机是上海重型机器厂有限公司在保留引进ALSTOM公司HP磨煤机技术优点的基础上, 结合中国国情和上重公司自身30多年的设计和制造中速磨煤机的经验积累, 经过结构优化和二次技术创新而开发出来的, 已获得了两份授权发明专利(专利号为ZL 200510111837.4的碗式中速磨煤机, 专利号为ZL 200610024013.8的动态分离器), 形成了两个机械行业标准(标准号为JB/T 7680-2007的《HP型碗式磨煤机》和标准号为JB/T 10993-2010的《单出口碗式磨煤机》)。

新一代HP磨煤机的四个主要设计指导思想:

- 1)煤种适应性强, 能够碾磨最廉价的劣质煤;
- 2)适应锅炉高效燃烧、节能环保的要求;
- 3)降低设备投资费用和安装成本, 降低电厂基建投入;
- 4)运行可靠性高, 检修方便, 运行维护费用最低;

上海重型机器厂有限公司制造的HP磨煤机因其煤种适应性强、运行可靠性高、维护简单、维修费用低而受到用户的欢迎。至今, 已累计制造HP磨煤机3500多台, 为国内外近300家电厂的50MW~1000MW机组上配套使用, 情况良好。上重公司制造的HP磨煤机在国内中速磨煤机市场的占有率名列前茅。除了国内市场外, 近几年还批量出口800多台到东南亚、中东及南美洲等国家和地区。

国家电力局发布的电力可靠性指标(现委托中国电力企业联合会发布)表明: 上重公司的HP磨煤机可靠性指标连续多年保持国内同类产品生产厂家的第一名。



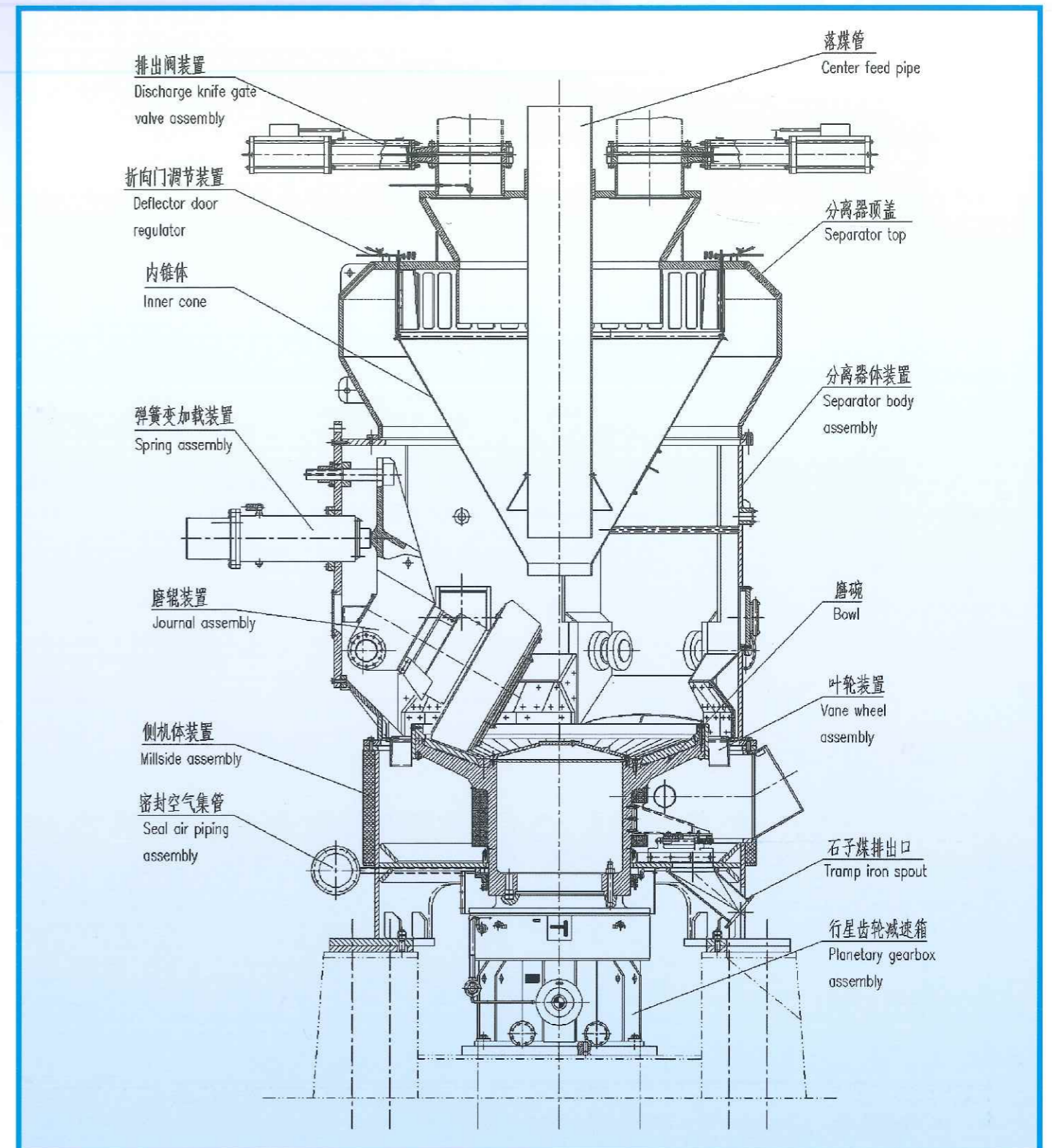
The latest HP coal mill is a new generation of medium-speed bowl mill which is developed by Shanghai Heavy Machinery Plant Co. Ltd after further structural optimization and improvement. The development of HP coal mill not only reserves the HP coal mill's technologic advantages introduced from ALSTOM, but also combines China's national conditions and SHMP's own accumulation of medium-speed bowl mill's design and manufacturing experience over thirty years. HP coal mill has obtained two authorized patents for invention (The medium-speed bowl mill with patent number ZL 200510111837.4, and the dynamic classifier with patent number ZL 200610024013.8) and formed two mechanical industry criterions (《HP bowl mills》 with criterion number JB/T 7680-2007, and 《Single port outlet bowl mills》 with criterion number JB/T 10993-2010). The latest HP mill's design meets four primary guidelines:

- 1) Good adaptability for coal types and adequate flexibility to handle the lowest cost inferior coal;
- 2) Suitable for the efficient combustion, energy conservation and environmental protection requirements of boiler;
- 3) Simply the design to yield benefits in capital cost, erection cost and decrease the infrastructural investment of project;
- 4) High operational reliability, convenient maintenance and the lowest maintenance expense.

HP mills produced by Shanghai Heavy Machinery Plant Co. Ltd (SHMP for short) are well liked by customers due to its better adaptability for various coals, high operational reliability, convenient and low costs for maintenance. Up to now, total quantity of HP medium-speed coal mill produced by our company has amounted to 3500 sets or so, all the mills equipped for nearly 300 power plants with 50MW-1000MW units home and abroad have good condition. HP coal mills produced by our company have been at the top of domestic market share. In recent years, except for domestic market, more than 800 sets of HP coal mills have been exported to countries and areas such as Southeast Asia, the Middle East and South America.

The operational reliability index for medium-speed coal mill issued by State Power Board (now consigned to State Power Enterprise united conference) indicates that HP coal mill produced by our company ranked first for its reliability among the coal mill manufacturers in China for many years.

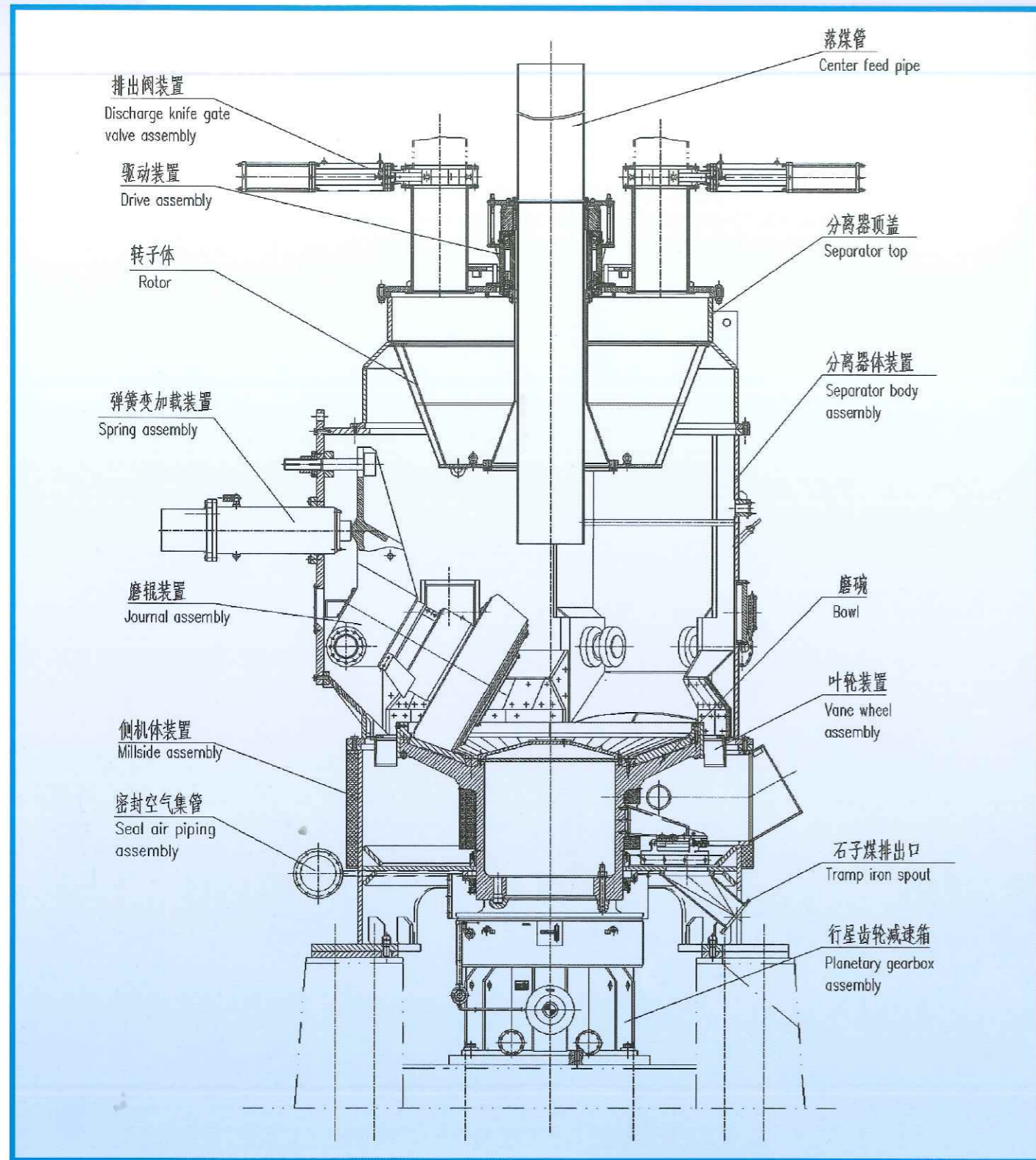
SKETCH 简图



带静态分离器

EQUIPPED WITH STATIC CLASSIFIER

简图 SKETCH



STRUCTURE CHARACTERISTIC AND TECHNOLOGIC SUPERIORITY 结构特点及技术优势

HP磨煤机从功能上可以划分为碾磨系统、分离系统和石子煤调节系统等，这些系统独特的结构，保证了HP磨煤机的技术优势。

HP coal mill can be divided to grinding system, classification system, pyrite regulating system etc. from the function. The unique structure of these systems assures the technologic advantages of our product.

碾磨系统 GRINDING SYSTEM

HP磨煤机碾磨系统由磨碗装置、磨辊装置和弹簧或液压变加载装置等组成。

The grinding system of HP coal mill consists of bowl assembly, journal assembly and spring or hydraulic loading assembly.

磨碗装置由整体式铸造的磨碗、耐磨衬板等组成。磨碗上的圆环形碾磨区域由多块耐磨衬板组成，衬板大小适中，人工即可搬动，检修非常方便。衬板的压紧装置保证了衬板在断裂时也不会跳出，提高了HP磨煤机对劣质煤的适应性。

Bowl assembly is composed of one-piece casting bowl, wearable liners and so on. The circular grinding area of bowl consists of many wearable liners. The size of these liners is moderate. They can be removed by manpower and the maintenance is very convenient. The liner compacting assembly assures that the liners won't jump out of the bowl even when broken, so as to improve the adaptability of HP coal mill for inferior coal.

磨辊装置采用锥形辊套，保证了磨煤机的高效碾磨性能。辊套采用了成熟的堆焊工艺技术，对一般的煤种，磨辊辊套设计寿命在10000h以上 ( $k_e \leq 2$ )，且辊套磨损后可以重复堆焊使用，可有效降低运行成本。

The journal assembly adopts a conical grinding roll to ensure the high grinding performance of coal mill. The grinding roll adopts mature technology of overlaying welding. For normal coal types, the design life of grinding rolls should be longer than 10000 hours ( $k_e \leq 2$ ). What's more, the grinding rolls can be re-welded with overlay material when worn to reduce the running cost.

所有HP系列磨煤机都有一套磨辊翻转机构，磨辊能够从各自的门孔中翻出，检修极为方便。由于HP磨煤机在磨辊结构上作了改进，使磨辊更换可以直接在机器上进行，进一步缩短了停机时间。

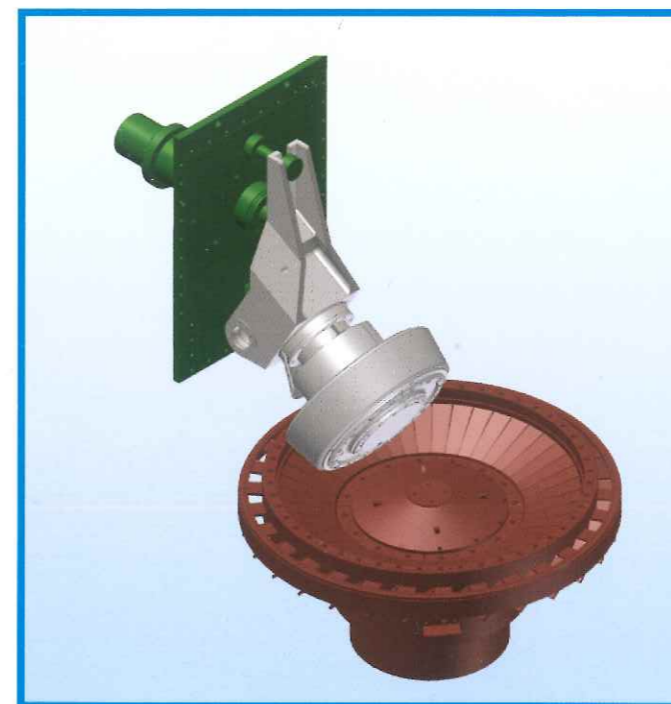
All HP series coal mills have a set of roll overturn mechanism. The journals can be tilted out from respective gate hole in separator body, so the service work can be quite convenient. Due to the improvement of the journal structure, replacement of grinding rolls can be performed directly on the machine so as to further shorten down time.

磨辊与磨碗衬板无直接金属接触，运行时可空载启动（亦可带负荷启动），启动力矩小、运行安全平稳，出力调节范围大，最小出力为最大出力的25%，非常适合于电厂调峰和等离子点火要求。

There is no direct metal contact between grinding roll and bowl liners. HP coal mill can be started without load (also can be started with load). The starting moment is low, and the running is safe and stable. HP coal mill has a wide range of adjusting output and its minimum output equals to 25% of maximum output, so it's quite suitable to the load regulation and plasma ignition requirements of power plant.

外置式弹簧或液压变加载装置使加载系统性能稳定，维护量小，维修成本低。

HP coal mill adopts externally mounted spring or hydraulic loading assembly. The loading system has a stable performance, so less maintenance work and lower maintenance cost are required.



带动态分离器

EQUIPPED WITH DYNAMIC CLASSIFIER

分离系统 CLASSIFICATION SYSTEM

磨煤机分离系统包含叶轮装置、分离器体、折向门（静态）、转子体（动态）及分离器顶盖等部件。

最新优化设计的随磨碗一起转动的叶轮装置可以改变一次风的流向和流速，使通过磨煤机的空气分配得更为均匀，增强了煤粉的分离效果，降低了磨煤机内部的磨损及其一次风阻损。

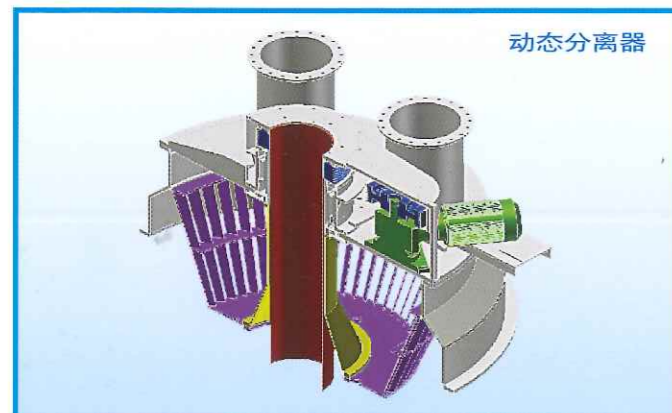
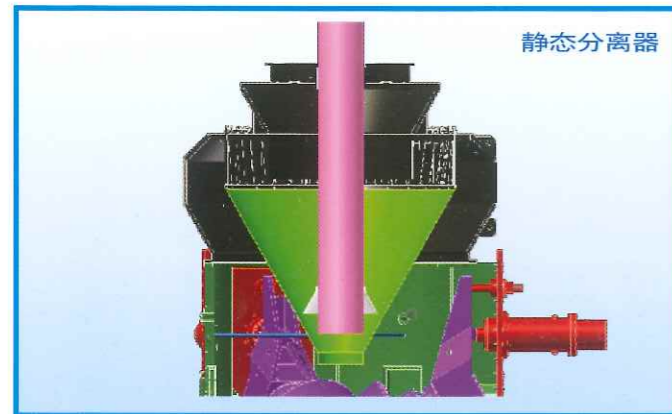
HP磨煤机在分离器体靠近磨碗外缘的位置装有导向装置，在这里发生了一级分离，使大的煤粉颗粒返回磨碗继续碾磨，提高了煤粉分离效率，减少了大颗粒煤粉对磨煤机分离器体及以上部件的磨损，提高了这些部件的寿命。

优化设计的静态分离器是双重锥形结构，其外部带有手动调节煤粉细度的折向门装置，可以有效提高分离效率，降低磨损和减少压力损失。静态分离器特别适用于细度要求不高的燃烧工况。

动态分离器是与本体一体化设计的。配置动态分离器可以有效地减少细煤粉在磨煤机内部的循环次数，大大提高了分离效率，提高煤粉均匀性，获得高品质的煤粉，进一步降低飞灰中的碳含量，从而满足锅炉高效燃烧和节能环保等方面的要求。

转子体装置是动态分离器的核心部件。转子体形状为锥形，确保了通过转子体表面的煤粉和空气场分布均匀。转子体的转速决定了磨煤机出口的煤粉细度。

HP磨煤机可根据运行需要选配静态分离器或动态分离器。



The classification system of HP coal mill consists of vane wheel, separator body, deflector door (static type), rotor (dynamic type) and separator top.

The newly optimization-design vane wheel assembly turning together with bowl can change the flow direction and velocity of primary air. This can make the distribution of air passing the mill become more uniform, and then strengthen separation effect of pulverized coal. Also, the abrasion inside the mill and loss of primary air can be reduced.

HP coal mill installs a deflector assembly on the separator body near outer margin of the bowl, where the first stage of classification just takes place. The deflector makes the larger coal particles return to the bowl for pulverizing again. As a result, the classification efficiency of coal particles has been improved, the abrasion to separator body and assemblies above it caused by larger coal particles has been decreased, and the life span of these assemblies has been prolonged.

Optimized static classifier is double cone type with external, manually adjustable deflector assembly for fineness control. The structure can improve the classification efficiency, decrease the abrasion and pressure loss. Static classifiers are typically used when firing conditions do not require high fineness levels.

Dynamic classifier is integrated designed with the mill body. Equipping dynamic classifier can effectively reduce circulation of fine pulverized coal in the mill, greatly raise classifying efficiency, improve the uniformity of pulverized coal, obtain high quality pulverized coal and further reduce the carbon content in the flying ash, thereby satisfying the requirements as efficient combustion, energy conservation and environmental protection of boiler.

The rotor assembly is the core of the dynamic classifier. The conical shape of rotor ensures symmetrical pulverized coal and air flow passing through the rotor surface. The rotational speed of the rotor controls the fineness of the product leaving the mill. HP coal mill can be equipped with either static classifier or dynamic classifier according to the operation requirements.



石子煤调节系统 PYRITE REGULATING SYSTEM

石子煤调节系统由叶轮装置、分离器体、刮板装置和侧机体等部件组成。

HP磨煤机设计理念为：对锅炉没有燃烧价值的石子煤要尽量在磨煤机处排出，以减少石子煤对系统的不利影响。HP磨煤机有很好石子煤量调控技术，调控手段包括调整各处间隙、安装节流环和增减一次风量等，完全可以做到少排或不排石子煤。但如果石子煤不能在磨煤机处及时排出将造成碾磨时更多无用功消耗，碾磨件寿命下降，煤粉管道磨损严重，炉膛结焦加重和锅炉效率降低等一系列问题。因此HP磨煤机往往控制有适量的石子煤排出。

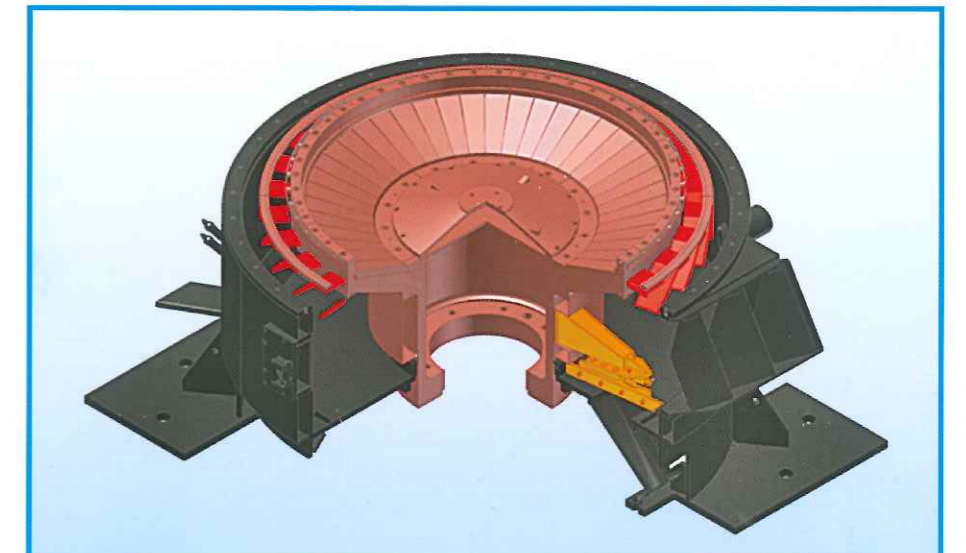
按照空气动力学原理最新设计的翼型叶轮装置使通过叶轮的气流更为均匀，减少了煤的溢出，提高了石子煤的排出效率。

新设计的HP磨煤机侧机体一次风口采用倾斜结构，有效地防止石子煤在进风口处堆积。

带扭簧的刮板装置如果遇到大的外来杂物落在侧机体底部时，刮板会自动折叠，让开，提高了磨煤机对劣质煤的适应性。

Pyrite regulating system consists of vane wheel assembly, separator body, scraper assembly, millside etc.

The design concept of HP coal mill is: the pyrite which is lack of burning value for boiler shall be discharged as much as possible at coal mill to decrease its bad influence on the system. Actually, HP coal mill has an excellent regulating and controlling technology of pyrite quantity. The regulating measures include adjusting gaps, installing throttle rings, increasing or decreasing the primary air flow and so on. As a result, discharging less pyrite or even no pyrite can be fully realized. But if the pyrite cannot be discharged



betimes at the coal mill, it may cause a series of problems such as more useless consumption during grinding, less service lifetime of grinding parts, serious abrasion of pulverized coal pipe, coking aggravation of furnace chamber and lower boiler efficiency. Thus, HP coal mill usually control to discharge moderate pyrite.

The aerofoil-type vane wheel assembly accorded with aerodynamics theory makes the flow through the vane wheel more uniform, minimizing the spillage of coal and enhancing the pyrite discharging efficiency.

As to newly designed HP coal mills, the primary air inlet of millside has been changed to gradient structure to effectively prevent pyrite's accumulation at air inlet.

If the scraper assembly with torsion spring encounters larger foreign matters falling on the bottom of the millside, the scraper usually will automatically fold and make way, improving the adaptability of coal mill for inferior coal.

HP磨煤机整体的简约和无死角结构避免了积粉现象，提高了设备的安全性，同时使得HP磨煤机具有通风阻力小，对基础重量和厂房高度要求低，一次风机等配套设备投资小等技术优势。

The integral concise and no dead angle structure of HP coal mill avoids accumulation of pulverized coal, improves the security of the equipment, and also brings a lot of technologic superiority such as low ventilation resistance, less requirements for foundation weight and workshop height, and lower corollary equipment investment of primary air fan.

**适用范围 APPLICATION SCOPE**

HP系列碗式磨煤机对不同煤质的适用性较强，在国内外已得到广泛的应用。

HP系列磨煤机适用煤种范围：

- 水分 Mt ≤ 45%
- 挥发份 Vdaf ≤ 50%
- 灰份 Aar ≤ 45%
- 哈氏可磨度 HGI ≥ 30
- 磨损指数 Ke ≤ 7.0

经过多年的技术创新HP磨煤机的应用领域也得到了大大扩展，除电力市场外，磨煤机及其改型产品已经广泛应用在高炉喷煤、水泥窑、IGCC绿色能源、石灰石脱硫、煤化工和石油焦等多个领域。碾磨物料也由各种煤扩展到石灰石和石油焦等。

HP series medium-speed coal mill is better suitable for various coal types, and has already been used widely at home and abroad.

Scope of coal type to be suitable for HP series coal mill:

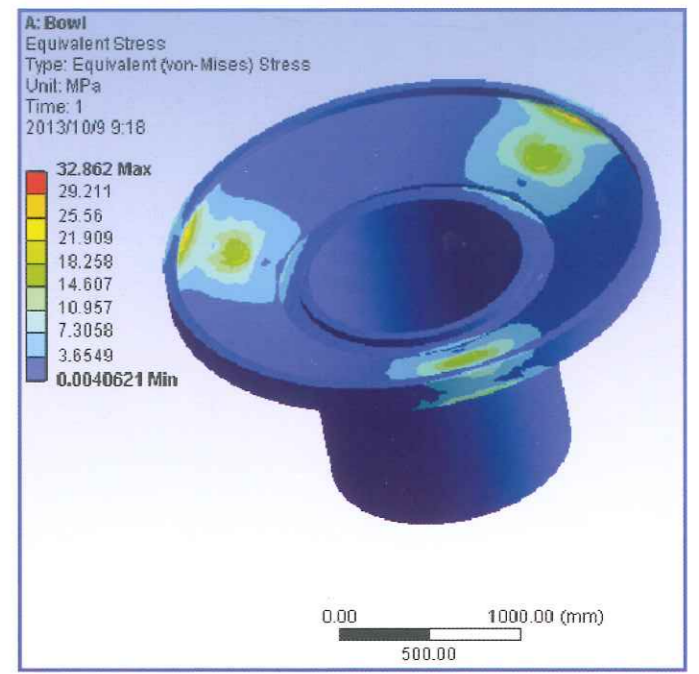
- Moisture Mt ≤ 45%
- Volatility Vdaf ≤ 50%
- Ash Aar ≤ 45%
- Hardgrove index HGI ≥ 30
- Abrasion factor Ke ≤ 7.0

Due to several years' technical innovation, the application scope of HP bowl mill has been evidently extended. Besides the electric power market, HP coal mill and its remodeled products have been widely applied to multiple areas such as blast furnace coal injection, cement kiln, IGCC green energy, desulfurization with limestone, coal chemical industry and petroleum coke. The grinding materials also have been extended from various coals to limestone, petroleum coke etc.

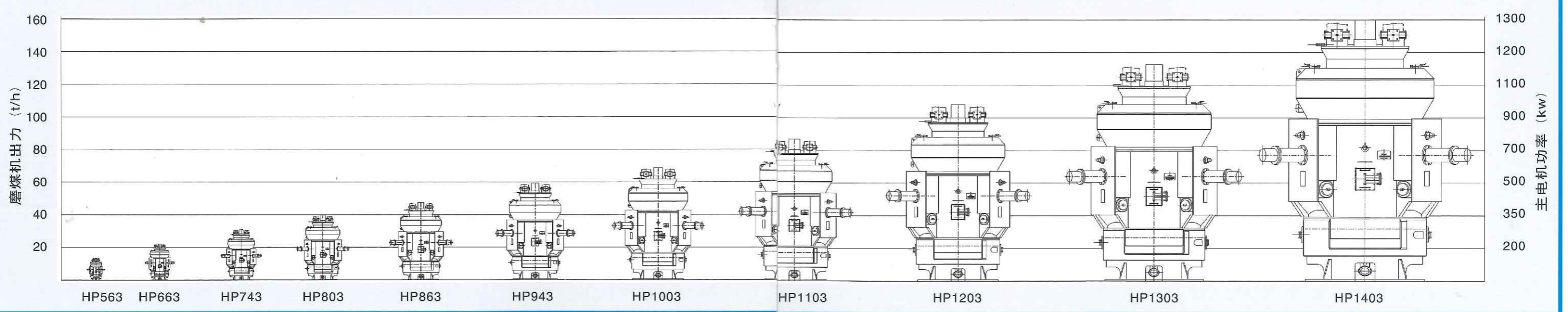
**TECHNOLOGIC CRITERION 采用的技术标准**

| 序号 No. | 标准编号 Criterion No. | 标准名称 Criterion name                    |
|--------|--------------------|--|
| 1      | JB/T 7680-2007     | HP型碗式磨煤机 HP bowl mills                 |
| 2      | JB/T 10993-2010    | 单出口碗式磨煤机 Single port outlet bowl mills |

磨碗受力分析图



注：磨煤机外形图未按比例绘制，具体尺寸需联系厂家。



职能体系 FUNCTION SYSTEM

设计开发 DESIGN AND DEVELOPMENT



上重公司拥有国家级技术中心，有一支国内一流的设计开发团队。该团队在中速磨煤机领域有三十多年的设计开发经验，曾转化设计过RP磨、HP磨、SM磨、MPS磨和MBF磨等多种类型中速磨煤机，自主开发了HP563、HP663和HP1403等系列HP磨煤机，掌握了市场主流的中速磨煤机的设计开发能力。对于用户的特殊需求完全可以做到定制设计，并可以为用户提供各种问题的解决方案。

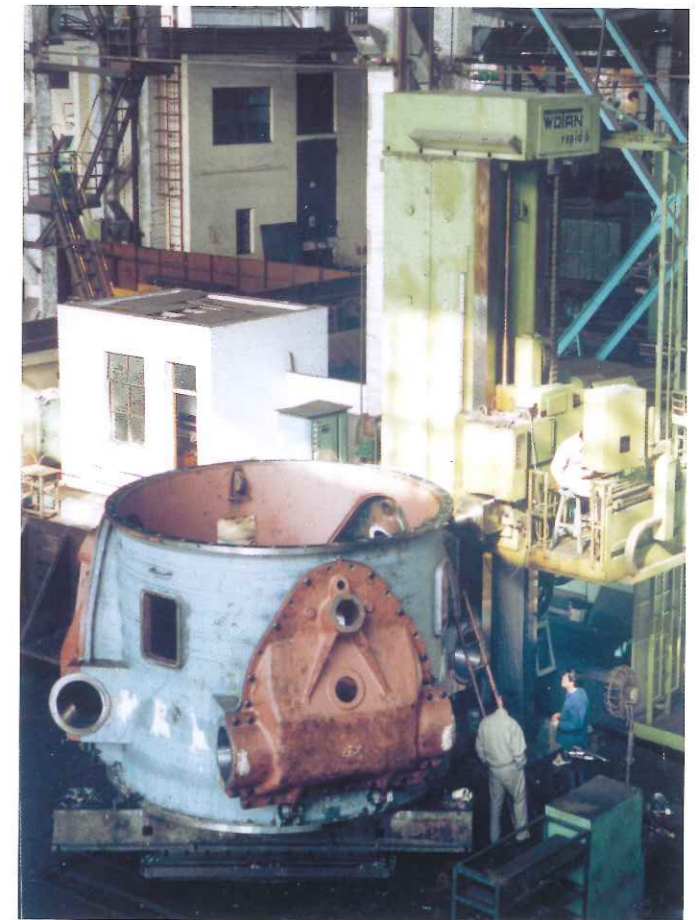
SHMP maintains a state-level technical centre and possesses a domestically leading design and development team which has more than thirty years design experience at medium-speed coal mill area. This team has transformed and designed a lot of medium-speed coal mills such as RP mill, HP mill, SM mill, MPS mill and MBF mill, and independently developed HP563, HP663 and HP1403 series HP coal mills. This team has mastered the design and development ability of the mainstream medium-speed coal mills in the market. Our team can do custom design for special demands and can also provide solutions to customers for their problems.



MANUFACTURE 加工制造

上重公司位于上海闵行区的工厂占地面积96万平方米，拥有万吨锻造水压机、165MN锻造油压机、数控镗床、数控龙门铣床、大型卧式车床等一流的加工设备，迄今为止共制造了超过3500台磨煤机，制造工艺成熟可靠，磨煤机设备的最大年生产能力可达500台。

The plant of SHMP located at Shanghai Minhang district covers an area of 960,000 square meters. Our company owns many top-ranking manufacture equipments such as ten thousand tons forging hydraulic press, 165MN forging oil press, NC boring machine, NC gantry milling machine and large horizontal lathe. Up to now, our company has manufactured more than 3,500 sets of coal mill. The manufacturing process of coal mill is mature and reliable, and the maximum annual production capacity of coal mill is up to 500 sets.



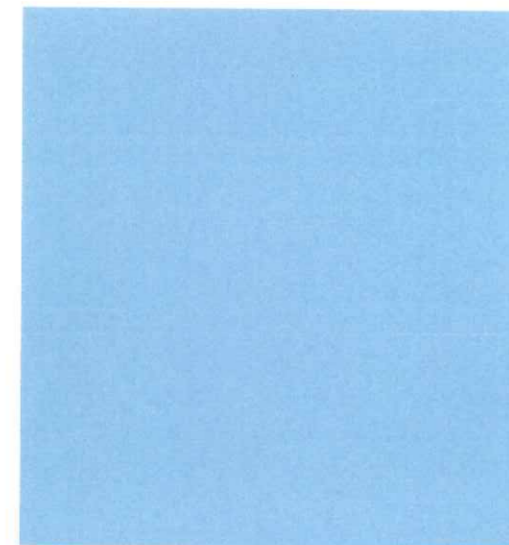
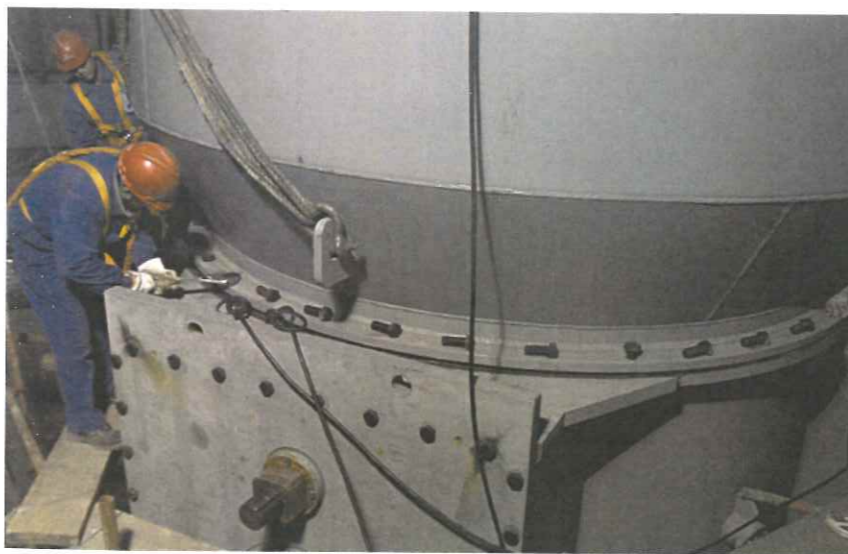
上重公司设立了专门的质量保证部，有多种检测手段和各种高精度检测设备，力求每一件出厂产品都是高性能的优质产品。上重公司的质量管理体系通过了GB/T 19001-2008和ISO 9001:2008认证。

SHMP sets up a special quality assurance department with multiple testing methods and high-precision testing equipments, doing our best to ensure every factory product is a high-quality product. The quality management system of SHMP has been certificated by GB/T 19001-2008和ISO 9001:2008.

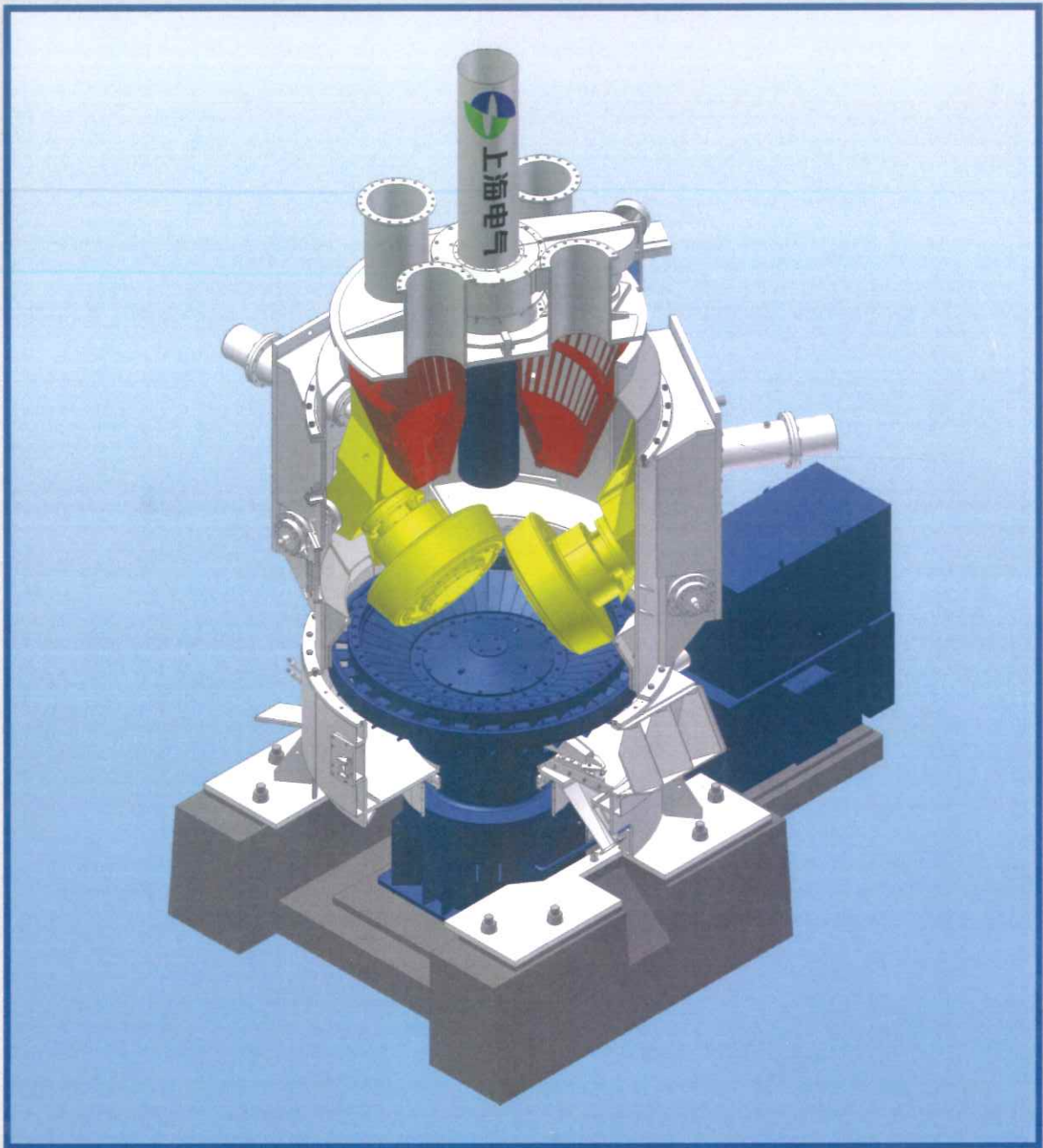


上重公司秉承“客户至上”的管理理念，设有独立的客户服务部，拥有一批经验丰富的现场工程师对HP磨煤机产品提供强大的售后支持。上重公司承诺在接到客户反映问题后24小时内回复，48小时内到达现场处理。

SHMP, adhering to the managerial concept of "ustomer first" sets up an independent customer service department which owns a group of highly experienced field engineers to provide strong after-sale support for HP coal mills. SHMP promises that we will reply within 24 hours after receiving the customer reflect problems and arrive at the field to deal with these problems within 48 hours.







**上海电气上重碾磨特装设备有限公司**  
SHANGHAI ELECTRIC SHMP PULVERIZING & SPECIAL EQUIPMENT CO., LTD.

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