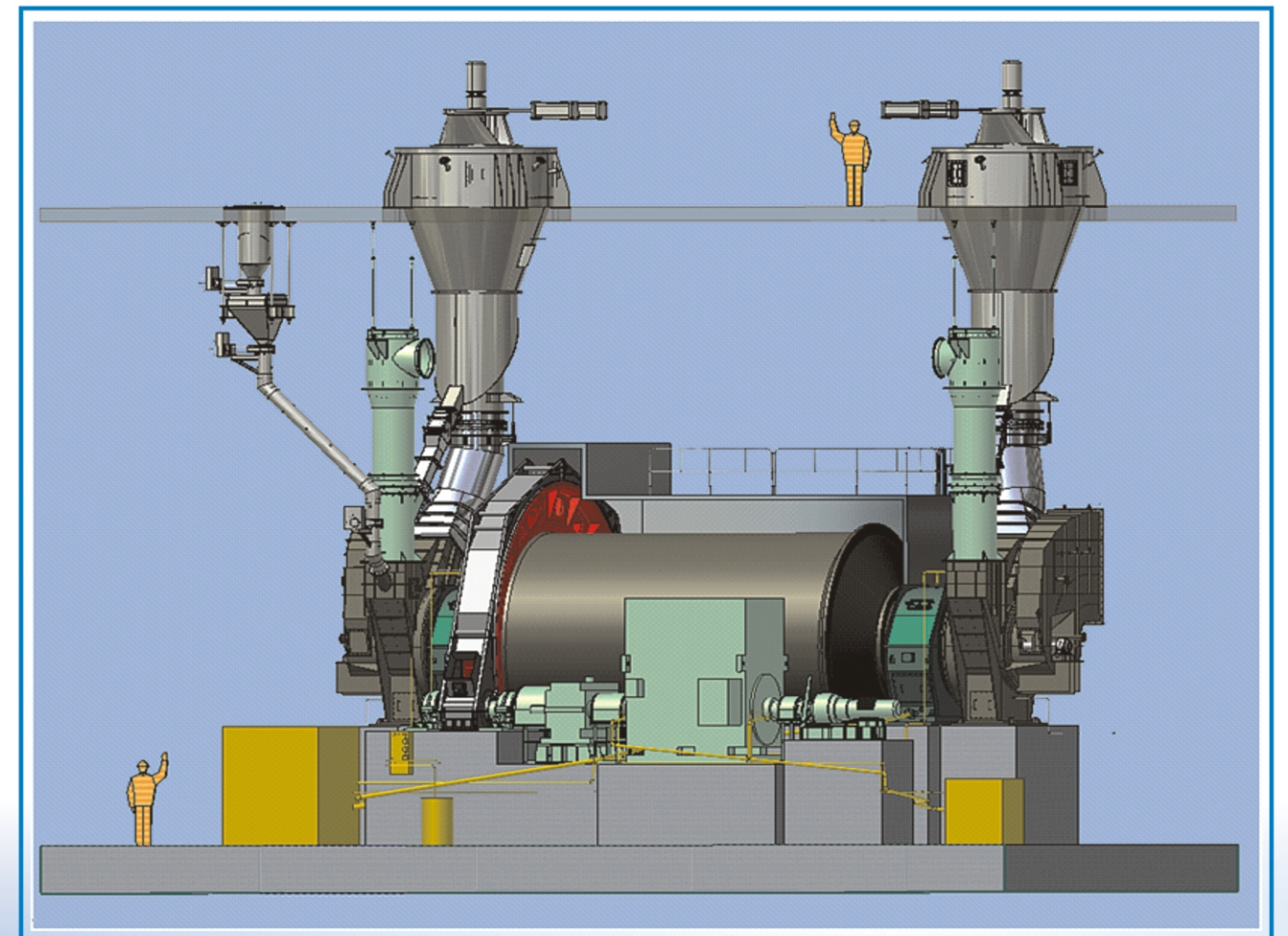


双进双出钢球磨煤机

DOUBLE INLET & DOUBLE OUTLET
BALL MILL



上海重型机器厂有限公司

SHANGHAI HEAVY MACHINERY PLANT CO., LTD.



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

地址: 上海闵行江川路1800号
电话: 021-54721141
021-67287185
传真: 021-54721132
021-54723973
邮编: 200245
http: www.shanghai-electric.com
E-mail: shmpjy@shanghai-electric.com

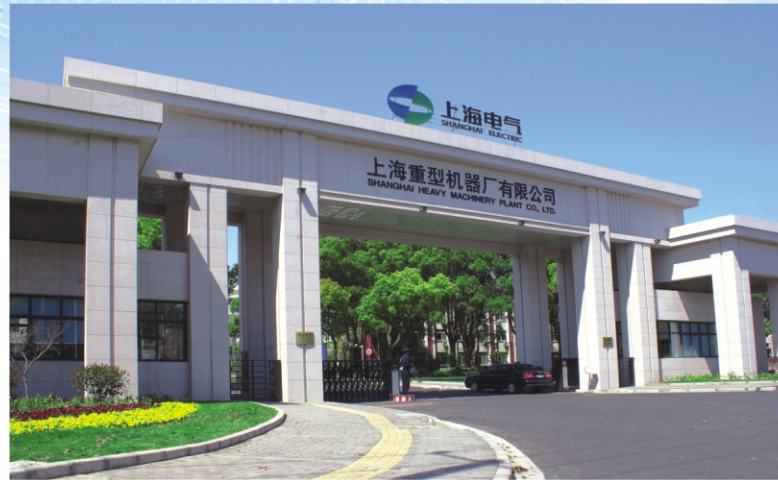
ADD: 1800, Jiangchuan Road, Minhang, Shanghai
Tel: 021-54721141
021-67287185
Fax: 021-54721132
021-54723973
PC: 200245
http: www.shanghai-electric.com
E-mail: shmpjy@shanghai-electric.com



MGS



1.公司简介 Company profiles	03	电耳煤位测量装置	18
2.产品介绍 Product Introduction	04	Electric ear coal level monitoring device	
3.磨煤机结构简介 Structural Introduction of MGS mill	05	磨机总风量控制 Control of total airflow	19
4.技术优势 Technological Superiority	06	磨机出口温度控制 Temperature control at mill outlet	19
筒体 Mill shell	06	一次风压力控制 Control of primary air pressure	19
主轴承 Main bearing	07	7.磨煤机型号 Mill Model	20
传动装置 Driving unit	08	技术规格参数 Technical data	20
螺旋输送机 Spiral Conveyer	09	型号规格说明 Model Specifications	20
分离器 Classifier	10	煤种适用范围 Scope of coal	21
加球装置 Ball charging assembly	11	传动装置布置方式 Layout of driving unit	21
混煤箱 Coal mixing box	11	8.设备特性 Character of MGS Ball Tube Mills	22
密封系统 Sealing system	12	9.职能体系 Function system	24
隔音罩 Sound-proof-hood	12	设计开发 Design and development	24
5.运行原理 Operating principle	13	质量保证 Quality assurance	24
6.控制方法 Control mode	16	加工制造 Manufacture	25
负荷控制 Load Control	17	售后服务 After-sale service	26
煤位控制 Control of coal level	17		
压差煤位测量装置	18		
Differential pressure coal level monitoring device			



PRODUCT INTRODUCTION 产品介绍

上海重型机器厂有限公司（以下简称上重公司）前身为大鑫机器厂，始建于1934年，1958年在闵行现址建立新厂，1962年正式命名为上海重型机器厂。2004年改制为上海重型机器厂有限公司，为上海电气集团股份有限公司成员企业，是国家机械工业大型骨干企业、中国东南地区最大的重型机器制造厂和铸锻中心。

The predecessor of Shanghai Heavy Machinery Plant Co., Ltd. (hereafter referred to as SHMP) was Shanghai Da Xing Machinery Plant established in 1934. In 1958, a new factory was rebuilt in Min Hang and in 1962, it was renamed officially as 'Shanghai Heavy Machinery Plant'. 2004 restructuring of Shanghai Heavy Machinery Plant Co., Ltd., become a member under Shanghai Electric (Group) Corporation. SHMP is one of heavy machinery plants in China and the State's large scale mainstay enterprise as well as the largest heavy machinery plant and casting & forging center in east of China.

上重公司经过多年的基础建设和技术改造，已成为一个组织管理结构健全，技术力量雄厚，加工设备齐全，工艺手段先进，测试方法完善，可以独立设计制造大型电站、冶炼、轧钢、锻压、矿山、水泥建材设备和大型优质铸锻件的现代化大型企业。

Since our capital construction and technical reform for many years, SHMP has already become such a modern and large enterprise with advantage such as sound management organization, strong technical ability, complete machining equipments, advanced processing means, perfect measuring & testing methods, independent designing force and manufacturing equipments for large power station, metallurgy, steel rolling, forging & pressing, mining and cement industries as well as heavy quality castings and forgings.

上重公司位于上海西南地区的闵行区黄浦江畔。全公司占地面积96万平方米，建筑面积43万平方米。现有职工总数3200名，各类技术人员660名。拥有专用码头，铁路贯穿厂区，交通运输十分便利。

SHMP is located next to Huangpu River, Minhang District, southwest of Shanghai. The whole company covers an area of 960,000 square meters, the gross leasable area is 430,000 square meters, with 3200 employees, including 660 technical staff. The transportation of SHMP is very convenient, cause it has specialized terminals, and the railway run through the whole factory.

上重公司是国内享有盛誉的磨煤机专业制造厂，产品有双进双出钢球磨煤机、单进单出钢球磨煤机、中速磨煤机等。至今已制造了数百台双进双出钢球磨煤机。上重公司已成为国内设计和制造双进双出钢球磨煤机最主要厂家之一。

上重公司多年以来一直为广大电站用户服务，长期为用户提供质量可靠的各类型全系列磨煤制粉设备。上重公司生产的MGS双进双出钢球磨煤机（以下简称MGS磨煤机）无论是从设计理念、研究和制造质量上能更加适应电厂的需要。经过我们的长期研究和现场跟踪调查，对该种磨煤机的结构、制造、安装、控制、运行维护取得了非常丰富的经验数据。

MGS系列双进双出钢球磨煤机具有连续作业率高、维修方便、出力与细度稳定、储存能力大、响应迅速、运行灵活性大、风煤比低、适用煤种广、不易受异物影响等优点，适合研磨各种硬度和磨蚀性强的煤种，是火力发电厂锅炉制粉设备中除直吹式中速磨煤机、高速风扇式磨煤机之外的又一种性能优越的直吹式低速磨煤机。

MGS系列双进双出钢球磨煤机可配套于150MW至1000MW大型火力发电机组锅炉的制粉系统，也可用于化工、建材和磷矿等部门作为制粉的设备。

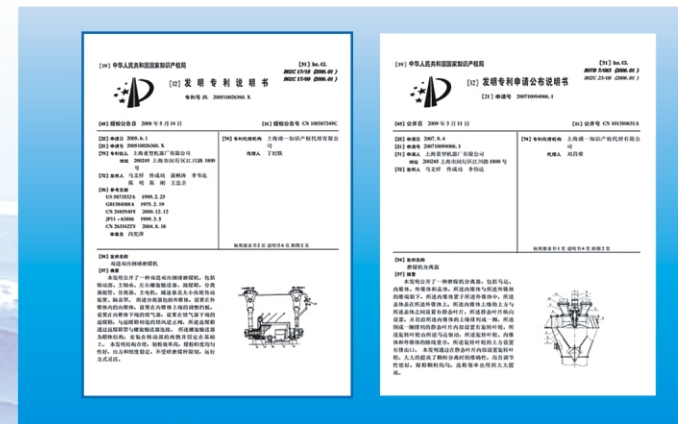
上重公司拥有双进双出钢球磨煤机自主知识产权，成功申请双进双出钢球磨煤机、磨煤机动态分离器发明专利。

SHMP is one of the specialists of coal mill manufacturing with high reputation in China. Its products include medium-speed coal mill, double inlet & double outlet ball mill and single inlet & single outlet ball mill etc. So far, SHMP has been produced hundreds sets of the MGS double inlet & double outlet ball mill. Now SHMP has become one of the main manufactures possessing capability for designing and producing ball mills.

Over the years, SHMP has been services for majority of power plant customers. SHMP provide whole series coal mill with reliable quality to users for a long time. The MGS double inlet & double outlet ball mill (hereafter referred to as MGS ball mill) is very fitting and satisfying the demand for power plant from the view of design research, development capabilities, and manufacturing quality. And profound of long-term study and follow up survey on site, we got a plenty of experience data about the construction, manufacture, installation, control, operation and maintenance of ball mill. MGS ball mill has so many profiles such as high efficiency for successive operation, easy to maintenance, stable output and fineness, large capacity of storage, high flexibility, low ratio between coal and air, a broad range of coal types suitable for pulverizing, no influence from foreign matter, ability for pulverizing the fuel with high hardness and abrasiveness. In all, it is an excellent straight blow low-speed ball mill which is use for power plant except straight blow medium-speed coal mill and high speed fan-type light wheel coal mill.

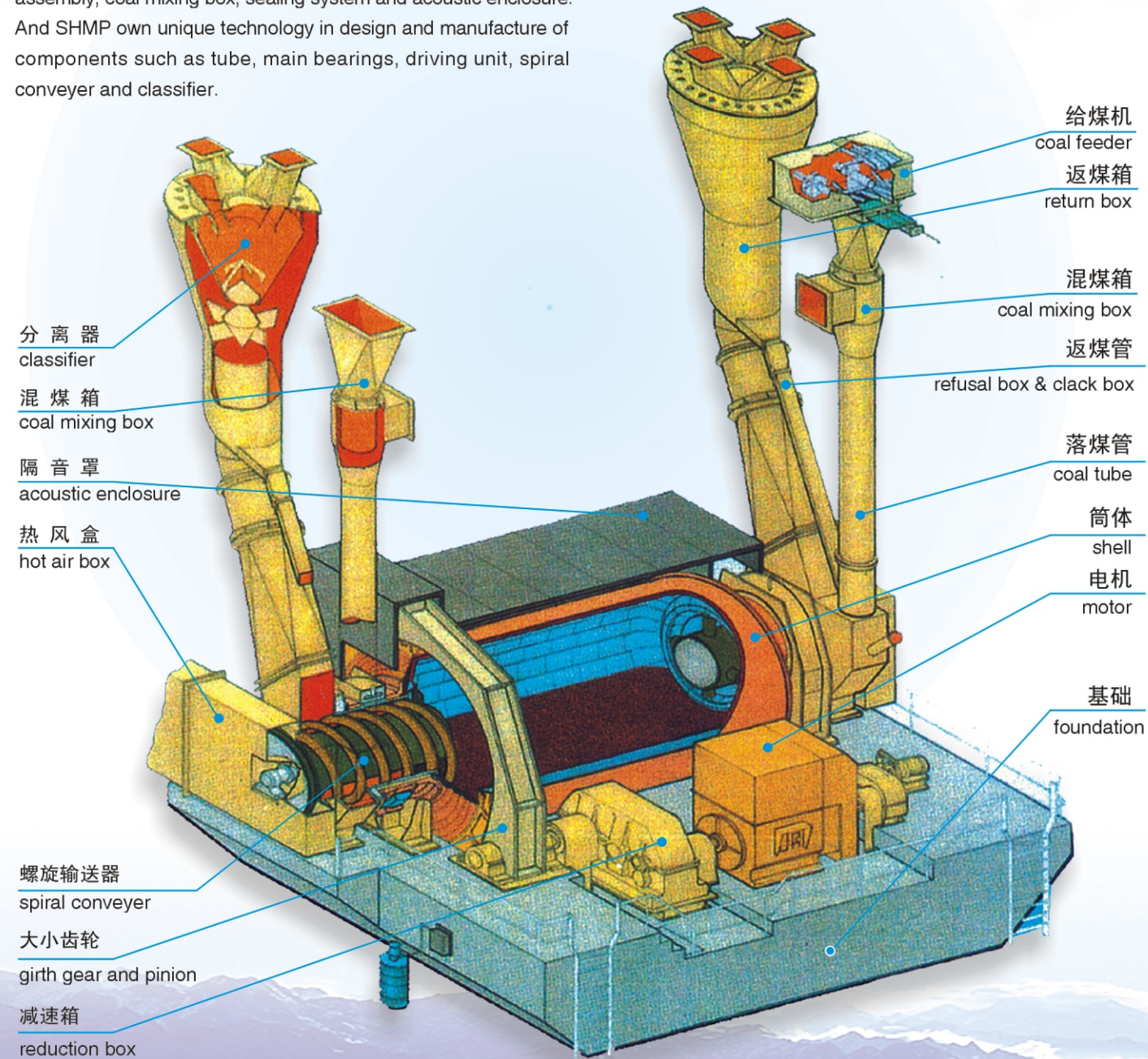
MGS ball mill supporting for power plant whose pulverizing system is 150MW to 1000MW, it also can be use as a pulverizing system equipment for industry like chemical, building materials and phosphate mineral.

SHMP owns independent intellectual property rights of double inlet and double outlet ball mill, and also successfully applied for patent for inventions of double inlet and double outlet ball mill and dynamic separator which is use for coal mill.



MGS双进双出钢球磨煤机的主要组成部分为：筒体、主轴承、传动装置、螺旋输送机、分离器、加球装置、混煤箱、密封系统、隔音罩。上重公司在筒体、主轴承、传动装置、螺旋输送机、及分离器等零部件的设计和制造上都有自己独到的技术优势。

The main mechanical components of MGS ball mill include shell, main bearings, driving unit, spiral conveyer, classifier, ball charging assembly, coal mixing box, sealing system and acoustic enclosure. And SHMP own unique technology in design and manufacture of components such as tube, main bearings, driving unit, spiral conveyer and classifier.



磨煤机结构简介

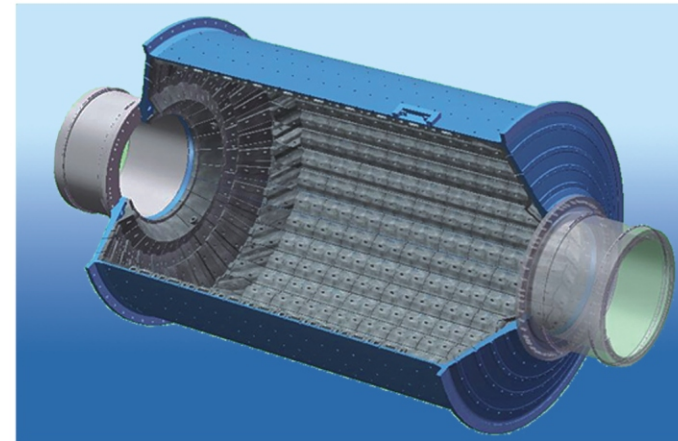
STRUCTURAL INTRODUCTION OF MGS BALL MILL

TECHNOLOGICAL SUPERIORITY 技术优势

筒体 SHELL

筒体是由两个铸造中空轴、端盖和用钢板卷制的圆筒焊接而成，筒体两端中空轴支撑在两个球面调心巴氏合金主轴承上。筒体内侧衬有非对称波形衬板，每块衬板通过两个螺栓与筒体固定，便于安装拆卸。

- 端盖与筒体采用对接焊，受力状态良好
- 筒体采用整体加工，保证同心度
- 筒体焊后退火，消除焊接应力；焊缝探伤，保证焊缝质量
- 中空轴及端盖采用一次铸造成型，确保精加工后无缺陷
- 衬板质量可靠、性能优越。采用法国第四代“等强度磨损衬板”专利技术，整个磨损期衬板波纹形状不变，可保证获得稳定的出力和细度
- 衬板螺栓采用特殊密封，螺母为高强度锁紧螺母；使用寿命长，密封性好



The shell is fabricated by 2 casting trunnions, head and rolled tube. On 2 ends of the shell, the trunnions are supported on the 2 self-aligning babbitt bearing, dissymmetric wave liners are mounted inside the tube, each liner is connected with the tube by 2 bolts to facilitate mounting and dismantling of parts.

- The joint between end cover and shell by butt welding can realize enough strength to sustain the load.
- Machining of the shell is done integrally so as to ensure its concentricity
- Overall annealing for stress relieving and weld inspection are performed to ensure the shell with good welding quality
- The trunnion shaft and end cover are made by casting to shape one time, in order to no bug after fine finishing.
- Liners are reliable quality and super performance. Using the fourth generation patented technology which called equal strength and wear liner designed by French, the corrugated shape of liners didn't change in the entire wear period, in order to make sure the output power and size of coal powder are stable.
- Special sealing for liner bolt and high strength locking nut are applied for purpose of long life span, good sealing effect and so on.



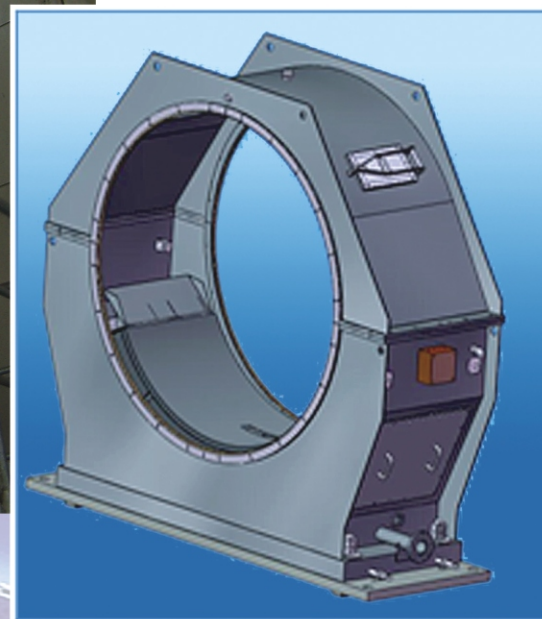
主轴承 MAIN BEARINGS

主轴承由轴承座、球面瓦、轴承盖等组成，用于回转筒体的支撑，调心结构可保证筒体在负荷作用下的下水平度，瓦体与轴承座之间为球面配合，并涂润滑脂，具有良好的调心功能。

- 主轴承采用性能可靠的高低压润滑系统，高压油注入轴瓦与中空轴的间隙中，形成高压油膜，可以避免轴瓦和中空轴有任何接触。低压油从中空轴上方喷淋至中空轴上，使中空轴有良好的润滑。
- 轴瓦采用自调心巴氏合金球面瓦，具有良好的调心功能
- 球面瓦采用循环水冷却，可保证轴瓦的正常运行温度
- 在主轴承中有测温热电阻，时刻监测主轴承的温度，防止温度过高，避免出现抱轴，拉伤等各种事故发生。轴承座采用铸焊结构，结实耐用，外表美观大方。

The main bearing consists of bearing housing, shaft bushing and cover. It is used for support the rotating tube. The self-aligning structure can ensure the levelness of the shell under the load condition. The bushing and bearing match with spherical surface coated with grease, so as to keep in excellent self-aligning Function.

- The main bearing is equipped with high and low pressure lubrication system. The high pressure oil fed into the gap between bushing and trunion shaft forms a layer of high pressure oil film which can avoid any direct touching between the bushing and trunion shaft can get good lubrication result.
- Material of self-aligning bushing is Babbitt metal, with good self-aligning feature.
- Circulating water cooling is adopted for the bushing so as to ensure the normal operational temperature of the bushing
- The thermal resistance equipped in the main bearing can keep monitoring the temperature of main bushing. Thus it can prevent over high temperature, seizure and scratch of shaft etc. The bearing housing is made by means of casting and welding structure. So it is strong, durable and nice appearance



传动装置 DRIVING UNIT

传动装置由主传动和慢传动构成，主传用于磨机的正常运行，慢传用于磨机的启动和停止及检修维护。

主传动路径：由主电机经主减速机驱动小齿轮传动轴，小齿轮与磨机的大齿轮啮合把动力传给筒体。

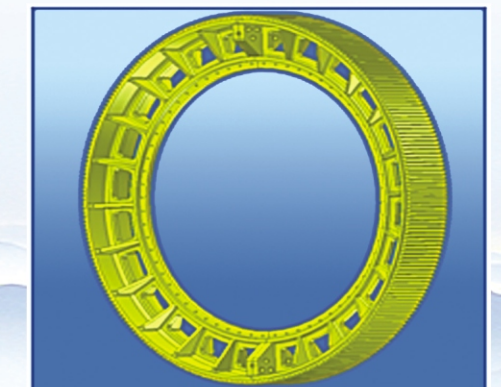
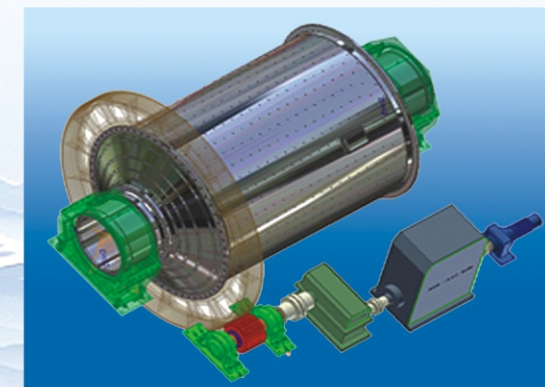
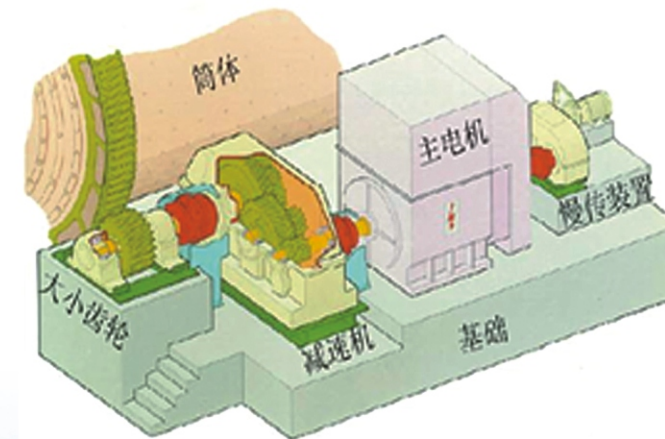
慢传动路径：由慢传动电机经减速机，再通过离合器与主电机相连。大齿轮与小齿轮采用喷雾润滑。

- 采用大变位开式齿轮，增大啮合角，改善齿轮的承载能力。大变位齿轮的寿命比普通标准齿轮寿命高30%以上。
- 大小齿轮制造采用国际常用精度等级。改善齿轮的啮合状态，还使磨机运行的更加平稳，同时使主轴承的工作状态更加良好。
- 开式齿轮配有齿轮罩，齿轮罩采用径向密封，并配有密封风机，充分防止灰尘的进入。从而有效的保证了齿轮在良好的环境条件下运行。
- 由电机减速机组成的慢传动装置配有超越离合器（斜齿离合器）。当磨机正常运转时，与磨机断开；在停机时可以使磨机带载荷继续缓慢旋转，以防止磨机筒体内热点的形成避免出现筒体变形和发生火灾等风险。另外，它还可以使磨机在检修时更加方便。

The driving unit consists of main driving and slow driving. Main driving is used for normal running of the mill and slow driving is equipped for starting, stopping and maintaining the machine. Main driving unit: Main motor drives small gear through driving speed reducer. And then small gear meshed with lager gear to rotate the tube.

Slow driving unit: Slow motor drives through speed reducer to connect main motor with overrunning clutch. Girth gear and pinion adopts spray lubrication system.

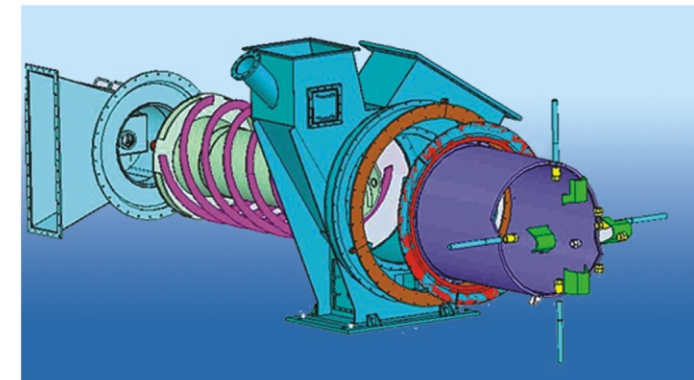
- Wide shifting girth gear is used for enlarging its engaging angle and improving its load-carrying ability. Thus the life span of the girth gear is longer than that of ordinary standard gear by over 30%.
- The accuracy classes of girth gear and pinion is conform to international class. The raised accuracy of gear not only can improve the situation of engagement, but also can make operation of the mill more stable. Meanwhile the working condition of main bearing can become much better.
- The exposed gear is equipped with a gear guard in which radial sealing is adopted. In addition, a sealing air fan is effectively used to prevent dust from entering so as to ensure the gear can run under satisfactory condition.
- The slow driving unit is arranged with a set of component including motor and speed reducer. During normal running of the mill. The slow driving unit can be disconnected with the machine through a overrunning clutch (helical gear clutch). However, when stopping the mill, the slow driving unit can make the machine carrying its load run continuously at a low speed, so that the coal temperature in the mill can be held uniformly and any risk e.g. conflagration etc. can also be avoided. Beside, more convenient maintenance for the mill can be realized.



螺旋输送机 SPIRAL CONVEYER

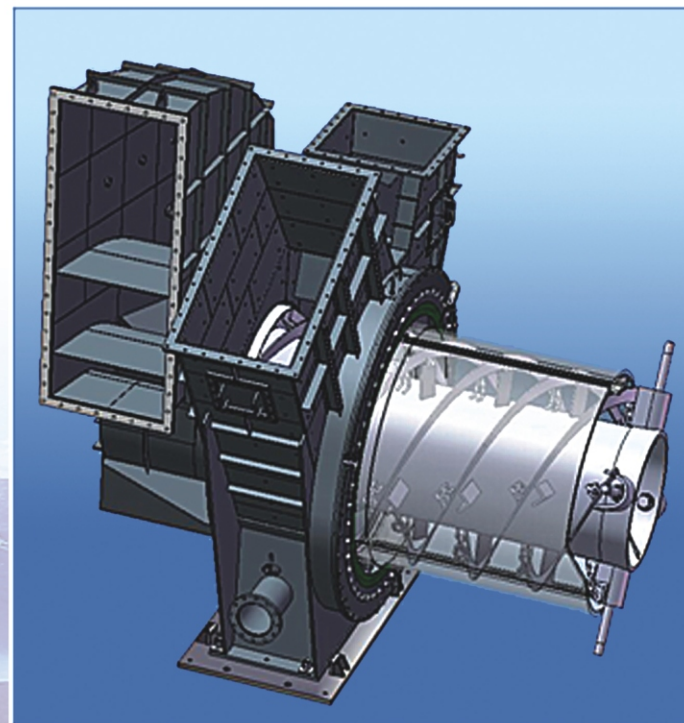
螺旋输送机由螺旋推进器及输送壳体组成。螺旋推进器一端通过支撑杆与壳体相连，另一端由输送器壳体外轴承支撑，当壳体旋转时带动螺旋推进器旋转。

- 关键件螺旋叶片，采用进口耐磨钢板制作，抗磨蚀，强度高，结实耐用，寿命长。
- 通过改善支撑结构、改进材料性能、加大设计裕量，加工中保证同心度、安装时提高要求等多种措施解决了螺旋推进器撑杆易断裂问题
- 螺旋叶片和中空管用链条连接，叶片柔性高。链条前方设有尖角形挡板保护链条。在叶片的柔性和挡板的助推作用下，输送机对大块物料具有很强的适应性，可有效防止堵煤
- 输送机与中空轴的动静结合部位采用进口密封盖。螺旋输送机引入密封风，确保运行中不漏粉，保证良好的密封性
- 输送机内壁设有耐磨衬板，抗磨性好



The spiral conveyer consists of spiral propeller and conveyer. One end of spiral propeller connects shell with stay bar, and another end is sustained by bearing outside the shell. The tube rotates spiral propeller when it is running.

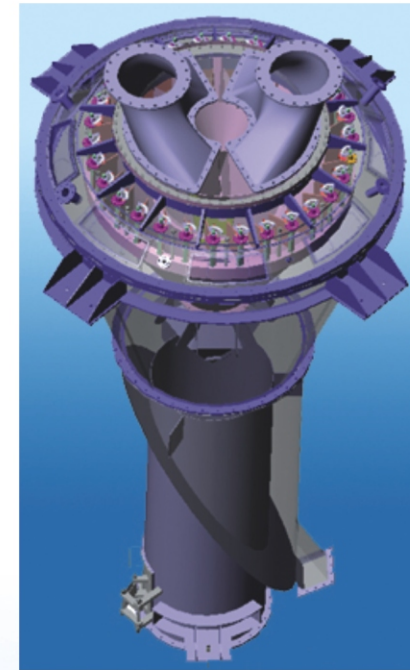
- The spiral blades which belong to critical parts are made of wearing resistant steel plate imported from abroad. Therefore the parts possess following advantages, such as good wearing resistance, high strength, strong and reliable as well as long life span.
- We solve the problem of strut frangible by many measures. Such as improving the support structure, improving material properties, increasing design margins, and ensure concentricity during processing, and improve the requirement of installation.
- Spiral blade and chain hollow tubes connected to a flexible blade height. Chain has a cusp-shaped front bezel protection chain. In boosting the role of flexible blades and baffles, conveyors for bulk materials with strong adaptability, can effectively prevent the blocking of coal.
- The covers imported from abroad are used for conveyer and trunnion shaft. Sealing air is led to the bearing part of propeller. Thus it can ensure proper operation without leaking coal dust.
- Wear-resistance liner on inner wall. Good wear resisting property.



分离器 CLASSIFIER

上重公司具有成熟先进的分离器技术，可根据客户要求配备雷蒙式双锥型静态分离器、动静结合双锥型分离器或轴向分离器。

- 雷蒙式双锥型静态分离器：采用锥形旋风分离器，与输送机分离布置，煤粉经过充分的混合进入分离器，使煤粉的均匀性好。在分离器中装有挡板调节装置，以控制分离器出口的煤粉细度。在分离器内部装有耐磨衬，使用寿命长。是应用最广泛的一种分离器型式。
- 动静结合双锥型分离器：为满足锅炉燃烧无烟煤时对煤粉高细度和高均匀性指标 ($n \geq 1.2$) 的需求，上重公司在静态分离器基础上开发出了动静结合双锥型分离器，用动态叶轮取代多出口分配器位置，在原有静态分离器上增加一个动态分离器的功能，由此在原有基础上大大提高了分离器的选粉能力。目前该种分离器已得到广泛应用和认可，多个电厂的 600 MW 机组均已安装和使用该种分离器，使用情况优良。



The SHMP with advanced production technology about classifier, According to customer's requirements we can provide reymond type double cone classifier or static and dynamic comdined classifier.

- Raymond type double cone classifier: it is adopted and arranged away from conveyer. The coal dust mixed up sufficiently enters the separator and its uniformity can be improved further. Baffle plated regulator is arranged in the separator to control the fineness of coal dust from separator. Wearing resistant liner is designed inside the separator. Thus its life span can be longer. It is one of the most widely used type of separator.
- Static and dynamic combined classifier: To meet the high demand for pulverized coal fineness and high uniformity index ($n \geq 1.2$), SHMP developed an association of activity and inertia classifier based on the static classifier, with dynamic impeller to replace the multi-outlet distributor, adding a dynamic Classifier functions on the original static classifier, then the ability of the splitter has greatly improved. Currently this kind of Classifier has been widely used and recognized, more than a dozen plants of 600MW units have been installed and running smoothly.

FEATURES 性能特点

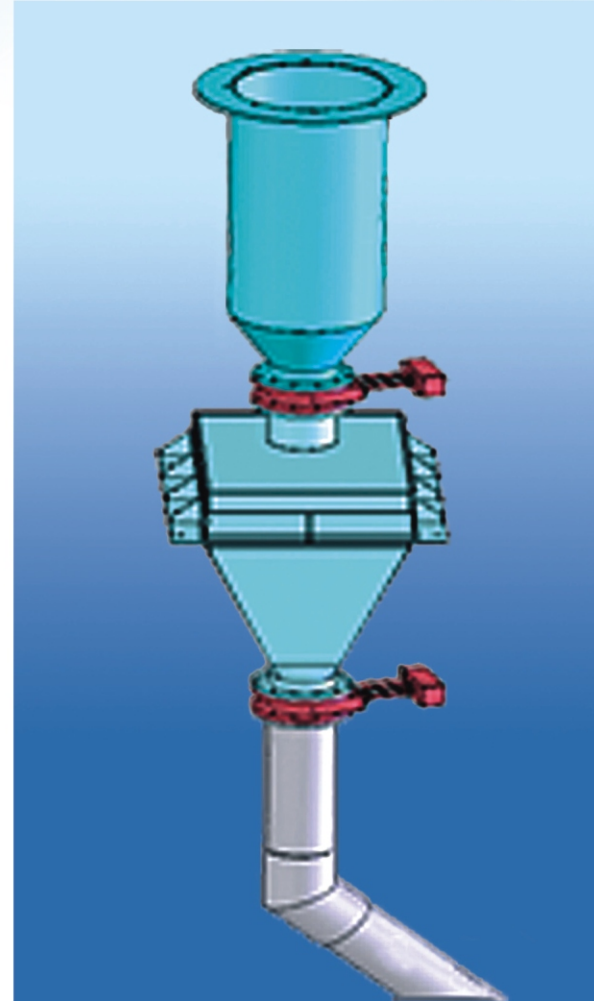
- 可获得极细煤粉 ($R_{90} \approx 2\%$) 以提高难燃煤种锅炉的燃烧效率;
 - 可提高煤粉均匀性 ($n \geq 1.2$) 并提高磨煤机出力、降低能耗;
 - 转子转速调节范围大 (60~150rpm)，煤粉细度调节范围大 ($R_{90}=2\% \sim 20\%$ 可调)。
- Obtained fine pulverized coal ($R_{90} \approx 2\%$) to improve the efficiency of flame coal combustion boiler;
 - Can improve the uniformity of pulverized coal ($n \geq 1.2$) and increase mill output, reduce energy consumption;
 - Rotor speed adjustment range (60 ~ 150rpm), coal fineness adjustment range ($R_{90} = 2\% \sim 20\%$ adjustable).

加球装置 BALL CHARGING ASSEMBLY

加球装置由储球箱、上、下闸阀及管道组成，通常放在给煤机同一层面上。由于结构上采取了特殊措施，可以使磨机实现不停机加球。加球时，球进到闭合装置，上闸板关闭，下闸板渐渐打开，球即落入原煤入口处，随原煤一起由螺旋推进器送入磨内。这样，磨内钢球始终保持在额定值，从而使磨机发挥最佳粉磨能力。

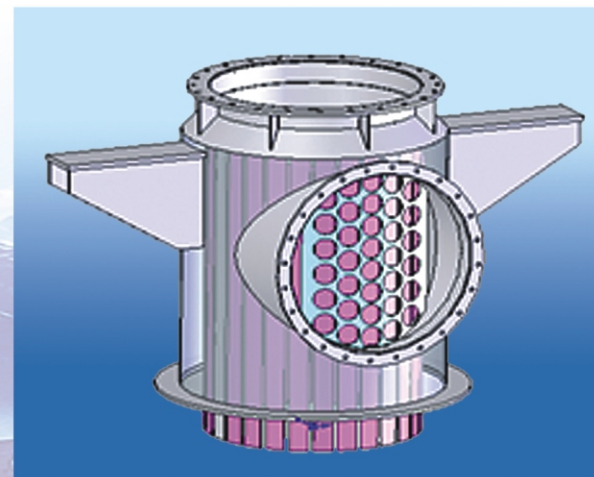
The ball charging assembly consists of reserve ball box, upper and lower sluice valves and piping. Usually it is located at the same level as the coal feeder. Due to special measures taken for structure, steel ball can be charged without stopping the machine. During this process, when the balls enter the closing device, upper flash board closes and the lower one opens gradually. As soon as the balls fall in the raw coal area, they can be sent into the mill together with raw coal by spiral propeller. So the steel balls inside the mill will always be kept at their rated value and the mill can thus realize its optimum pulverizing capability.

- 可实现不停机加球，有利于磨机的连续运行
- 两个闸板阀保证了良好的密封性，加球时磨机内部压力无损失，不漏粉
- It can charge the balls without stopping the machine, so that keep the mill working properly.
- The ball charging assembly is equipped with two gate valves which possess satisfactory sealing function, so the pressure of mill can be assured and the phenomena of pressure loss and coal dust leakage will not be happen.



混煤箱 COAL MIXING BOX

- 旁路风从四周吹入，有效的将煤粉进行预烘干。
- 内部采用不锈钢叶片，落煤管采用不锈钢板，有效地阻止了煤粉粘贴，避免煤粉堵塞。
- By-pass air blows in from all sides to make coal dust pre-dry effectively.
- Stainless steel vane and coal chute are adopted inside the box. Thus coal dust sticking and blocking can be avoided successfully.



由于磨机运行时呈正压状态，因此在中空轴处的固定件和旋转件之间有一个特殊的密封连接件，以防止煤粉泄露到外界空气中。密封连接件是由一个合成材料制成的密封垫和表面光洁的圆环组成。用密封风机提供的压力高于磨内的压力，密封风作用在环形密封垫上，使密封垫始终紧贴于金属环的光滑表面，防止磨内煤粉泄露。

Because of positive pressure state during running of the mill, a special sealed joint part is designed between the fixed part and rotary part at the trunnion so as to prevent coal dust from releasing outside. The sealed joint part consists of the seal washer made of synthetic material and smooth circle ring. The pressure supplied by the sealing air fan is higher than that in the mill. When the sealing air is acting on the ring-shaped seal washer board, the washer is forced to stick tightly to smooth surface of the metal ring so as to prevent the coal dust from releasing out of the mill.

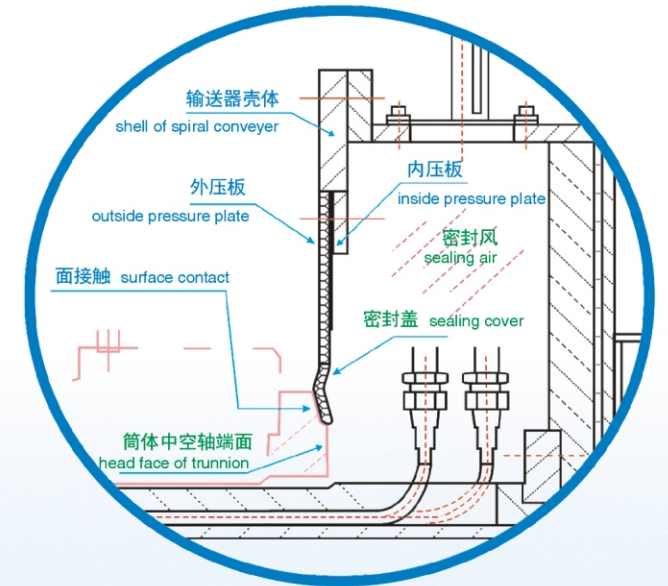
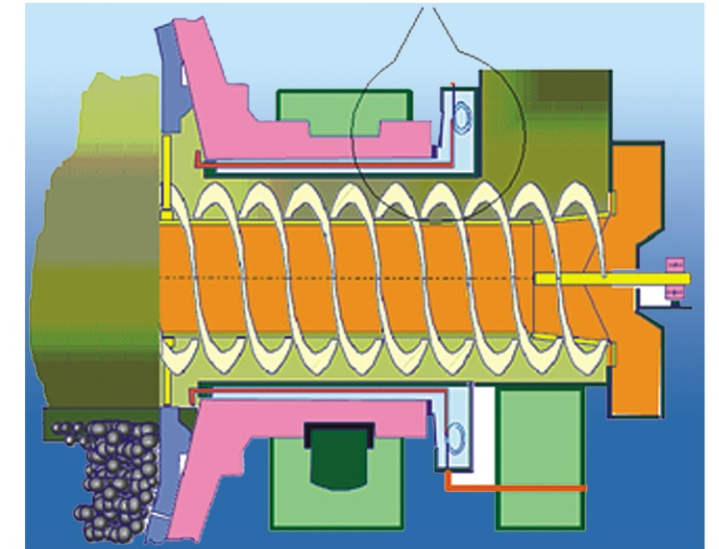
隔音罩 ACOUSTIC ENCLOSURE

隔音罩由金属框架、薄钢板、矿物棉等构成。隔音罩的使用能很有效隔离磨机产生的噪音。

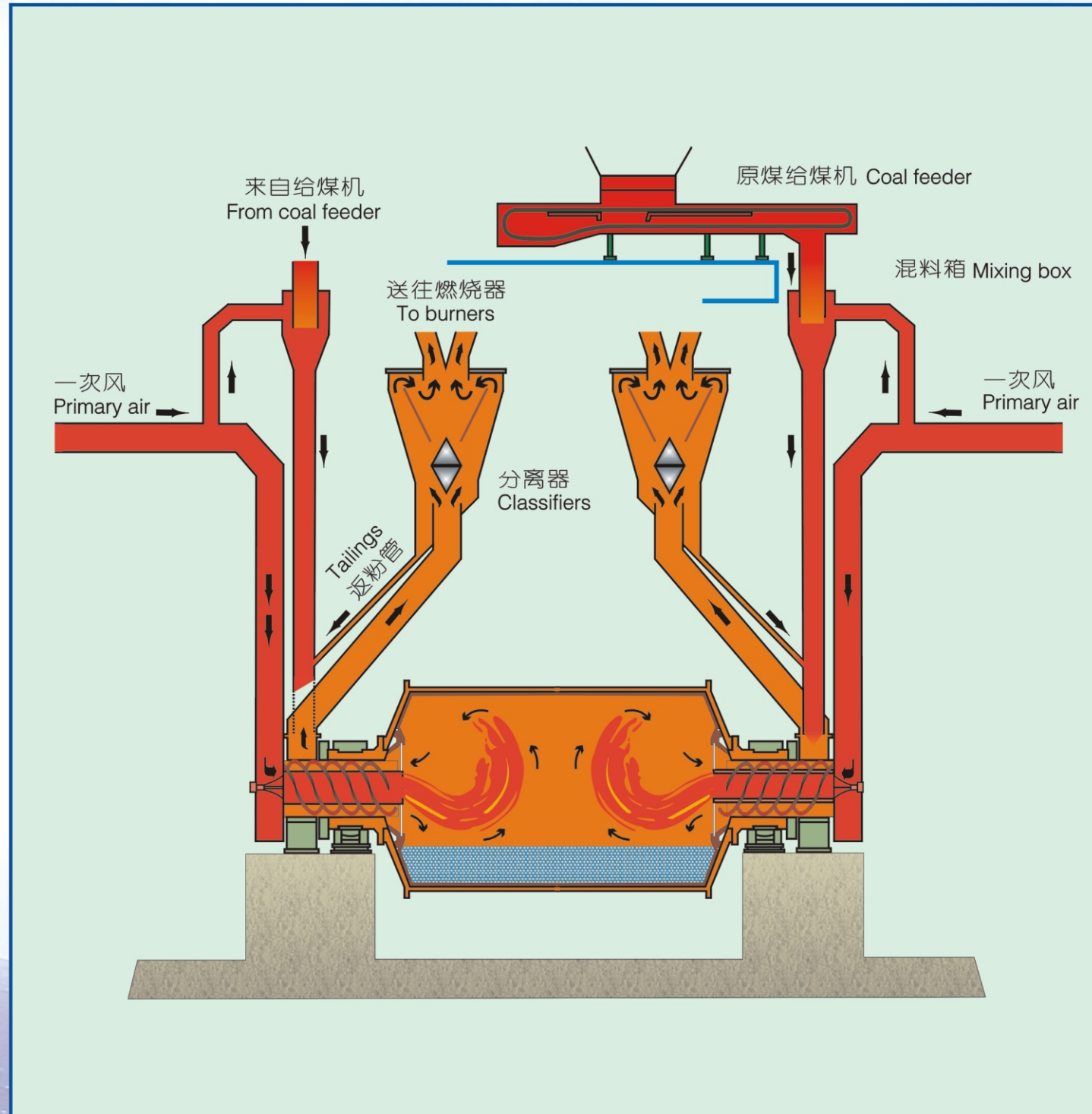
The acoustic enclosure consists of metal frame, steel sheet, mineral wool etc. The acoustic enclosure can be used effectively to insulate the noise produced from the mill.



SEALING SYSTEM 密封系统



5 运行原理 OPERATING PRINCIPLE



原煤通过速度自动控制的给煤机从料斗内卸下。煤落入混煤箱内，经旁路风预烘干后，由螺旋输送器的旋转运动将煤推入到磨机筒体内。然后通过旋转筒体内的钢球运动将煤进行研磨。

热的一次风通过输送机内中心管进入筒体内，把煤干燥后，按原煤进入磨机的相反方向，通过中心管与中空管之间的环形通道把煤粉带出磨机筒体，与旁路风混合后进入分离器。

分离器内装有调节挡板，可根据煤粉细度要求调节挡板开度。粗颗粒的煤粉撞击挡板后靠重力的作用回落至磨机筒体内，与原煤混合在一起重新进行研磨。合格的煤粉悬浮在一次风中，从分离器出口输送至燃烧器，然后喷进锅炉内进行燃烧。

磨机的研磨介质是钢球，通过钢球与原煤撞击和摩擦完成研磨。根据原煤的腐蚀性 and 衬板的使用寿命要求，可选用不同材质的衬板和钢球。磨机可实现不停机加球，磨机的维修费用低，连续作业率高。

双进双出钢球磨煤机比其它类磨煤机更能够适应高硬度和腐蚀性强的煤种研磨。

双进双出钢球磨煤机的独特之处是有两个对称而彼此独立的回路。操作时可使用一个或两个回路。

与其他磨煤机控制方式不同，双进双出钢球磨煤机的出力不是靠调整给煤机来控制，而是通过调节通过磨机的一次风量来控制的。

不管磨机的负荷如何，筒体内风煤比始终相对稳定。在给定负荷的情况下，如想增加磨机出口的煤粉流量，只需加大一次风阀门开度，一次风的流量和带出的煤粉量就会同时增加。这是双进双出钢球磨煤机独有的特点，因而该磨机的响应时间非常短，可迅速响应锅炉的负荷变化。

MGS双进双出钢球磨煤机系统的独特之处是把使用旁路风的两个优点结合起来：

- 自动控制始终优化选择旁路风，使煤粉预干燥风量保持在需要值。
- 旁路风具有预干燥的作用，在混煤箱内与原煤混合进行预干燥，然后与筒体内出来的煤粉一起进入分离器。煤越湿，这一优点越突出。

双进双出钢球磨煤机的风煤比低于立式磨，煤粉在一次风中浓度高，锅炉在燃煤情况下允许的最小负荷较低，低负荷时，可减少维持负荷的燃油或天然气用量。

为使磨机正常运行，无论出力如何，必须使磨机内的煤量保持稳定。磨机内的煤量主要通过煤位压差装置来测量。压差是磨机内部煤位的反映（磨机内煤越多，压差越大）。噪音测量装置（电耳）也作为煤位的辅助测量手段（磨机内的煤越多，发出的噪音越小）。

通常在运行中的磨机内的煤量约占研磨介质的15%，相当于在额定负荷下1/4小时的出力。该性能与用一次风量负荷调节的原理相结合，是双进双出钢球磨煤机反应时间短的原因。



控制方法

CONTROL MODE

The raw coal unloaded from the bunker through the coal feeder equipped with automatic speed control drops into coal mixer. After pre-drying by by-pass air, the coal is pushed into mill tube by a spiral conveyer and then it is pulverized by means of moving balls in the rotating tube.

Hot primary air flows into the mill tube through the center pipe in the conveyer, and then in a reversed direction, it flows out of the mill bringing the dried coal dust along the top half annular channel between the center pipe and hollow pipe. The coal dust mixed together with primary air and by-pass air from coal mixer comes into the classifier.

Adjustable baffle plate is equipped in the classifier and the opening of baffle plate can be adjusted based on the requirement of coal dust fineness. Coarse particle of coal dust falls back into the mill tube after bumping against the baffle plate by means of gravity for pulverizing again together with raw coal. The qualified coal dust suspending in the primary air will be sent to the burner from the outlet of classifier and then be sprayed into the boiler for burning.

The medium of coal mill is steel ball. According to abrasion of original coal and the lifetime of liners, we can choose different materials which are use for liners and steel balls. The steel balls can be supplemented without stopping the machine. Thus it not only makes low cost of mill maintenance, but also its successive working efficiency can be raised.

Obviously, pulverizing the coal types with high hardness and abrasiveness should be the advantage of MGS ball mill by comparison with other mill types.

The unique feature of MGS ball mill is the mode of two symmetrical and mutually independent loops.

The output of MGS ball mill is controlled by means of regulating the primary air passing through the mill, which is different from other control modes depending on regulating the coal feeder. No matter how much load of ball mill, the ratio between air and coal is always kept stable disregarding the mill load. That is to say,

under the specified load, if it is intended to increase coal dust flow at the outlet of coal mill, as long as the opening of valve for primary air is enlarged, the air flow and attached coal dust flow can be increased simultaneously, which is the unique feature of MGS ball mill. Because the time for mill response is very short, thus it is possible to make the load of boiler change quickly.

The unique feature of MGS ball mill is to combine two advantages of by-pass air;

- Automatic control system always optimize and select by-pass air so as to make the pre-drying air flow for coal dust keep at the require value;
- By-pass air possesses the function of pre-drying and thoroughly drying the coal. The by-pass air enters the coal mixer together with raw coal. Then pre-dried mixture together with thoroughly dried coal dust from the mill flows into classifier. The wetter the coal is, the more prominent this advantage will be.

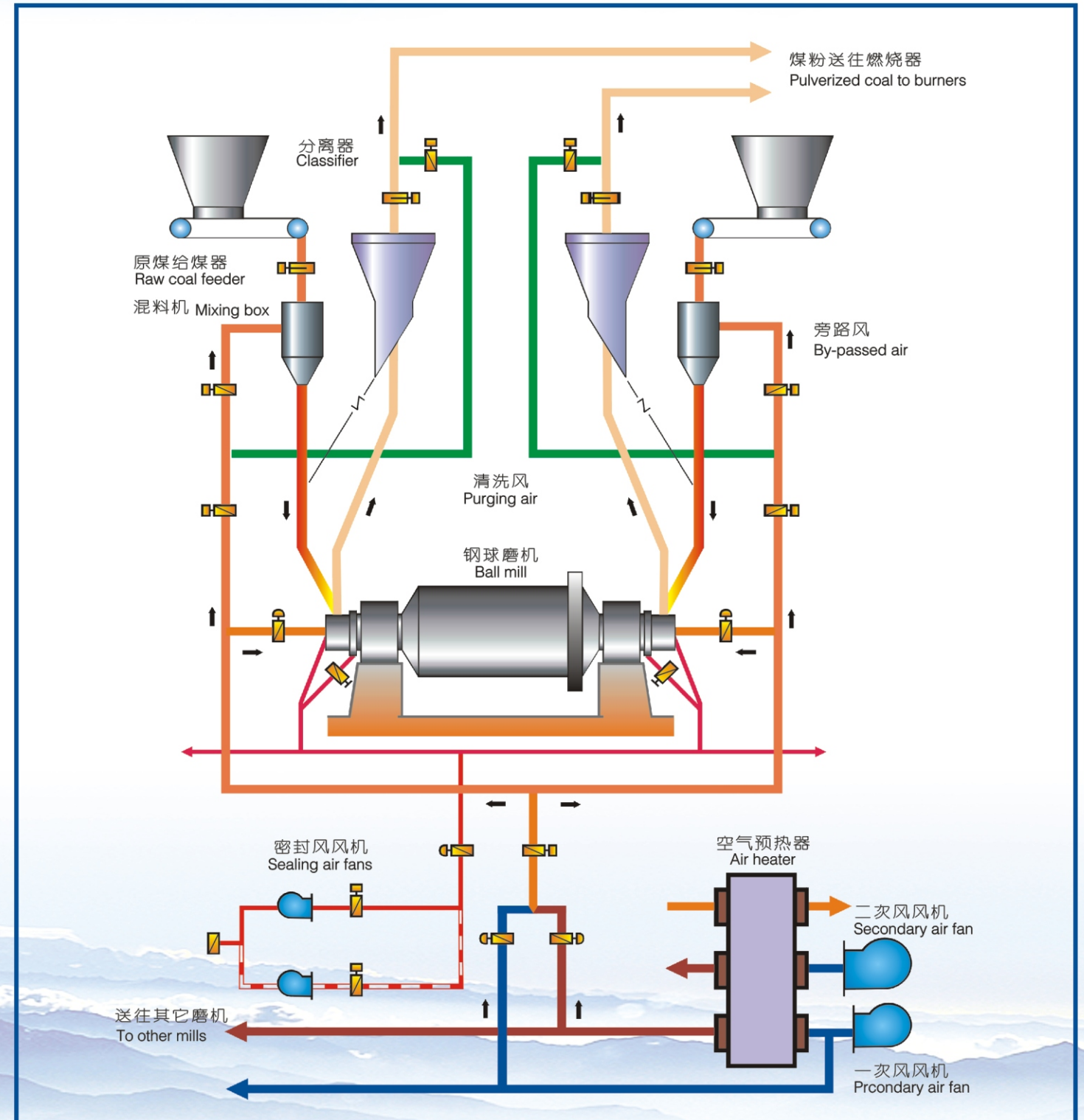
The ratio between air and coal of double inlet and double outlet ball mill is lower than vertical mill. The coal dust in the primary air get high density and the boiler allowed a lower load under the condition of burning coal. The low load can reduce the cost of oil or natural gas for sustaining the load.

In order to make MGS ball mill work properly, the coal quantity in the mill must be kept stable disregarding its output. The coal quantity inside the mill can be measured by a kind of device for pressure difference and coal level is equipped on the mill. The coal quantity in the mill is reflected by pressure(the more coal inside the mill, the bigger the pressure difference). The coal quantity inside the mill also can be measured by means of noise control (The more the coal, the lower the noise).

Generally, during the operation, the coal quantity inside the mill is nearly equals to 15% of pulverizing medium and working amount of 1/4h under the rate load. The combination of this performance and the principle of load adjust by primary air is just the cause for quick response of MGS ball mill.

为了保证双进双出钢球磨煤机的正常运行，整个系统设有五个控制环路。具体表述如下：

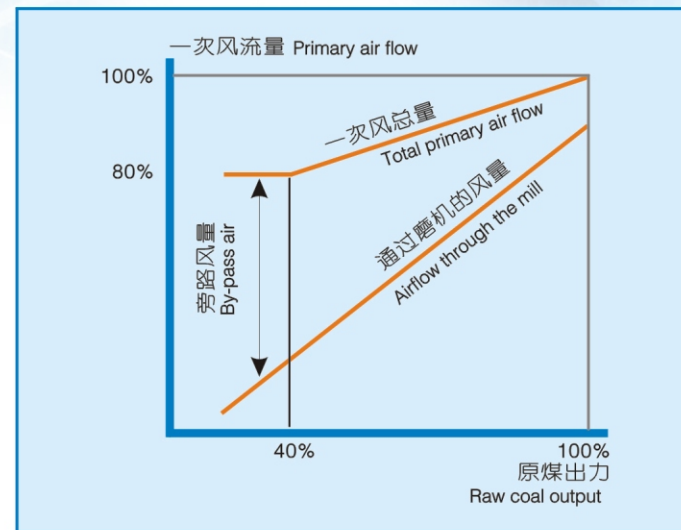
In order to keep normal operation of MGS ball mill, the whole control system consists of five controlling loops as follows:



负荷控制 LOAD CONTROL

与其他类型的磨机不同，双进双出钢球磨煤机的出力不是靠调节给煤机的运行速度，而是调节进入磨机的一次风量。无论锅炉的负荷怎样变化，磨机内部的风煤比始终保持恒定。因此，只需通过改变位于磨机一次风系统的挡板位置，调节磨机入口的一次风量，就可以随心所欲地调节煤粉的流量。

It's different from the other mill types, the output control of MGS ball mill is realized by means of regulating the primary air coming into the mill instead of the control mode through adjusting the running speed of coal feeder. The ratio between air and coal inside the mill is always kept constant disregarding the load of boiler. Thus the coal dust flow can be controlled easily as long as the position of stop plate located at the primary air system of the mill can be changed and the primary air flow at the inlet of the mill can be adjusted.



煤位控制 CONTROL OF COAL LEVEL

磨煤机的出力是由一次风量决定的，与给煤速度无直接关系。给煤机的速度，即进入磨机的给煤量是根据磨机中的煤位进行控制的。磨机内必须保持一定数量的煤以取得最佳的研磨效果，为此必须不断地对磨机内的煤位进行测量。

双进双出的煤位控制装置有两种，可以按用户要求提供，它们之间相互独立。一种为压差煤位测量装置，另一种为电耳煤位测量装置。实际应用中以压差测量为主，电耳为辅。

两种煤位测量装置适用工况有所不同，压差装置只有在磨机筒体内煤量达到正常工作状态下才能正常工作。噪音测量装置适用于磨机内煤位从零负荷至满负荷的全过程。



The capacity of mill is decided by primary air, and it is no direct relationship with the speed of coal feeder. The coal feeding quantity coming into the mill is controlled base on the coal level in the mill. A certain quantity of coal must be kept in the mill so as to reach its optimum pulverizing effect. For this purpose, the coal level inside the mill must be measured all the time.

Coal level control of MGS ball mill consists of two independent portions of which one portion is a measuring device for differential pressure of coal level and the other one is electric ear, it can be provide by consumer's request. In the practical application, device for differential pressure is the main measure, while electric ear secondary.

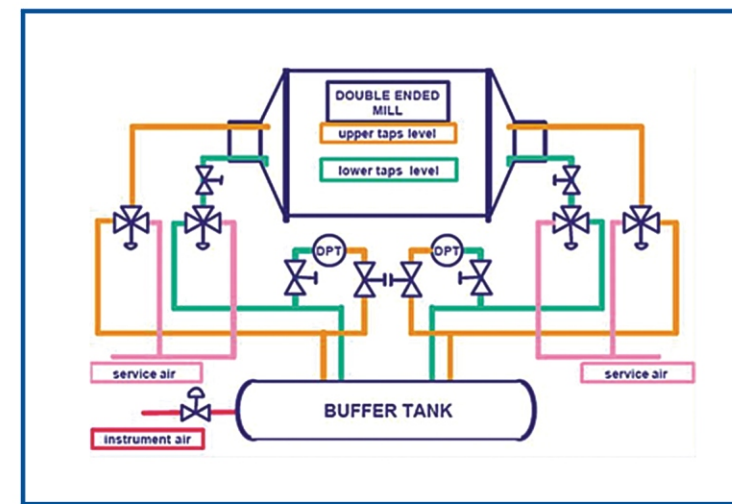
The two measuring modes are suitable for different working conditions. The pressure difference device can work properly only if the coal quantity inside the mill has reached normal working state. The noise measuring device is suitable for working in the whole process e.g. coal level from zero load to full load.

压差煤位测量装置

DIFFERENTIAL PRESSURE COAL LEVEL MONITORING DEVICE

磨机上配有压差煤位测量装置，并随时测试与煤位有关的压差值。当煤位下降时，给煤机的调速器就会收到信号，提高给煤机的运行速度。反之即降低给煤机速度。

压差测量由气罐、阀组、管路及仪表等组成。压差装置由两个环路构成，一个是测量环路，另一个是吹扫环路。



The differential pressure coal level monitoring device is equipped on the mill and pressure difference values concerning coal level can be gained at any time. When the coal level reduces, the speed regulator of coal feeder can immediately receive the signal. So the running speed of coal feeder can be raised and whereas the speed can be reduced.

The pressure difference device consists of gas tank, valves, piping and instrumentation etc. It is equipped with two loops of which one is for measuring, the other is for purging.



电耳煤位测量装置

ELECTRIC EAR COAL LEVEL MONITORING DEVICE

煤位控制系统内，除压差测量之外，还有磨机噪音测量装置(电耳)加以补充，磨机里的煤越多，它发出的噪音也就越沉闷。

麦克风置于回转筒体附近，通常2只麦克风在筒体的长度方向均布。麦克风接收磨机内噪音的压力信号，通过一次仪表装置将噪音分析、过滤、产生真实的反映磨煤位地噪音曲线，然后将噪音曲线转换为煤位信号。

In the control system of coal level, besides the differential pressure coal level monitoring device, the electric ear coal level monitoring device is equipped and served as supplement. The more the coal in the mill is, the lower the noise from the mill will be.

Microphones are arranged close to the rotating mill tube. Usually two microphones are equally spaced along the direction of tube axis. After the signal for noise pressure in the mill is received by microphones, noise analysis and filtration are executed. Then the noise curve reflecting exact coal level in the mill is produced. Finally, the noise curve is converted to the signal for coal level.



磨机总风量控制

CONTROL OF TOTAL AIRFLOW

进入混煤箱的旁路风，负责在任何煤粉流量的情况下，保持在煤粉管道中拥有足够的输送煤粉的风速。为此，风量控制系统专门设计了一个调节单元，以保证获得最低的风流量，并且还负责在煤粉干燥达不到要求时，增加旁路风流量。

The by-pass air coming into the coal mixer can keep enough air speed for transferring coal dust in the pipe under any condition of coal dust flow. Thus an adjustment unit is specially designed for airflow control system so as to ensure the lowest airflow. Besides, when the coal dust can not meet the requirement for drying, by-pass airflow can be increased through the adjustment unit.

磨机出口温度控制

TEMPERATURE CONTROL AT MILL OUTLET

磨机出口的风/煤温度应保持在尽可能高的温度值上，以使研磨过程正常进行。温度的调节，是通过按不同比例混合一次风的冷风和热风实现。调节系统直接作用于冷风挡板，而热风挡板的开启度，已按要求设置了，即在任意调节冷风挡板的开启度时，热风量应当在总风量 30% 与 80% 的范围内。

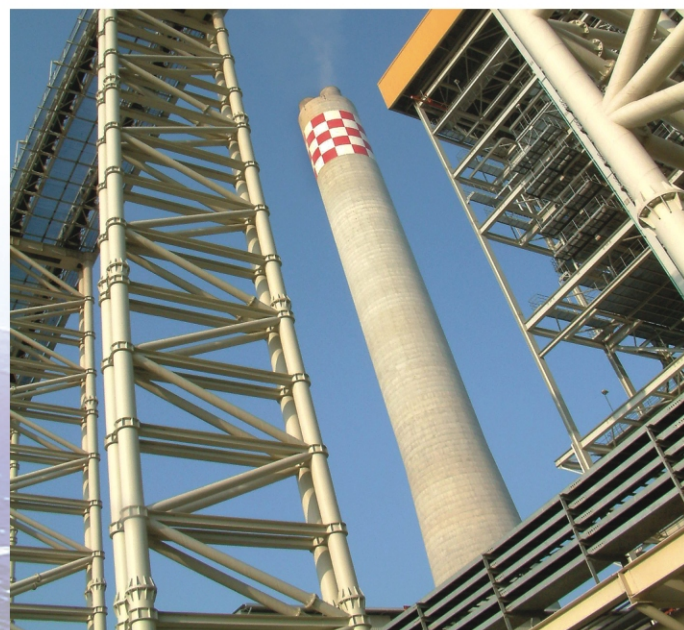
The temperature of air/coal at mill outlet should be kept at the max value as far as possible to make the pulverizing process execute properly. The temperature regulation is realized by means of mixing the primary air(cold air and hot air) based on different proportions. The regulation system acts directly on the cold air baffle plate and the opening of hot air baffle plate has already been set. In this case, whatever the opening of cold air baffle plate is adjusted, the hot airflow can be always kept within the scopes of 30% and 80% (total airflow).

一次风压力控制

CONTROL OF PRIMARY AIR PRESSURE

磨机在一定负荷下，一次风压力必须维持在所需范围内才能保证煤粉输出磨机，为此，专门设有一个压力控制系统，该系统最终通过调节风机叶片开启度达到一次风压力维持在一定范围内。

When the mill is under a certain load, the primary air pressure must be maintained within the required scope so as to ensure the coal dust to be sent out of the mill. For this purpose, a special pressure control system is equipped. So finally, the primary air pressure can be maintained within a certain scope through adjusting the opening of blower blade.



MILL MODEL 磨煤机型号

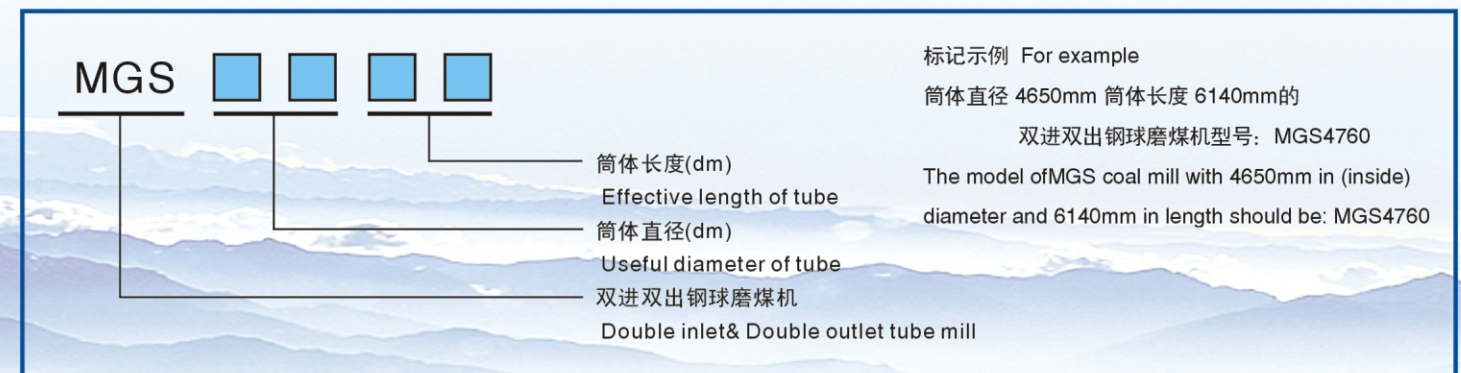
TECHNICAL DATA 技术规格参数

型号	筒体有效直径 (mm)	筒体有效长度 (mm)	最大钢球装载量 (t)	磨机基本出力 (t/h)	主电机功率 (kW)	磨机筒体转速 (r/min)	设备重量 (t)
MGS3448	3350	4940	53.6	35	800	18	158
MGS3854	3750	5540	68	52	1150	17	205
MGS4054	3950	5540	75.7	56	1300	16.6	220
MGS4060	3950	6140	83.9	62	1400	16.6	230
MGS4062	3950	6340	86.6	67	1500	16.6	235
MGS4360	4250	6140	99	75	1800	16	260
MGS4366	4250	6740	108	82	1900	16	272
MGS4760	4650	6140	116	88	2200	15.3	300
MGS4766	4650	6740	128	97	2300	15.3	315
MGS4772	4650	7340	139	105	2500	15.3	330
MGS5066	4950	6740	151.9	115	2900	15	342
MGS5072	4950	7340	165.4	125	3200	15	360
MGS5272	5150	7340	190	143	3700	14.5	416

注.表中的基本出力所对应的煤特性如下:
 煤的哈氏可磨度系数HGI为55;
 煤粉细度为200目筛子的通过率75%;
 煤的收到基水分减去出口煤粉水分≤10%

Note that the table corresponding to the basic output characteristic of the coal is as follows:
 Hardgrovegrindability of coal HGI factor of 55;
 Coal fineness of 200 mesh sieve through rate of 75%;
 Coal as received minus total moisture ≤ 10% final moisture

MODEL SPECIFICATIONS 型号规格说明



煤种适用范围 SCOPE OF COAL

含水分（应用基）8-20%根据煤的特性，在特殊情况下可允许30%	Moisture (Application base) 8-20% Based on coal feature. In particular condition, up to 30% can be permitted.
哈氏可磨度 40-80HGI	Hard grove index 40-80HGI
挥发份（可燃基）≤40%	Volatility (combustible base) ≤40%
灰份（干燥基）≤49%	Ash (Drying base) ≤49%
冲刷磨损指数 ≤7.0	Scour and abrade index ≤7.0
进料粒度 0-30mm	Grain size of feeding 0-30mm
出料粒度 75-90%通过200目筛	Discharge size 75-90% through 200 mesh (TYLER)

传动装置布置方式 LAYOUT OF DRIVING UNIT

磨煤机的传动装置有多种布置方式：从驱动侧面向磨机看可分为左装、右装及内传动和外传动等不同方式，在订货时必须标明传动装置的布置方式。

MGS ball mill has many layout of driving unit: observing from the driver side coal mill can be divided into left-equipment, right-equipment, internal and external drives etc., the arrangement must be indicated when ordering the coal mill.



连续作业率高

High efficiency for Successive operation:

实现了不停机加球。螺旋推进器叶片，筒体衬板的易损件采用优质耐磨材料，使用寿命长，只要锅炉运行不停机，磨机可长期运行。

The wearing parts such as steel balls can be supplemented without stopping the running mill. Normally the spiral propeller vane and the wearing parts of tube liner which adopts excellent wearable material, have a long life span. The mill can be kept running for lone terms as long as the boiler is in proper operational condition.

在宽负荷范围内，响应迅速

Quick response within Wide range of load:

磨机储存量大，加上出力与一次风量成正比，使磨机响应速度非常快。

The response of mill can be very quick because of its large capacity of coal storage and direct ratio between its output and primary air.

维修次数少

low maintenance:

磨机运行期间，无需停机维护。螺旋叶片、筒体衬板的更换可跟随锅炉检修时进行。使磨机的维护费用大大降低。

During the operation, it will not be necessary to stop the machine for maintenance. The replacement of spiral propeller vanes and tube liners can be performed following the overhaul of boiler so as to reduce the maintenance cost greatly.

研磨煤种范广

A broad range of coal types
Suitable for pulverizing:

磨机的研磨机理决定了磨机可适应各种煤质。

The mill can be suitable for various coal types based on its pulverizing mechanism.

风煤比低

Low ratio between Coal and air:

风煤比低是磨机本身结构所决定的。风煤比低使煤粉在一次风中浓度提高，加上低负荷细度增加，这使锅炉在燃煤情况下的最小负荷较低，其结果可减少为维持负荷而燃用昂贵的气或油。

The low ratio between coal and air is due to the mill's construction. The low ratio can make the density of coal dust high in the primary air besides the increment of low load fineness. Thus the boiler can reach lower minimum load under the condition of coal combustion. As a result, gas or oil used for maintaining the load can be reduced.

出力和细度稳定

Stable output and fineness:

出力的调节与一次风量成正比。一次风量不变，出力就是稳定的，再有出力的控制与磨内煤量的控制是相互独立的，不会因出力的增加而影响磨机内的煤量。煤粉细度，通常是磨机的钢球量决定的，只要钢球量不变细度也是稳定的。

It is a direct ratio between the regulation of output and primary air. The output will be stable when the primary air is constant. In addition, the control for output is independent of that for coal quantity inside the mill. The increment of output will not influence the coal quantity in the mill. The fineness of coal dust is usually determined by the ball quantity. The fineness will be stable if the quantity of steel ball doesn't change.

具有研磨坚硬和高磨蚀性燃料的能力

Ability for pulverizing the Fuel with high hardness and Abrasiveness:

研磨过程中，受磨损的是衬板和钢球。衬板一般寿命也很长，并且针对煤种的特性可选用相应材质来提高抗磨损性能。

During the process of pulverizing, the liners and steel balls are subjected to the wear-out. Generally, the life span of liner is very long. Besides, corresponding material can also be chosen according to the feature of coal type so as to improve their wear-resistance.

不受异物影响

No influence from foreign Matter:

双进双出钢球磨煤机对“三块”（铁块、木块、石块）适应能力很强，只要尺寸不过大，充其量将“三块”当作研磨介质在磨内一起参与粉磨，不会影响磨机运行。

The MGS ball mill is quite applicable for “three blocks” i.e. iron block, wood block and stone block. If the block size is not too large, the “three blocks” can be pulverized in the mill as grinding medium without influencing the operation of mill.

储存能力大

large capacity of storage:

通常煤量是钢球装载量的15%，相当于磨机额定负荷下1/4小时的工作量，短时间不给煤或单侧给煤不会影响磨机出力。特别是磨机从低负荷到高负荷响应速度非常快，响应时间为15秒内。

As a rule, coal quantity should be 15% of charging capacity of steel ball, which equals to working capacity for 1/4h when the mill is under the rated load. The output of mill will not be affected if no coal feeding or coal feeding from single side for short time. Especially the response speed will be very quick when the mill changes from low load to high one. Its response time is within 15 seconds.

低负荷时细度增加

Improvement on fineness During low load:

低负荷时，煤在磨内停留时间长，细度就增加了。对锅炉燃烧非常有利，特别是低负荷下维持火焰的稳定性更好。

During low load, coal can stay in the mill for long time and its fineness can be improved. Thus it will be favorable for combustion in the boiler. Especially the stability of sustaining the fire will be better under the low load.

灵活性大

High flexibility:

双进双出钢球磨煤机根据负荷要求，可实现双进双出，单进双出，或半磨运行三种工况。这在实际应用中给用户带来更大的方便。

Three operational modes such as double inlet & double outlet, single inlet & single outlet or half mill in operation, can be realized according to the load requirement of BBD ball mill. Therefore, it offers more convenience for users in practical application.

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。该团队在钢球磨煤机领域有三十多年的设计开发经验，设计开发领域囊括电站、水泥、矿山用各类型钢球磨煤机。上重设计所经过近十五年努力，通过对国外技术的消化和自主研发，使上重公司拥有了自 MGS 3448 到 MGS5272共7个系列13种规格的双进双出磨煤机选型、参数计算、图纸设计、制造质量控制、安装与运行的全套技术，在国内、外处于领先地位。可满足150MW至1000MW发电机组的配置需求。同时上重公司根据市场需求，成功研发出了磨机配套的各种规格动态分离器、轴向分离器等技术，以满足不同客户需要。目前上重公司已完全掌握了该种磨煤机选型计算、设计、制造、安装、运行全套技术，拥有一支成熟的技术团队。

SHMP possesses a state-level technical centre and owns a top-notch national design and development team. Within more than thirty years of design experience at ball coal mill area, our centre has designed and developed a lot of ball mills used in power plants, cements and ores. After making 15years'effort on absorbing foreign technology and independence researching and developing .SHMP possesses 7 series double in-let and double out-let ball mills, band from MGS3448 to MGS5272 and totally 13 types. We are at NO.1 position in the home and outside with the technology of type selection, parameters calculation, drawing design, quality control, installation and operation. Our product can satisfy the assemble demands brands from 150MW to 1000MW fire power plants. In order to meet various demands of customer, SHMP has researched and developed many kinds of dynamic classifiers and axial classifiers. At present, SHMP owns a good team for design, manufacture, installation, operation and adjustment.

FUNCTION SYSTEM 职能体系

质量保证 QUALITY ASSURANCE

上重公司设有专门的质量保证部，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.



加工制造

MANUFACTURE

上重公司拥有120 MN 锻造水压机、165 MN 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 台各类研磨设备，制造工艺成熟可靠。

SHMP owns many top-ranking manufacture equipments such as 120MN 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 pulverizer. The manufacturing process of coal mill is mature and reliable.



售后服务 AFTER-SALE SERVICE

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MGS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 "customer first", sets up an independent customer service department which owns a group of highly experienced field engineers to provide strong after-sale support for MGS coal mills. SHMP promises that we will reply within 24 hours after receiving the customer reflect problems.

