## 公司承诺
## THE COMPANY PROMISED

1.为客户免费培训技术人员

2.根据购货合同，我公司可派工程技术人员指导安装调试

3.公司长年供应机器易损件

4.收集客户反馈意见，及时制定实施方案，解决客户实际问题

5.我公司生产的机器按国家标准实行三包

1. Training technicians for customers free of charge.

2. According to the purchase contract, our company can send engineers and technicians to guide the installation and debugging.

3. The company supplies wearing parts for machines all the year round.

4. Collect feedback from customers, formulate implementation plans in time, and solve practical problems of customers.

The machines produced by our company carry out three guarantees according to the national standard.


**马鞍山市联冠机械制造有限公司**

Ma' anshan lianguan machinery manufacturing co., ltd.

电话：0555-6767508

传真：0555-6770181

邮箱：maslgjx@126.com

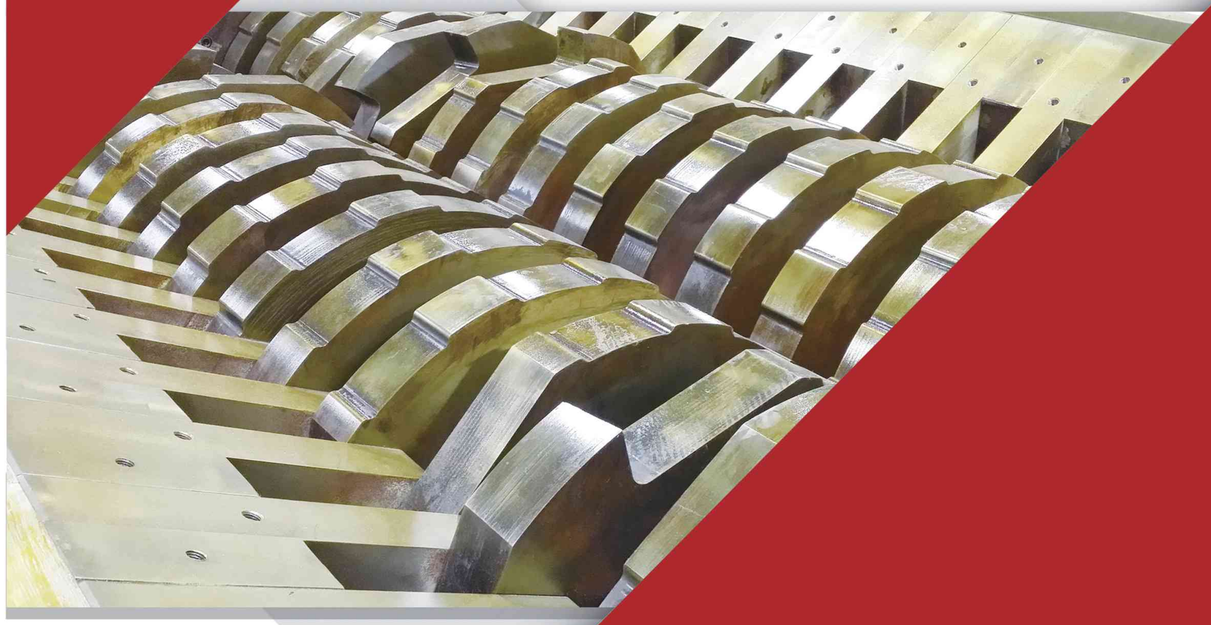
网址：www.ahsisuiji.com

地址：安徽省马鞍山市博望区博望镇鸭绿江东路206号


anbecrown

冠合®

# 固废破碎技术流



为资源再生行业

提供更优质的机械设备

**马鞍山市联冠机械制造有限公司**

Ma' anshan lianguan machinery manufacturing co., ltd.

# 公司简介
## COMPANY PROFILE

马鞍山市联冠机械制造有限公司创立于2015年，是一家专注于高端固废破碎装备研发与智能制造的大重型撕碎机生产技术型企业。公司总部坐落于中国先进制造业重镇——安徽省马鞍山市，是马鞍山撕碎机行业规模头部企业，源头实力工厂，依托长三角区域完善的产业链与技术创新生态，采用德国技术工艺，致力于为全球资源再生、环保处置及循环经济领域提供专业化、系统化的破碎解决方案。

作为撕碎技术领域的先行者，联冠机械深耕单轴、双轴及四轴撕碎机核心技术，以中大型撕碎机破碎生产线为主。产品矩阵涵盖重型工业固废破碎生产线系统、大件垃圾撕碎机破碎生产线、生物质秸秆撕碎机破碎生产线、金属剪切撕碎机破碎生产线，以及针对金属、木材、橡胶、塑料、一般性工业固废等物料的专业化处理机型。广泛的应用在RDF 和SRF工业固废行业、废旧金属回收行业、塑料加工回收行业、废旧轮胎回收行业、木材木料回收行业、电子垃圾回收行业、工业垃圾回收行业、生活垃圾处理行业、餐厨垃圾处理行业、有机垃圾处理行业，撕碎机扭矩大、噪音低、产量高等特点已经广受用户认可。

马鞍山市联冠机械制造有限公司所用的撕碎机刀具，选用进口和国内高性能特种钢，如harddX500、D2、DC53、H13、Cr12MoV、60Si2CrV（M6V）等，我公司拥有自己的刀具生产车间，以确保撕碎机上更关键的刀具质量。公司同步开发适配各类工况的高性能撕碎机刀片，采用超耐磨合金材料使用欧洲激光熔覆增材强化工艺，显著提升刀具耐磨性、抗冲击性与服役寿命，让撕碎机刀片满足严苛工业场景下的连续作业需求。

### 马鞍山市联冠破碎机、撕碎机技术优势：

★破碎撕碎设备所用刀具为自产自销
★设备工艺采用欧洲技术，超耐磨激光熔覆工艺刀片
★具备多年破碎撕碎设备生产经验
★为客户提供一站式解决方案
★根据客户需求提供定制服务
马鞍山市联冠机械为资源再生行业提供更优质的机械设备

### Technical Advantages of Ma 'anshan United Crown Crusher and Shredder:

★Cutting tools used in crushing and shredding equipment are self-produced
★ The equipment and technology adopt European technology，equipped with ultra-wear-resistant laser cladding blades.
★ Having many years of production experience in crushing and shredding equipment
★ Provide customers with one-stop solutions
★ Provide customized services according to customer requirements
Ma 'anshan lianguan machinery provides better mechanical equipment for the resource recycling industry.

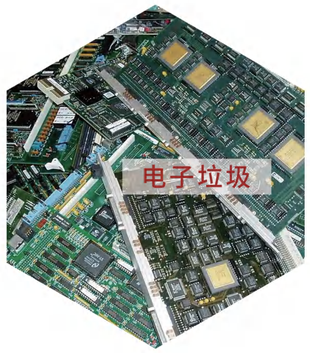
Ma'anshan Lianguan Machinery Manufacturing Co., Ltd., founded in 2015, is a technology-driven manufacturer specializing in the R&D and intelligent manufacturing of heavy-duty solid waste shredding equipment. Located in Ma'anshan, Anhui, China, we provide professional and systematic shredding solutions for global resource recycling and the circular economy.Leveraging the well-established industrial supply chain of the Yangtze River Delta, we integrate advanced European and German engineering concepts into our equipment design and manufacturing. Our product portfolio covers single-shaft, double-shaft and four-shaft shredders, as well as medium- and large-scale shredding systems and complete processing lines.

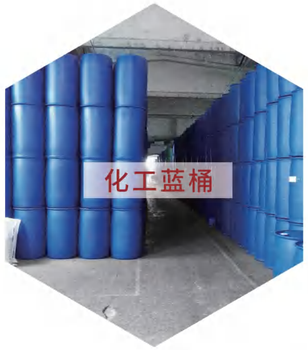
Our shredding equipment is designed to process a wide range of materials, including metal, wood, rubber, plastic and various types of solid waste. Our solutions are widely applied in RDF/SRF production, scrap metal recycling, plastic recycling, waste tire recycling, e-waste processing, municipal solid waste and kitchen waste treatment.

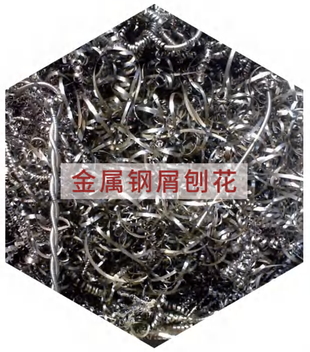
With features such as high torque, reliable performance, low noise and high processing capacity, our shredders are engineered for demanding industrial applications and continuous operation.A key strength of Lianguan is our in-house cutter and blade manufacturing capability. We produce shredder blades using high-performance tool and wear-resistant steels, including Hardox 500, D2, DC53, H13, Cr12MoV and 60Si2CrV(M6V), depending on the application and material being processed.Our blades are manufactured through professional machining and heat-treatment processes and can be further strengthened using European laser cladding technology. This enhances wear resistance, impact resistance and service life, helping our customers maintain stable shredding performance under demanding operating conditions.

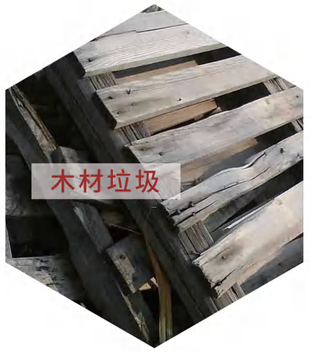
From shredder design and manufacturing to blade production and complete shredding solutions, Lianguan is committed to delivering reliable, efficient and application-specific equipment for customers worldwide.

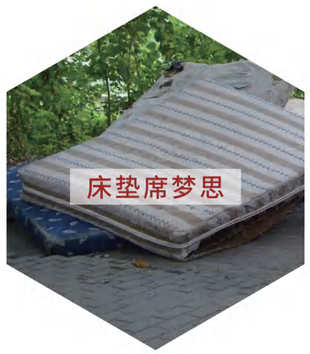
# 应用领域非常广泛
## THE APPLICATION FIELD IS VERY WIDE

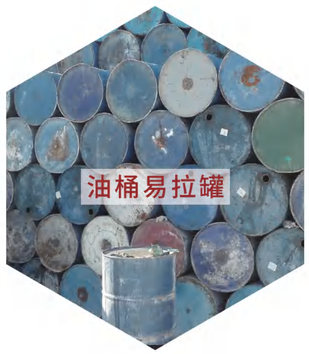


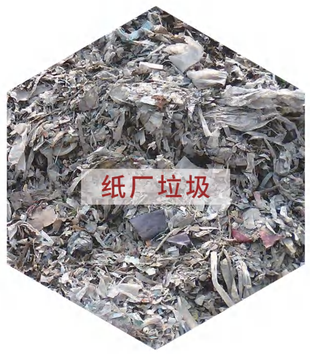










# 撕碎机刀片/粉碎机刀片
# SHREDDER BLADE/SHREDDER BLADE

## 1.选材

联冠机械精选国产和进口优质钢材，原材料采用HARDDX、DILLIDUR、D2、SKD11、DC53、HMB、H13、CR12MOV、6CRW2SI、9CRSI等优质特钢，好的钢材是做好刀具的基础。

## 2.锻造

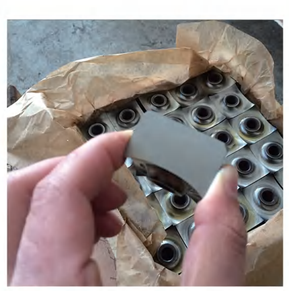
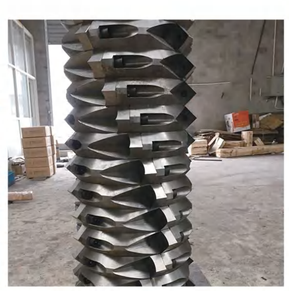
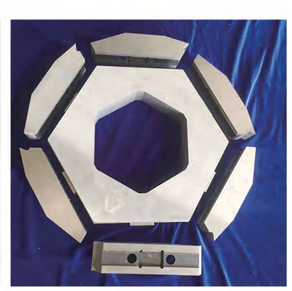
好的钢材离不开锻造工艺，原材料高温加热后，经过锻造锤反复锻造可使材料密度更高，质密性更佳，千锤百炼，才能得到优质的工件胚料。

## 1. Material selection

United crown machinery selects domestic and imported high-quality steel products. the raw materials are harddX400/500, D2, SKD11, DC53, HMB, H13, Cr12MoV, 6CrW2Si, 9CrSi and other high-quality special steel products. good steel products are the basis for cutting tools.

## 2. Forging

Good steel cannot be separated from forging process. After the raw materials are heated at high temperature, the forging hammer repeatedly forges the raw materials to make the materials have higher density and better quality. Only after a thousand hammers can the high-quality workpiece blank be obtained.

## 3.精加工

采用各种CNC精加工设备确保精度，提高工作效率。加工质量稳定，质量高，重复精度高，更大程度保证刀片的质量规格重复高精度。

## 4.热处理

热处理选用大直径真空炉，热处理均匀、硬度精准、性能稳定。先进的热处理工艺能将加工件材质性能调到最佳的状态，是加工工艺的灵魂。

## 5.精磨

采用高精度磨床精磨，让刀具的平行度更好，精度更高，工人装配更方便，成批量生产也能保证尺寸的一致性。

## 3. Finishing

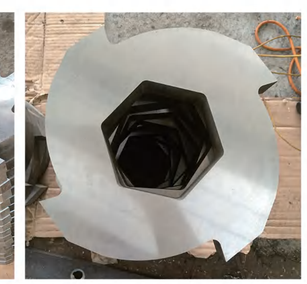
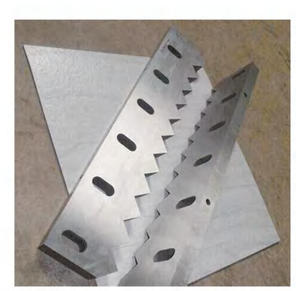
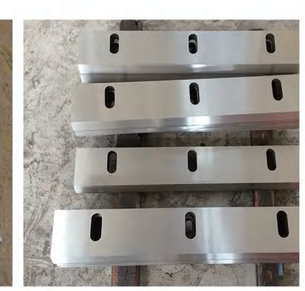
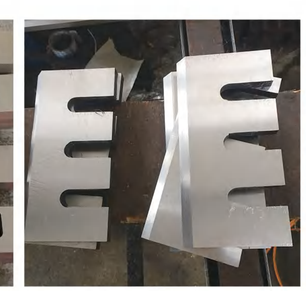
All kinds of CNC finishing equipment are adopted to ensure accuracy and improve work efficiency. The machining quality is stable, the quality is high, and the repeatability precision is high, thus ensuring the repeatability and high precision of the quality specification of the blade to a greater extent.

## 4. Heat treatment

Large diameter vacuum furnace is selected for heat treatment, which is uniform in heat treatment, accurate in hardness and stable in performance. Advanced heat treatment technology is the soul of the processing technology, which can adjust the material properties of the processed parts to the best state.

## 5. Fine grinding

High-precision grinding machine is adopted for fine grinding, so that the parallelism of the cutter is better, the precision is higher, the assembly of workers is more convenient, and the size consistency can be ensured in batch production.

# 撕碎机参数
# SHREDDER PARAMETERS

| 型号 Model | 刀具规格 Tool specification | 功率(kw) Power (kw) | 转速(r/min) Speed (r/min) | 刀具数量 Numberof tools | 产量(kg/h) Output (kg/h) | 破碎室尺寸(mm) Sizeof crushing chanber(mm) |
|---|---|---|---|---|---|---|
| GH300型 | Φ180*12 | 3 | 15–30 | 24 | 100–400 | 300*320 |
| GH400型 | Φ180*12 | 5.5 | | 32 | 200–600 | 400*320 |
| GH500型 | Φ200*20 | 7.5 | | 24 | 300–800 | 500*370 |
| GH600型 | Φ220*20 | 11*2 | 10–20 | 30 | 500–1000 | 600*440 |
| | Φ250*30 | 15*2 | | 20 | | 600*500 |
| | Φ300*30 | 18.5*2 | | 20 | | 600*600 |
| GH800型 | Φ300*30 | 22*2 | 10–20 | 26 | 600–1500 | 800*600 |
| | Φ350*40 | 37*2 | | 20 | | 800*700 |
| | Φ400*40 | 45*2 | | 20 | | 800*800 |
| GH1000型 | Φ350*50 | 37*2 | 8–15 | 20 | 1000–2000 | 1000*700 |
| | Φ400*50 | 45*2 | | 20 | | 1000*800 |
| | Φ450*50 | 55*2 | | 20 | | 1000*900 |
| GH1200型 | Φ400*50 | 45*2 | 8–15 | 24 | 2000–4000 | 1200*800 |
| | Φ450*60 | 55*2 | | 20 | | 1200*900 |
| | Φ500*60 | 75*2 | | 20 | | 1200*1000 |
| GH1600型 | Φ550*70 | 75*2 | 8–15 | 22 | 4000–8000 | 1600*1100 |
| | Φ600*80 | 90*2 | | 20 | | 1600*1200 |
| | Φ650*100 | 132*2 | | 16 | | 1600*1300 |
| GH2000型 | Φ700*80 | 160*2 | 8–15 | 24 | 8000–20000 | 2000*1400 |
| | Φ750*100 | 220*2 | | 20 | | 2000*1500 |
| | Φ800*100 | 280*2 | | 20 | | 2000*1600 |

我公司提供K系列、ZSY系列、FK系列、行星系列减速机供客户选择。
Our company provides K series, ZSY series, FK series, planetary series reducer for customers to choose.

## 双轴撕碎机性能特点：

⊙双刀轴式结构，使用多片多爪式刀具，并与刀轴配合多角度变化，切削时省力，切削力强，展现强劲的破碎能力。

⊙马达经过齿轮箱传动系统做传动结构，使其成为低速高扭力之强力运转，达到破碎效果。

⊙大型传动轮，采用特殊钢材制成，经热处理硬化，使用寿命长。

⊙齿轮箱采用进油式滑轮，运转顺畅，低噪音，扭力大，耐长时间运转作业。

⊙低转速及高扭力之设计，提供较低噪音及较少扬尘量，提高良好的工作环境。

## Performance characteristics of biaxial shredder:

⊙ Double-cutter shaft structure, using multiple multi-jaw cutters and cooperating with cutter shaft for multi-angle changes, saves labor in cutting, has strong cutting power and shows strong crushing ability.

⊙ The motor is driven by the gear box transmission system, making it a powerful operation with low speed and high torque to achieve crushing effect.

⊙ Large transmission wheel is made of special steel and hardened by heat treatment, with long service life.

⊙ Gearbox adopts oil inlet pulley, which is smooth in operation, low in noise, high in torque and resistant to long-term operation.

⊙The design of low rotating speed and high torque provides lower noise and less dust emission, improving a good working environment.

## 注：

1.以上规格参数仅供参考，如有更改恕不另行通知。

2.破碎产量受物料种类和出料尺寸要求影响。

3.撕碎机没有标准型号，可根据客户要求定制。

## NOTE:

1. The above specifications and parameters are for reference only and are subject to change without prior notice.
2. The crushing yield is affected by the material type and discharge size requirements.
3. Shredder has no standard model and can be customized according to customer requirements.

# 大件垃圾/工业固废破碎系统生产线

## BULKY WASTE/INDUSTRIAL SOLID WASTE CRUSHING SYSTEM PRODUCTION LINE

马鞍山市联冠机械制造有限公司采用“破碎+分选+资源化”处理工艺，先将来料中尺寸超过有效破碎仓的超大件和工业固废进行拆解，然后通过重型链板输送机或装载机将大件垃圾输送至破碎仓，双轴剪切式破碎机将各种混合固体废弃物破碎成较小粒度。特别是产品的安全性、稳定性、气密性、维护便利性、操作人性化、刀具强度及耐磨度、破碎机结构进行合理优化设计，破碎的过程中将金属物料与其他物料自动分离，金属物料经除铁器自动卸入缓存装置，其他物料通过封闭式皮带输送机输送至垃圾清运车，整套生产线配备专业降尘系统。

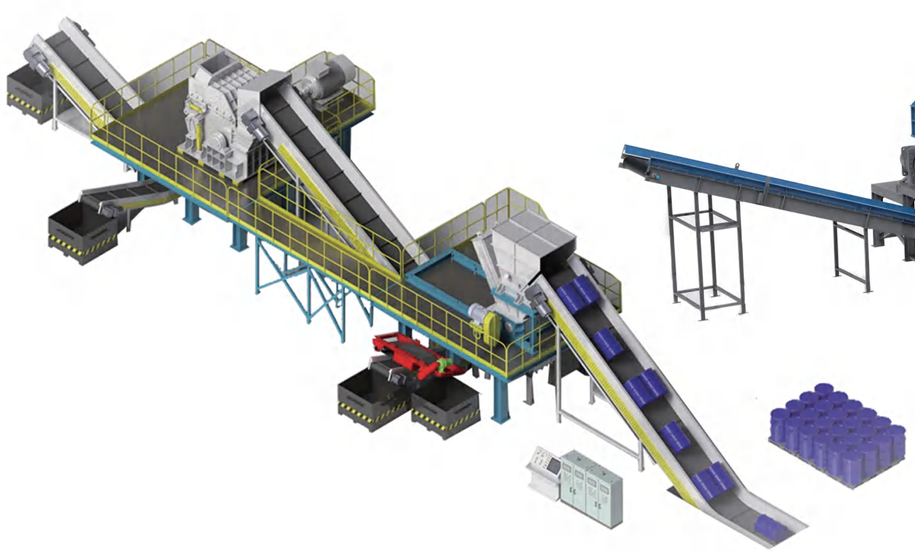
Ma'anshan Lianguan Machinery Manufacturing Co., Ltd. adopts the "crushing + sorting + resource utilization" process, first dismantle the oversized pieces and industrial solid waste in the material that exceed the effective crushing bin, and then use the heavy chain conveyor or loading The machine transports large pieces of garbage to the crushing bin, and the double-shaft shear crusher crushes various mixed solid wastes into smaller particle sizes. Especially the product safety, stability, air tightness, maintenance convenience, humanization of operation, tool strength and wear resistance, reasonable optimization design of the crusher structure, and automatic separation of metal materials from other materials during the crushing process. Metal materials are automatically discharged into the buffer device through the iron remover, and other materials are transported to the garbage truck through the enclosed belt conveyor. The entire production line is equipped with a professional dust reduction system.

大件垃圾/工业固废破碎系统生产线是我公司正对目前市场上的难题，如大件垃圾（各种家具、家电等）、固废危废垃圾（油桶、工业废布、纸厂废料等）难以破碎分选问题，进行高效破碎生产的系统生产线，整条生产线包含链板输送机、双轴破碎机、皮带输送机、除尘机、磁选机、提料机、压块机、打包机、螺旋清洗机、振动筛等设备，为客户提供合理高效的技术方案。

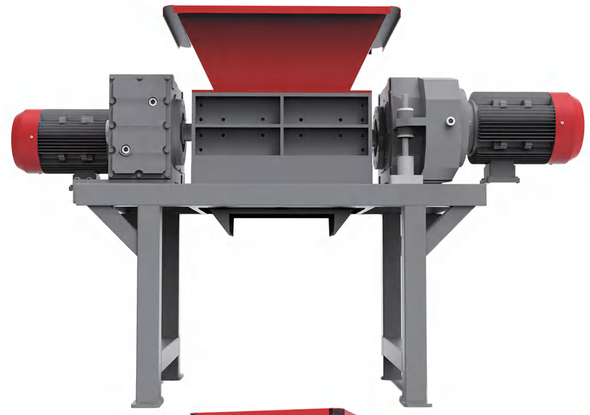
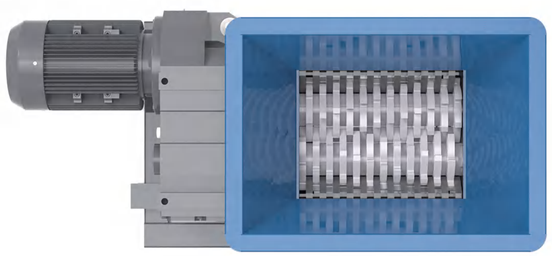
The production line of bulky waste/industrial solid waste crushing system is our company is facing the current market problems, such as bulky waste (various furniture, home appliances, etc.), solid waste and hazardous waste (oil drums, industrial waste cloth, paper mill waste) Etc.) It is difficult to crush and sort the problem, and the system production line for efficient crushing production. The entire production line includes chain conveyors, double shaft crushers, belt conveyors, dust collectors, magnetic separators, feeders, briquetting machines, and packing Machines, spiral cleaners, vibrating screens and other equipment to provide customers with reasonable and efficient technical solutions.

马鞍山市联冠机械制造有限公司提供一站式固废破碎、筛分及资源循环利用整体装备及全面解决方案。设备主要应用在生活垃圾分选、焚烧领域，生物质预处理、水泥窑协同处置，危险废弃物预处置，橡胶、塑料、有机垃圾、工业垃圾及其他固体废弃物处置领域。

Maanshan Lianguan Machinery Manufacturing Co., Ltd. provides one-stop solid waste crushing, screening and resource recycling overall equipment and comprehensive solutions. The equipment is mainly used in the fields of domestic waste sorting and incineration, biomass pretreatment, cement kiln co-processing, hazardous waste pre-processing, rubber, plastic, organic waste, industrial waste and other solid waste disposal fields.



# 小型工业垃圾撕碎机/厨余垃圾撕碎机
## SMALL INDUSTRIAL WASTE SHREDDER / KITCHEN WASTE SHREDDER

**小型垃圾撕碎机结构组成:**

破碎机主体:设备主要机体采用优质钢板焊接消除应力处理,整体机加工，确保设备在长时间重负荷中的稳定性;

轴承与密封:轴承座采用的拼合便拆式，能快速拆下动刀、定刀、轴承等部件，易于维护和更换刀具，特有的密封结构有效阻隔破碎物和油脂的接触，处理液态物料也能保护轴承和齿轮等;

动刀与定刀:动刀材料采用专用特殊合金钢锻打毛坯，精密机加工、多次热处理淬火、回火和保温而成，整体韧性硬度一致,确保更好的切削性能和使用寿命。

刀轴:采用高强度重载专用钢材加工精制，更合理地配合刀具为切削物料提供有力的动力。

The main body of the crusher: the main body of the equipment is welded with high-quality steel plates to eliminate stress, and the overall machining is to ensure the stability of the equipment under heavy load for a long time;

Bearing and seal: The split and easy-to-disassemble type of the bearing seat can quickly remove the movable knife, fixed knife, bearing and other parts, easy to maintain and replace the knife, and the unique sealing structure effectively prevents the contact between broken objects and grease, and also handles liquid materials. Can protect bearings and gears, etc.;

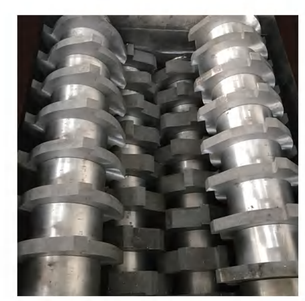
Movable knife and fixed knife: The movable knife material is made of special special alloy steel forging blank, precision machining, multiple heat treatment quenching, tempering and heat preservation, the overall toughness and hardness are consistent, ensuring better cutting performance and service life.

Cutter shaft: It is processed and refined with high-strength and heavy-duty special steel, which is more reasonable with the cutter to provide powerful power for cutting materials.

# 大型四轴撕碎机
## FOUR-AXIS SHREDDER

四轴撕碎机系列，整机技术来源于欧洲，该款机器是一款多功能，通用性较强的机器，采用标准化模块化设计，零部件互换性较好，辅刀采用锻件精制而成，主刀采用特种合金钢经特殊的专门工艺制成，具有耐磨性好和高强度特点，驱动部分采用中间齿轮传动，形成差速关系。四轴撕碎机可撕碎体积较大物料，双轴撕碎机无法破碎的物料，四轴撕碎机都能将其破碎。

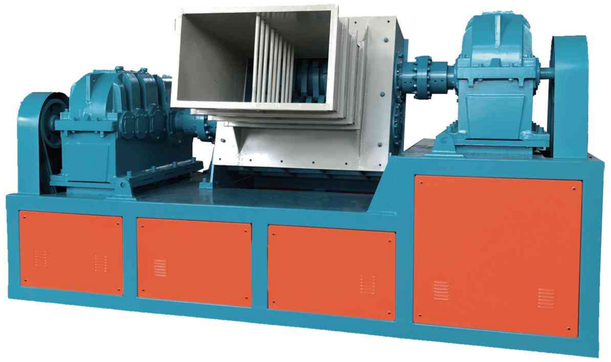
Four-axis shredder series, the whole machine technology comes from Europe, this machine is a multi-functional, versatile machine, adopting standardized modular design, with good interchangeability of parts, the auxiliary cutter is made of forged pieces, the main cutter is made of special alloy steel by special special special process, with good wear resistance and high strength characteristics, and the driving part adopts intermediate gear transmission, forming a differential relationship. The four-axis shredder can shred materials with larger volume, while the two-axis shredder can shred materials that cannot be shredded, and the four-axis shredder can shred them.



# 塑料撕碎机/胶胎管道撕碎机
## PLASTIC SHREDDER/RUBBER TYRE PIPE SHREDDER

联冠塑料撕碎机适用于大口径塑料桶、废旧塑料制品的破碎与回收。联冠根据德日先进技术制造的双轴剪切式破碎机适用于大口径塑料桶，PE塑料桶，PP塑料桶等多种不同厚度，高度，口径不一的塑料桶破碎回收。联冠塑料撕碎机的刀具可由出料尺寸定制化，产量可根据用户要求提供型号，双轴剪切式破碎机也适用大负荷固体废物的破碎处理。撕碎后的物料再进粉碎机，能让粉碎机产量增加3-5倍。

The combined crown plastic shredder is suitable for crushing and recycling large-caliber plastic barrels and waste plastic products. Double-shaft shear crusher manufactured by United crown according to Germany and Japan advanced technology is suitable for crushing and recycling plastic barrels with large diameter, PE plastic barrel, PP plastic barrel and other plastic barrels with different thicknesses, heights and diameters. The cutting tools of the combined crown plastic shredder can be customized by the discharging size, and the output can be provided according to the user's requirements. The double-shaft shear crusher is also suitable for crushing heavy-load solid waste. The shredded materials are fed into the crusher, which can increase the output of the crusher by 3-5 times.



1、联冠塑料撕碎机对于粉碎机难粉的大块料、轮胎、筐料 、蓝桶、管材、托盘、薄膜、编织袋、吨袋等可破碎；

2 、厚板材精密加工的组合结构外框,大角度六角柱的强力旋转轴,大口径坚固投入料斗,因此可以放心投入大型原料；

3 、在厚度、形状、排列顺序等方面设计加工的回转刀，剪切力强、刀刃锋利，能够提高破碎率；

4 、低速运转，噪音低，粉尘少；

5 、刀具由特殊合金钢制作，坚固耐用。

1. The United Crown Plastic Shredder can crush large pieces, tires, baskets, blue barrels, pipes, trays, films, woven bags, ton bags, etc. that are difficult to pulverize.

2. The outer frame of the combined structure for precise processing of thick plates, the powerful rotating shaft of the large-angle hexagonal column, and the large-caliber solid input hopper can be used to safely input large-scale raw materials.

3. The rotary knife designed and processed in terms of thickness, shape and arrangement sequence has strong shearing force and sharp blade, which can improve the crushing rate.   

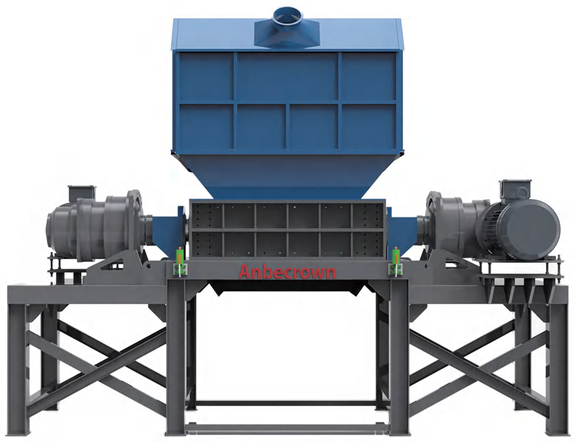
4, low speed operation, low noise, less dust;  

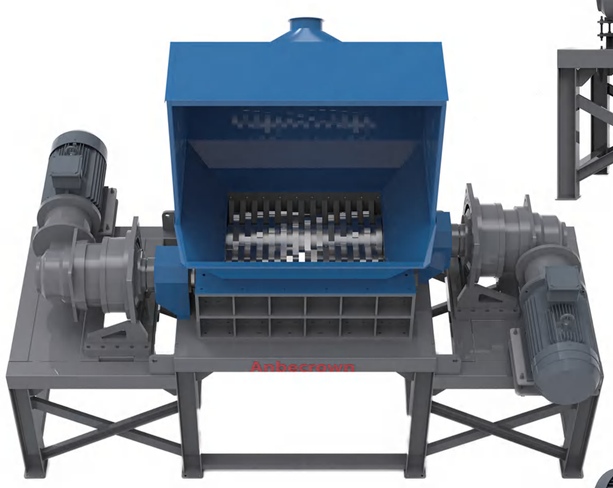
5. The cutting tool is made of special alloy steel and is firm and durable.

# 大件垃圾/农作物秸秆/危险固体废物/纸厂垃圾撕碎机

## LARGE WASTE / CROP STRAW / HAZARDOUS SOLID WASTE / PAPER MILL WASTE SHREDDER

联冠大件垃圾撕碎机，是针对大型建筑垃圾、农作物秸秆（如水稻、小麦、玉米等）、危险固体废物垃圾（如油桶、化工桶、化工废布等）、大件生活垃圾(如沙发、席梦思、衣柜、家电等)和纸厂垃圾(如纸厂铰绳辫子料、纸厂废料等)，专业针对大件垃圾物料的破碎而设计，联冠机械大件垃圾撕碎机主要可以对城市建筑垃圾、大件生活垃圾的破碎与减容。而纸厂的垃圾通过撕碎机破碎以后，不但可以焚烧发电，还可以继续造粒，以达到固废垃圾循环利用的目的。



### 使用大件垃圾撕碎机破碎产品优点：

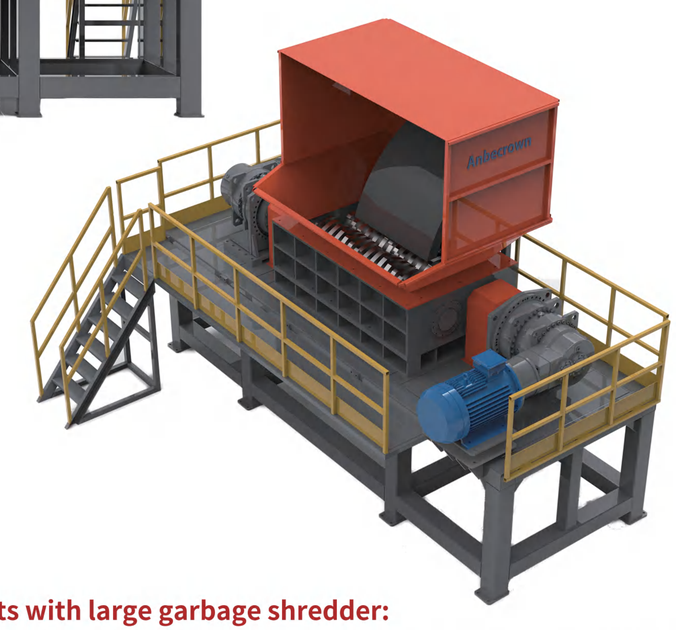
1、撕碎后的物料运输方便，可有效降低运输成本，增加运输效率；

2、撕碎后的物料更易存放，可以节省大量的仓库空间；

3、撕碎后的物料更好进炉子进行焚烧，作为电力能源重要的一部分。

4、撕碎后的物料经过深加工后可以造粒，做成其他工业产品的原料，又可以为社会发挥价值。

Lianguan large waste shredder is designed for large construction waste, crop straw (such as rice, wheat, corn, etc.), hazardous solid waste (such as oil bucket, chemical bucket, chemical waste cloth, etc.), large domestic waste (such as sofa, Simmons, wardrobe, household appliances, etc.) and paper mill waste (such as paper factory twisted rope braid material, paper mill waste, etc.), it is specialized in the crushing of large waste materials The design of the machine can mainly crush and reduce the volume of urban construction waste and large domestic waste. After the paper mill's garbage is broken by shredder, it can not only be incinerated for power generation, but also continue to granulation, so as to achieve the purpose of solid waste recycling.




### Advantages of crushing products with large garbage shredder:

1. The shredded materials are convenient to transport, which can effectively reduce the transportation cost and increase the transportation efficiency;

2. Shredded materials are easier to store and can save a lot of warehouse space;

3. Shredded materials are better fed into the furnace for incineration as an important part of electric energy.

4. After deep processing, the shredded materials can be granulated to form raw materials for other industrial products, which can also bring value to the society.

# 金属撕碎机/废钢撕碎机
# METAL/SCRAP SHREDDER

## 适用物料：

钢筋、报废汽车、发动机铝缸、自行车、摩托车、铝合金门窗、易拉罐、大油桶、油漆桶、彩钢瓦、轻薄料冰箱、空调、废旧家电、废铝、废铜、机油滤芯、金属边角料等废旧金属 。

## 撕碎机设备特点：

1、厚重动刀，破碎效率高，刀具均采用合金钢锻造，坚固使用寿命长。

2、框架板材厚，可抗高扭矩，非常坚固。

3、采用微电脑(PLC)自动控制，设启动、停止、反转及超载自动反转控制功能。

4、设备具有低转速、大转矩、低噪音、粉尘可达到环保标准的特点。

5、易于调整、维护费用低、经济耐用。

6、刀具的厚度和刀爪数量可根据不同物料更换。

7、采用高强度重载专用钢材加工精制，更合理地配合刀具为切削提供有力的动力。

8、设备主要机体采用优质钢板焊接消除应力处理/整体机加工，确保设备在长时间重负荷中稳定性。

## Applicable materials:

Steel bars, scrap cars, aluminum cylinders for engines, bicycles, motorcycles, aluminum alloy doors and windows, pop cans, large oil drums, paint drums, colored steel tiles, light and thin refrigerators, air conditioners, scrap household appliances, scrap aluminum, scrap copper, oil filter elements, scrap metal and other scrap metals.

## Features of shredder equipment:

1. Heavy moving knives have high crushing efficiency. The knives are forged with alloy steel and have long service life.

2. The frame plate is thick, resistant to high torque and very strong.

3. It adopts microcomputer (PLC) automatic control and has automatic reverse control functions of starting, stopping, reversing and overloading.

4. The equipment has the characteristics of low rotating speed, large torque, low noise and dust that can meet the environmental protection standard.

5. Easy adjustment, low maintenance cost, economy and durability.

6. The thickness of the cutter and the number of claws can be changed according to different materials.

7. Use high-strength heavy-duty special steel for processing and refining, and more reasonably cooperate with cutting tools to provide powerful power for cutting.

8. The main body of the equipment is welded with high-quality steel plates to eliminate stress/machined integrally to ensure the stability of the equipment under long-term heavy load.