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**Plastics Recycling “Beast” Quickly Shreds  
Even Biggest, High-Volume Items to Bits**

*“Fiercely” cost-effective, innovative designs eliminate catastrophic breakdowns,  
production downtime by upgrading points of vulnerability  
and enabling simultaneous shredding and chipping*

For very high-volume plastics recyclers, including those in need of a giant chamber to fit huge items, a new generation of advanced shredding technology has arrived. A monstrous unit called “The Beast” is ready to make quick work of the job, shredding items like an entire porta-potty or oversize curbside recycling bin via unique advances in hydraulic systems.

The challenge is that traditional large capacity shredders have points of vulnerability such as knives, shafts, bearings, and hydraulics that are not truly designed for such volumes or loads. This can result in costly breakdowns and production downtime, with long lead times for critical replacement parts and rebuilds.

On top of this, the cumbersome process of shredding, screening, and grinding plastics to size with different equipment in separate operations has traditionally been a bottleneck to processing. Screening is often a slower process than shredding.

In response, to ensure high production and reliability in such applications, industry innovators have developed high-volume, high-torque shredders like “The Beast” – large enough to efficiently reduce the biggest containers in one operation, and durable enough to last decades.

Getting to the root of the processing bottleneck, a new shredder technology is also enabling recyclers to simultaneously shred, chip, and size in portable or stationary systems, further speeding production and reducing processing costs.

### **Conventional Shredder Limitations**

For truly high-volume recycling operations, the size of the shredder can restrict production flow if it is not large enough to accept oversized plastic scrap. Hydraulic shredders operating at a single RPM, using a single rotary piston or gear pump, also never maximize throughput regardless of load.

The lack of robust construction, designed for reducing such materials at high-volume, inevitably leads to breakdowns and unscheduled downtime for repair and replacement.

“Typically, shredder companies use 4140 knives, traditional hard face welding or even tool steel for their systems, but inferior knives increase recyclers’ top maintenance cost – knife rebuilds,” says John Neuens, Sales Director of Milwaukee, WI-based BCA Industries, an established developer and manufacturer of industrial shredding and recycling equipment for a variety of industries.

Neuens outlines a host of other shredder design vulnerabilities that can lead to “catastrophic failures,” if not addressed.

Expensive shaft washout, due to undersized material along with poor shaft or clamping nut design, as well as old-style hex shafts, can allow stack loosening during operation.

Bearing failure, caused by contamination, often occurs when bearing seals and shaft armor insufficiently protect against shredding chamber compression forces.

Perhaps the most consequential point of failure can occur when shredder manufacturers build hydraulic power supplies using a single but very expensive hydraulic pump or motor, which can cost up to \$90,000 to replace with lead times of 12+ weeks, resulting in excessive downtime.

### **Reinventing High-Volume Recycling**

To help high-volume plastics recyclers dramatically and cost-effectively improve their production with minimal downtime, industry innovators have redesigned and modernized shredder systems, which have not been substantially updated in generations.

For example, the customizable ES2000 shredder called "The Beast" from BCA Industries, is designed for the toughest, high volume plastics shredding applications in the industry. It is designed to reliably shred up to 20, 30, and even 40 tons an hour in both stationary and portable units. This level of throughput cannot be produced with a smaller chamber.

With 24" diameter hard-faced knives using a base AR-500 alloy, 55" to 72" x 44" cutting chambers, and 8" 4130 Chromoly steel shafts, the unit can quickly reduce even the largest plastic scrap. With 24,000-38,000 pounds. total gross weight (not including power supply), it is designed to shred 15-35 tons of plastics or dense materials an hour with 179,000 foot-pounds of torque per knife. When even more throughput is required, it can be rated up to 800HP, and utilize dual cutting chambers. To maximize high-torque throughput and efficiency, it utilizes a pressure compensated variable displacement pump that allows the RPM to increase and decrease based on load.

The unit's design addresses the vulnerabilities of conventional shredders by utilizing inexpensive cluster drive system of eight small hydraulic motors which create redundancy in the power supply that eliminates much of the possible downtime. These cluster drive motors are off-the-shelf, and readily accessible, and they minimize cost while increasing reliability. Use of the cluster drives ensures continuous operability (at slightly lower output), even if one or more need to be replaced.

Instead of 7" shafts, 8" Chromoly shafts increase usable life. In place of old HEX shaft design or a double key round shaft, the unit uses a 6 key design where the knife literally rides on disposable keys, not directly on the shaft. With the keys taking any abuse instead of the shaft, the design eliminates shaft washout and simplifies knife changes.

Because the unit is designed with a double labyrinth style drop zone and outboard bearings, this eliminates any direct path to the shaft bearings. It also allows compressed material a path to exit the shredder, eliminating the "catastrophic costs" of bearing and shaft replacement.

Terry Frank of Ellwood City, PA says, "As production and maintenance supervisor of the largest US industrial battery recycler, I recommended "The Beast" (ES2000 shredder) to ownership in 2012 based on both the cluster drive and variable displacement hydraulic design. The other single speed shredders we worked with over the years were far too slow for our needs. The machine BCA delivered has far exceeded our throughput expectations, doing 4 times the tonnage and near double the knife life of our other equipment. The downtime has been a small fraction of what we had gotten used to as well."

To further enhance production, innovative shredders like this strike at the root of the processing bottleneck. Instead of using many shredders to progressively reduce the size of scrap, new shredder “knife” technology like BCA’s patented Triplus system (when used in the shredder) can uniformly cut to any size in a single pass without a screen, very quickly reducing scrap to a reclaimable proportion. It utilizes a unique bed knife design in a dual shaft shredder to cut the width of the material of the shredder. The size of the end-product is based on the size and geometry of the rotary and fixed knives as well as their gap distances.

A shredder using this design can produce over 85% correctly sized material in one pass with less than 10% oversized material, according to Neuens. He notes that the knife system can reduce scrap to the appropriate size with much less energy than typical shearing and grinding equipment. Power efficiency approaches 150% over any standard shredder.

When the knife technology is used with plastics, as well as ferrous/nonferrous metals, electronic waste, tires, ragger tail, C and D waste, MSW, as well as paper, it can dramatically reduce shipping costs by minimizing voids in containers due to oversized material.

While such units are typically hydraulic, all-electric versions are an attractive option if a very large chamber size is required, but not high-torque (i.e.-mild steel). All-electric versions are simpler, quieter, less costly, and even easier to maintain since the devices have no valves and cannot leak hydraulic fluid since none is used, according to Neuens.

Plastics recyclers needing high-volume shredding, whether high-torque or not, have long been frustrated by costly production breakdowns and bottlenecks.

With industry innovation, however, plastics recyclers now have the ability to quickly, efficiently, and reliably reduce even the largest scrap materials and loads to size onsite in a streamlined process. This has the potential to significantly increase production, as well as reduce labor and shipping costs, to boost the bottom line.

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