



## Best Practices in Wood Waste Recycling

### **Hybridize Size-Reduction Equipment for Wood Waste**

#### **Material: Wood Waste**

**Issue:** *In choosing size-reduction equipment, processors must balance their need for reliability and high throughput against their desire for high quality end-products. Chippers produce the highest quality ‘true’ chip, yet these are the most vulnerable to excessive wear caused by contaminants commonly present in wood waste. As a result, most wood waste processing applications use wear-resistant hogging or shredding equipment. Hogs and shredders achieve cost effective size reduction, but produce coarse wood particles rather than ‘true’ chips. As the industry seeks to move lower grade wood waste into product applications requiring higher quality chips, there is a need for equipment that can produce a high-quality, consistent product without sacrificing wear resistance.*

**Best Practice:** This Best Practice recommends the consideration of hybrid size reduction designs to process specific lower grade forms of wood waste into higher quality products.

**Hybrid Size-Reduction Equipment.** Hybrid size-reduction equipment refers to equipment that seeks to combine the durability of hogging equipment with the high-quality cutting action of chipping equipment. This equipment employs work-piece cutting surfaces that are sharper than those of a hog, but capable of withstanding wear and high-volume processing. The design of the reduction action is not to slice wood like a chipper, but rather to use a combination of impact force and cutting action. This action produces particles with cleaner edges than the typical shredded particle.

**Knife Hog Designs:** These hybrid size-reduction machines consist of a rotor that is fitted with sharper cutting tools than the standard fixed or swinging hammers. The sharper cutting surfaces yield a more uniform end-product that more closely resembles a true *chip*. An example of this hybrid equipment is the rotary knife hog. It has a series of “knives” turning on a large rotor that “cut” the wood waste against a steel anvil and then force it through heavy steel sizing grates. The resulting product is more consistent in size and generally produces fewer fines than the hammer hog. Again, the grates are interchangeable to allow a range of targeted product sizes. Knives and grates require regular maintenance.

**Punch and Die Designs:** This hog is fitted with close tolerance fixed cutters; and, the work zone of the anvil is fitted with a die pattern that matches the fixed cutters. These hogs have an efficient cutting ability, but greater sensitivity to hard contaminants. As a result, they require greater maintenance than hammer hogs when handling typical wood waste feedstock.

**Pan and Disc Design:** This hybrid design consists of a disc that is fitted with grinding teeth instead of knives. A series of screens on the bottom and outside the turning pan controls particle size and allows hard contaminants to fall through without meeting the cutting disc. These machines can operate at a lower speed and higher torque, which reduces maintenance requirements.

**Raw Material Types.** Hybrid size-reduction equipment varies with the raw material it can handle. Equipment that processes the wood using sharp, knife-like cutting surfaces is capable of processing any wood waste that is free of hard contaminants such as rock and metal. Because hard contaminants are common in wood waste, the only appropriate feedstock for it is the cleanest or most heavily sorted. Hybrid equipment that process through a grinding action can accept raw material with modest amounts of hard contaminants without experiencing unreasonable wear.

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**End Product Types.** Hybrid equipment can produce various end-product types. Equipment that processes the wood waste using sharp, knife-like cutting surfaces can produce a *chip* suitable producing pulp and paper and panel-board. Hybrid equipment that process through a grinding action produces a coarser product.

**Implementation: Selection Considerations.** The primary issues to consider in the selection of size-reduction equipment are: operational issues (e.g., effectiveness, compatibility with other equipment, capability to handle production throughput, etc.), capital cost, maintenance issues, and safety issues.

**Operational:** Working with an equipment vendor, the equipment should be carefully sized to handle a volume greater than the anticipated tonnage throughput of the plant. This sizing ensures the equipment can handle the types and volumes of wood waste processed at a given facility. Operators should consider both raw material and end-product issues to ensure that the machine will perform satisfactorily. Operators should consider running trials on several types and brands of size-reduction equipment using samples of the anticipated wood waste to verify the production of a satisfactory product.

**Cost:** Size-reduction equipment is among the most capital-intensive equipment at a processing facility. Hybrid size-reduction equipment tends to be more expensive than its standard counterparts. In general, the equipment becomes more expensive with increases in throughput capacity and increases in product quality. As a result, it is critical to match the equipment size to targeted throughput and equipment style to the raw material and targeted end-product.

**Maintenance:** Size-reduction equipment experiences wear from the abrasive properties of the wood itself and any non-wood contaminants present in the feedstock. Unavoidable hard contaminants in the raw material supply will restrict the use of hybrid equipment with sharp cutting edges because of excessive wear and the resulting constant maintenance. All size-reduction equipment should be equipped with shearing pins on the impact surface to reduce damage if a large hard contaminant gets into the machine. A metal detection system should protect sensitive equipment by stopping the in-feed conveyor if metal is present.

**Safety:** Most quality size-reduction equipment is adequately fitted with guards to avoid the ejection of any flying debris. Proper training is essential to the safe operation of any size-reduction equipment.

**Benefits:** Properly selected size-reduction equipment efficiently converts wood waste into the highest value products attainable from the raw material.

**Application Site:** This Best Practice applies to wood waste processing facilities.

**Contact:** For more information about this Best Practice, contact CWC (206) 443-7746, e-mail [info@cwc.org](mailto:info@cwc.org).

### References:

1. Aquino, John T. "The Tale of the Tub Grinder." *Waste Age*; April 1996.
  2. Universal Refiner Corporation; equipment brochure.
  3. Walsh, Dan. Northwest Wood and Fiber Recovery; Portland, OR.
  4. Yeasting, John. Re-Sourcing Associates; Seattle, WA.
- (See Appendix for an Equipment Manufacturer's List)

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