Vermeer



EFFICIENT WOOD WASTE RECYCLING:

Understanding your options for handling organic waste material



Recycling is becoming a common practice at most public and private waste handling facilities. In fact, recycling organic wood waste is how many facilities started. Today, recycling wood waste, organic and processed, isn't just a landfill space saver — it is also a revenue stream for many organizations.

To make wood waste a revenue stream area of your waste facility, you need to make sure you optimize your process. That starts with identifying what method of processing needs to be employed for the type of material being collected, determining the appropriate equipment to reduce the size of the material and deciding the steps for processing waste.

In this paper, you will learn about the different types of wood waste, equipment used for processing it, market opportunities and best practices for setting up a facility to produce recycled wood waste material.

This important information is divided into four areas:

1. **Defining wood waste — organic and processed**
2. **Exploring the equipment used to recycle wood waste**
3. **Understanding market opportunities for recycled wood waste material**
4. **Observing best practices for processing wood waste**

Part 1 Defining wood waste — organic and processed

By definition, wood waste includes all wood and wood-based products, including organic plant material (trees, plants, yard material, etc.) and processed wood material (lumber, plywood, etc.). These materials become waste when they outlive their usefulness or come to the end of their lifespan. To help reduce stress on the nation's landfill facilities, it is critical to develop sustainable practices to process and reuse wood waste.

There are many benefits to recycling wood waste. For example, with recycling wood and plant-based material, waste gets a second life where it can provide valuable nutrients for plants, cover for landscaping and fuel.

Compost, mulch and biofuel/biomass are the three biggest markets for recycled wood waste material. Still, smaller market opportunities are also viable with some additional processing, including animal bedding, paper and pressed lumber.

Through wood waste recycling, the number of trees harvested each year is reduced, and unnecessary waste is eliminated from landfills. It also helps reduce energy costs, and repurposed wood material delivers a natural fertilizer for plant development.

However, not all wood waste is the same. For example, organic material is a much cleaner resource than processed wood waste because there are significantly fewer contaminates mixed in with the material — reducing the number of steps, as well as costs involved, with the recycling process.

Organic material types

Organic waste comes in many shapes and material types, but at the heart of the organic recycling process is a carbon source mainly comprised of wood.

The most common sources of organic wood waste is trees that have been cut down or damaged during a weather event. Natural disasters, such as storms, tornados, hurricanes and ice storms, can be devastating, but downed trees play an instrumental part in replanting and rebuilding.

Other forms of organic material recycling

While most of the organic material comes from trees, other commonly recycled organic materials include:

- Leaves
- Grass clippings
- Shrubs
- Garden and landscaping plants
- Plant-based food scraps



Business spotlight: MW Horticulture Recycling Facility, Inc.

Located in Fort Myers, Florida, MW Horticulture Recycling Facility, Inc. is a wood waste recycling facility that sees its fair share of storm debris. Since 2013, MW Horticulture has processed organic wood waste from many tropical storms and hurricanes. The team uses a Vermeer TG7000 tub grinder and Vermeer trommel screens for processing. Wood waste is recycled to produce compost, soils and mulch, then sold to homeowners, wholesale manufacturers and garden centers.

MW Horticulture recycles 100 percent of the material it takes in, and every composting mix is produced from organic material only.

Collecting organic wood waste for recycling

To produce quality end products, recyclers need to keep the number of steps involved in recycling and handling time to a minimum. Every time material is moved, sorted and processed, it adds costs. And poorly processed material is not usually in high demand.

The key to minimizing the steps during processing happens during the collection process. Whether the material is coming to a facility through a community green-waste collection program, collected at yard-waste transform stations or dropped off at a landfill, common contaminates include:

- Plastic — Consumer plastic bags are among the most common sources of plastic found in recycled wood waste.
- Dirt — While dirt is an organic material, too much of it can slow down processing times and impact the quality of the end product.
- Metals — Mixed in with wood waste material, metal can damage the working parts of the machinery used for processing.

Defining wood waste — organic and processed (cont.)

- Concrete, bricks, blocks, etc. — Like metals, these solid materials can damage machinery and delay recycling.
- Processed wood material — While pallets and many building materials are made of wood, processed wood usually has several contaminates like nails embedded in the material. Depending on the end product and machine being used, it's best to process this type of material separately from organic materials.

Tips for keeping collected organic material clean

The most effective way to reduce the number of contaminants in collected material is through education.

Educating homeowners about what is considered acceptable organic material can be done through social media, PSAs and newsletters, as well as on the bags or stickers used during the collection process.

For larger volumes of material, collection facilities should take a moment to inspect incoming loads, especially if they're from a customer they have not worked for before. Posted signage and written communications can also help keep incoming material clean.

At the facility, it's essential to have incoming organic material separated by barriers from any nearby garbage collection sites to reduce the risk of plastic bags infiltrating wood waste piles.

For bulkier contaminants like metals and concrete, machine operators should spend time sorting material before running it through the grinder or shredder. Sometimes a quick shake of the excavator or loader bucket can dislodge mixed-in contaminates and help reduce the risk to the machinery.

Also, it's important to pay attention to how loaders and excavators handle piled material. Dirt pushed into a pile of organic wood material and then processed by a grinder or shredder can cause premature wear to drums, knives, and hammers.

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Technology like the Vermeer Damage Defense system for horizontal grinders and tub grinders can also provide protection against certain metal contaminates.

Non-organic wood waste recycling

As previously mentioned, processed wood material can also be recycled. However, because there is a greater chance of contaminates in this material than with organic material, you should consider keeping it separate from organic wood waste. Many processed wood materials can be reused to make pallets and biomass for fuel, but since it does not break down as quickly as organic material, it's best not to use processed wood for compost.

Some common processed wood material comes from:

- Lumber
- Pallets
- Building material



Part 2 Exploring the equipment used to recycle wood waste

Sizing wood waste is a critical step in the wood waste recycling process. Many potential retail markets demand material within specific size ranges, such as:

- Compost — Under 4 inches (10.2 cm) in length and width
- Mulch — 1-1/2 inches to 2-1/2 inches (3.8 cm to 6.4 cm)
- Biomass/biofuel — Varies by burner type and size

High-speed grinders, slow-speed shredders and screening equipment are the most widely used machinery to size collected wood waste material. A grinder or a shredder is used to reduce the volume of collected material, while screening equipment, like trommel screens, are used to separate various sizes of material.

Grinding equipment types

The three most widely used machines for processing wood waste material are high-speed horizontal grinders, high-speed tub grinders and slow-speed shredders. Determining which machine type to use depends on the incoming material type, size and shape; facility location; and the kind of end product being produced. For example, tub and horizontal grinders are most often used for processing organic wood waste because they can reduce material to smaller sizes faster and more efficiently than most shredders. However, shredders are a viable option for smaller recycling operations and handling processed wood material, as well as other building material and debris.

Horizontal grinders advantages

Horizontal grinders are efficient at handling longer material. So, if you receive a lot of long-cut tree branches and limbs, using a horizontal grinder can help reduce the cutting time before processing material through grinders. Horizontal grinders are also good at handling loose green waste.

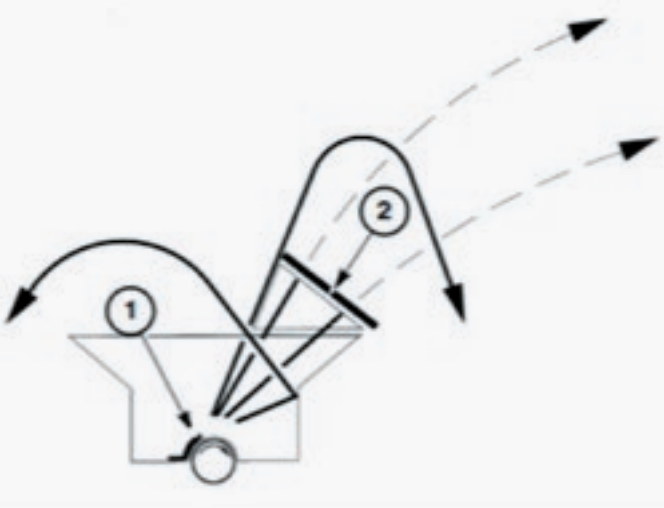
Horizontal grinders are an excellent option to use at facilities where space is a bit restrictive. Tub grinders are ideal if they are equipped with a thrown object restrain system like the one found on Vermeer models.

Tub grinder advantages

Tub grinders can handle bulkier materials like tree stumps, as well as processed wood material like pallets. Tub grinders use gravity instead of conveyor belts to feed the hammer mill, so there are fewer moving components on a tub grinder than a horizontal grinder. Tub grinders are efficient at processing loose green materials.

Shredder advantages

Slow-speed shredders neither have the same production levels as grinders, nor are they as effective at sizing materials, but they are typically more tolerant when processing material with many contaminates. To achieve the appropriate end product size, many facilities use shredders to pre-size material containing contaminates, like building materials, and then a grinder to achieve the desired final sizing.



The patented Vermeer thrown object restraint system (TORS) helps reduce the potential for thrown objects from the tub during machine operation. This system consists of a rotor deflector **(1)** and a tub cover **(2)** that work together to limit the quantity and distance of thrown objects.

Part 2 Exploring the equipment used to recycle wood waste (cont.)

Choosing the right grinder for your operation

Vermeer horizontal grinders and tub grinders are built tough and are offered in a variety of configurations to suit large land-clearing, municipal waste and composting operations. Tips for choosing the right grinder for your operation are below.

What is your jobsite like?

- **URBAN** — Residential, commercial or other populated areas (compost, transfer station).
- **MUNICIPAL** — Municipal areas with high traffic (highways, county roads, organic waste recycling).
- **REMOTE** — Remote jobsite (land clearing, pipeline, agriculture).

What type of material are you processing?

- **LOGS** — Materials that are typically processed on land-clearing or harvesting sites.
- **PRESORTED** — Pre-sorted and land-clearing material such as bark, brush or longer tree limbs.
- **NON-WOODY** — Non-woody material such as hay or ag residue.
- **LARGER DIAMETER** — Items of large diameter, such as tree stumps and root balls.

What will your end product be?

- **CHIPS**
- **GRINDINGS**

Horizontal grinder


HG4000 horizontal grinder


HG4000E horizontal grinder


HG6000 horizontal grinder


HG6000E horizontal grinder


HG6000TX horizontal grinder


HG6800TX horizontal grinder

Tub grinder


TG5000 tub grinder


TG5000E tub grinder


TG7000 tub grinder


TG7000E tub grinder

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Exploring the equipment used to recycle wood waste (cont.)

Sorting and separating equipment

Depending on the end product being produced, sorting and separating machinery may also need to be employed. Screen equipment is widely used for making compost and for some biomass/biofuel types. To achieve high-quality products, you may also need to add an air separator to remove plastic contaminants from processed material.

Trommel screens overview

While options for screening include deck screens as well as disc and star screens, trommel screens are the preferred method at many facilities because of their efficiency and ease of maintenance. Compared to disc and star screens, trommels don't require much maintenance because the technology relies heavily on gravity to move and screen material versus more mechanical means.

The industry offers two configurations of trommel screens — a tensioned screen drum or an auger drum. Trommels with a tension screen drum use a lift-and-throw action to separate material. As compost is cycled through the drum, the smaller material passes through the screen's holes while larger material exits at the end of the trommel. The slope of the machine dictates the rate at which the material flows through the drum as it's tumbled. Using tensioned woven-wire screen panels allows the use of smaller gauge wire to increase the total open screen area, which helps maximize production.

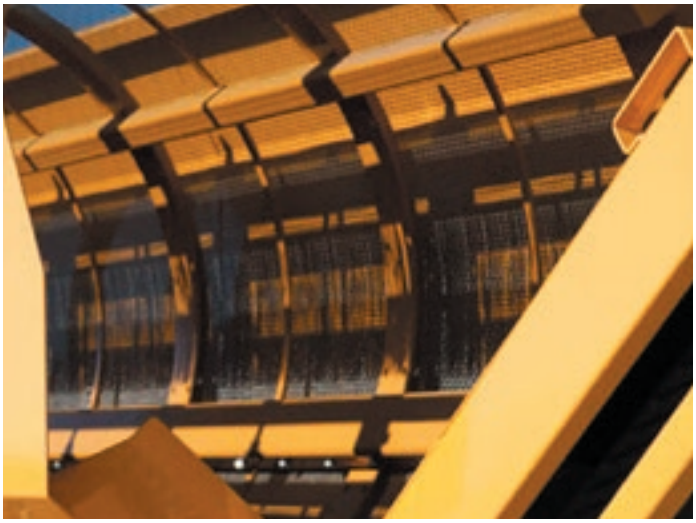
Trommels with an auger drum separate material using tumble-and-roll action, which reduces the chance of material spearing the screens. However, auger drums have less open surface area and are more prone to having wet material build up in the drum, and it may be more expensive to change product size due to needing an additional drum.





Machine spotlight:
Vermeer TR6450 trommel screen

The Vermeer TR6450 trommel screen features an adjustable/removable front fines, rear fines and overs conveyor for efficient three-product production. With a 20-foot (6.1-m) long, 6.5-foot (2-m) diameter quick-change tension screen drum, the TR6450 can sort up to 80 cubic yards per hour (137.6 m^3/hr) with .5-inch (1.3-cm) screens installed and material with moisture less than 40%. It is powered by a 120-horsepower (90-kW) Cat 3.6L Tier 4F (Stage V) diesel engine, and its drum speed can be adjusted from 0 rpm to 25 rpm based on material type and moisture content. Also, the front fines conveyor can be removed completely, and its auxiliary hydraulics can be used to power other equipment like an air separator.



Part 3 Understanding market opportunities for recycled wood waste material



Since these products can be bulky to transport, most customers prefer to source suppliers locally. So, there is relatively low competition for producers in many areas of the world.

Organic material will provide the most nutrient-rich compost, but processed wood can be used to produce mulch and biomass for fuel. Mulch and biomass buyers are typically more concerned about consistent sizing and the purity of the end product (free of contaminates) than the type of source wood waste material used.

Compost market overview

Compost is a growing market globally, and there are significant opportunities in the United States, especially as more communities implement policies to eliminate wood, green and food waste from landfills.

In addition, widespread use of compost has many benefits backed by research. According to a U.S. Composting Council (USCC) factsheet developed in conjunction with the Association of American Plant Food Control Officials (AAPFCO), compost can:

- Help prevent soil erosion
- Assist in stormwater management
- Promote healthier plant growing
- Conserve water
- Reduce waste
- Combat climate change
- Improve soil health
- Assist in wetland reclamation

Markets for reselling compost include:

- Landscaper and landscape material suppliers
- Golf courses
- Greenhouses
- Agriculture
- Homeowners

Mulch market overview

Currently, mulch is an even bigger market than compost, and it continues to grow as the uses of mulch multiplies and more people grow their produce. According to a January/February Soil & Mulch Producer News story, “More time at home boosts mulch and soil sales.” Home gardening and the demand for mulch has experienced significant growth throughout the COVID-19 pandemic. And this trend is expected to continue into the future.

The popularity of colorized mulch is also creating opportunities for mulch usage. Now mulch is more than just a functional product — it’s also used to enhance landscaping aesthetics.



Understanding market opportunities for recycled wood waste material (cont.)



Markets for reselling mulch include:

- Landscapers and landscape material suppliers
- Gardeners and garden material suppliers
- Agriculture
- Landfills for cover
- Construction for runoff prevention
- Homeowners

Biomass market overview

More widely used in Europe, the biomass market is not growing in the United States as quickly as the compost and mulch markets are; still, there is a lot of potential in the future as more renewable energy policies are adopted. Markets for reselling biomass include:

- Ethanol plants
- Greenhouses
- Industrial plant applications
- Homeowners for a heat source
- Wood pellet production for cooking and heating



Business spotlight: Bevo Farms

With 48 acres (19.4 ha) of greenhouses in Langley, British Columbia, and another 5.5 acres (2.2 ha) in Pitt Meadows, British Columbia, North America's top propagation company, Bevo Farms, relies on biomass to keep all its facilities at the right temperatures during the colder months of the year. Heating systems were converted to accept biofuel in the early 2000s when natural gas prices were on the rise.



Bevo Farms collects and processes recycled wood waste itself using a Vermeer HG6000TX horizontal grinder. The biomass heat solution helps keeps Bevo Farms operational costs balanced when natural gas pricing fluctuates.

Bevo Farms runs its grinding operation year round. The scrap material they work with includes pallet and sawmill waste primarily. Their Vermeer horizontal grinder handles a variety of materials being processed.

Part 4 Observing best practices for processing wood waste

To capitalize on the growing number of opportunities for wood waste recycling, adopt efficient and cost-effective manufacturing processes. One of the most important details to pay attention to during the production process is how frequently material is being moved, because every time material is handled, it adds to operational costs. To minimize movement, evaluate the layout of your facility, so the material flows one way.

While this example highlights how to create an efficient compost layout, mulch facilities can have a similar arrangement. Keep in mind that a good layout will minimize material handling and help control outside factors, like moisture, which can impact maturing and cause odors.

Controlling the flow of material.
Here's an example of how an efficient composting facility is arranged.



1. **Drop-off area:** Receiving incoming material near the front or side of the facility will help reduce material handling time because it only has to be moved one way as it is processed. Distancing it from the retail area is also important to reduce cross contamination.
2. **Incoming material and grinding area:** This area should keep incoming material separated by type (mulch or compost material) for efficient processing and proper recipes. For efficiency reasons, consider not allowing customers who are dropping off material into this area. Material should be transferred into windrows quickly to reduce odor and fire risk.
3. **Composting area:** This area should have a solid base (asphalt or concrete) with a slight slope that runs parallel to the compost rows to provide drainage and reduce the chance of standing water between rows after a heavy rain. Windrows should be placed as close as possible for the turner to maximize space. A windrow management system should be used to track temperatures and turning for timely maturation.
4. **Screening or finishing area:** In this area, compost fines are separated from overs (which go back into the composting pile). The trommel screen should be sized to allow for ample productivity and to reduce a material flow funnel at the end of the process. Extra effort should be made to keep overs and fines separated to reduce cross contamination of the final product.
5. **Retail area:** This should be located near the entrance for convenient customer access.
6. **Drainage ponds:** Drainage is a major environmental consideration at composting facilities. At the lowest point of the composting area, a retention pond should be established to collect storm water runoff. In most states, the entire site runoff needs to be collected in a detention pond. Depending on state and local regulations, a secondary overflow pond may also be required for additional filtration. Special considerations should be made to reuse this water to provide optimal windrow moisture levels.

Using the right equipment

Investing in the right size and type of equipment is also vital for wood waste recycling. You've already read about grinders, shredders and trommel screens, but you also need to evaluate other types of machinery that can optimize your facility's production.

While wheel loaders and excavators are some of the most versatile machines at a wood waste facility, they should not be considered the only way to move material. Once the raw material is processed through grinders, employing conveyers is an efficient method for moving material around the site.

You should also consider investing in a compost turner if you're producing large volumes of compost or soils. Turning material with wheel loader buckets is time consuming and may not efficiently stir all the material in a windrow. Turning compost is a critical step in optimizing curing times and producing a quality end product. Also, if you plan to accept food waste, odors are controlled through frequent windrow turning. In addition, if you're retailing compost, soils and mulches at your facility, using big wheel loaders in more confined areas can be challenging and less efficient than using a more appropriate sized loader for this area of your operation. Smaller machines, like Vermeer ATX compact articulated loaders, can provide maneuverability and versatility to your retail operations. Using them can help you achieve a more cared for appearance in your retail space and keep your large equipment moving bulkier material instead of loading truck beds and trailers with retail products.

Sizing material

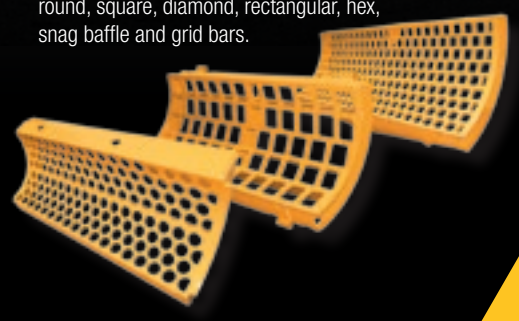
In addition to employing the right equipment, machines need to be configured to size material correctly. Sizing begins during the grinding process. Tub and horizontal grinders can be outfitted with a wide range of screen types and sizes.

To determine what type of screens you should be using, you need to consider the incoming material process and the end product being produced.

This guide will walk you through your screen options and what screen type works best based on incoming material and the end product.

MATERIAL PROCESSING CONSIDERATIONS	GRINDER SCREEN CONFIGURATION	COMPOST	MULCH	BIOMASS/BIOFUEL
Wet/soft material (palm fronds and garden trimming)		Diamond, hex	NA	NA
Hard/dry woods (oak)		Round, square, rectangular, hex	Round, square, hex, snag baffle	Round, square, hex, snag baffle
Construction debris and land clearing		Grid bars, square, rectangular	Grid bars, round, square, hex, snag baffle	Grid bars, round, square, hex, snag baffle
One-pass sizing for optimum production		Round, square, rectangular, hex	Round, square, hex, snag baffle	Round, square, snag baffle
		TWO-PASS SIZING		
Primary grind		Rectangular, square, hex	Rectangular, square, hex, grid bars	Rectangular, square, hex, grid bars
Regrind		NA	Square, round, hex, snag baffle	Square, round, hex, snag baffle

Grinder screen configurations include:
round, square, diamond, rectangular, hex, snag baffle and grid bars.





END PRODUCT SIZING

	LOW	HIGH
COMPOST	2-1/2 in (6.4 cm)	4 in (10.2 cm)
MULCH	1-1/2 in (3.8 cm)	2-1/2 in (6.4 cm)
BIOMASS/BIOFUEL	1/4 in (6.4 mm)	4 in (10.2 cm)





Cowart uses trommel screens to separate the compost into three different main blends. Those blends are then bagged and distributed through retailers. For Cowart's bulk customers, they will customize their mix ratio and currently produce around 400 different blends.

Business spotlight: Cowart, Inc.

Georgia-based Cowart Inc. produces compost, soil blends and mulch products in bulk. At the company's composting facilities, a wide range of organic waste is accepted, including food waste. The company uses Vermeer CT718 compost turner almost daily to add food waste to compost windrows efficiently. Cowart also employs several Vermeer tub grinders, horizontal grinders, trommel screens and mini skid steers. Owner Chris Cowart said optimizing their equipment fleet helps them control their operating costs and produce higher quality products.





WasteAway's setup creates the right size material for their biomass needs and helps separate nails and other debris, while still giving them a production rate of 200 yards per hour to 250 yards per hour (182.9 m/hr to 228.6 m/h).

Business spotlight: WasteAway Recycling & Environmental

WasteAway Recycling & Environmental in Kitchener, Ontario, uses a Vermeer HG6000 horizontal grinder with the Damage Defense system at their wood waste recycling facility. The company set up the grinder to produce biomass material under 3 inches (7.6 cm) using a hex shape screen. Damage Defense was added to the grinder because incoming material contained nails and other debris. The system has helped optimize WasteAway's productivity and reduce maintenance, as well as parts and service costs.

Help protect equipment from potential contaminate hazards

Metal can cause significant damage to grinders and shredders if it's not caught ahead of time. Presorting material and a watchful operator's eye can help prevent this. However, investing in a system that detects metal contaminates ahead of time can help provide additional protection. Horizontal and tub grinders equipped with the Vermeer Damage Defense system will automatically idle the engine down, reverse the infeed or tub and disengage the clutch when certain metal contaminants comes in contact with the machine's hammermill. Then when the contaminant is cleared, regular operations can resume.

Next steps

This paper should give you a good start at understanding all your options for recycling wood waste at your facility. Recycling wood waste is environmentally friendly. If you need help getting started, contact your Vermeer Recycling & Forestry Specialist at your local Vermeer dealer. You can also learn more about Vermeer recycling equipment by visiting vermeer.com.

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