

Section X:

Byproduct Utilization

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The economic disposal of wood residue, or non-lumber products (e.g. sawdust, short pieces of lumber, edging strips, etc.), is one of the most difficult problems within the wood products industry. Businesses are faced with few choices for disposal, let alone cost effective ones. Disposal by open burning, cheap landfilling, pushing over the side of the hill and other practices are no longer legal. Further, disposal of wood ash is more costly than in the past. Therefore, finding markets for these non-lumber products can be profitable.

Check with your local regulatory agency for utilization of 'contaminated' woods (e.g. woods with glues or laminate). For instance, in Wisconsin, wood residue from products such as particleboard, can sometimes be landspread, UNLESS it has plastic in it (laminated or epoxy glues). See Appendix A for contacts.

From a business standpoint, it is probably wisest to make a separate business to produce and market specialty products from the residues and by-products of the main company. Such a separation also allows different management styles and techniques to be used and may prove helpful with financial liability. A separate company on a separate site would keep the sawmill or main manufacturing facility from becoming a retail yard and eliminate the associated safety concerns from having customers walking all over.

Fuel

By far, the primary use for wood residue will be burning for energy.

Green residue, at 75 percent moisture content (MC), produces approximately 7 million BTUs of useable heat per ton. (Note: This ton of residue contains 1142 pounds of wood and 858 pounds of water). If the water is reduced to 114 pounds (10 percent MC), making 1142 pounds of wood, or 1256 pounds of residue, then there would be an increase in available heat—8 million BTUs. Because you need nearly .7 million BTUs to dry the wood, the effort appears to be a wash. Dry residue, such as planer shavings, produces about 13 million BTUs of available heat per ton, with 1818 pounds of wood and 182 pounds of water (10 percent MC).

While energy costs remain fairly stable in the 1990's at \$6 per million BTUs, the net value for burning wood as fuel, on-site with no transportation costs (after subtracting typical handling and storage costs), comes in at \$4 per million BTUs. The table below compares burning green vs. dried residue.

Dr. John Diebel, Michigan Tech University, has laid out some important concepts for dealing with wood product residues:

- C Visit your neighbors wood-using plants.**
- C Visit local plants that are not forest products oriented.**
- C Look for opportunities to solve other people's problems.**
- C On business trips, visit nurseries, industrial supply houses, toy manufacturers, poultry producers, packing houses, pet stores, and so on and find out who is their supplier of wood and why they deal with this company.**
- C Ask adhesive sales people about leads for companies gluing small pieces.**
- C Can local industry use your material for packaging or crating?**
- C Contact your local university for marketing assistance; contact your local small business development center.**
- C How can you product differentiate itself from similar products?**
- C Think globally, but act locally in researching market opportunities.**

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	Fuel value/ton	Cost/cu.ft.	Density: lbs/cu.ft
Green residue	\$28	\$.49	35
Kiln dried residue	\$58	\$.50	20

You have the same net heat value for kiln dried versus green residue, but per pound, you get more fuel value with kiln dried residue. Therefore, if you burn in higher amounts (tons), the savings become more apparent. You may also choose burning dry residue because of handling issues and it burns better in your model burner. See Section IV, Improve Dry Kiln Efficiency.

Compressed logs

Wood compressed into logs with wax added have many advantages, including less smoke (pollution) and carbon monoxide emissions. Higher heat per log (three times more than a stick of “natural” wood) make them attractive. Much of their success depends on good packaging and marketing. There are probably 25 manufacturers in the U.S. now, but air pollution controls on regular firewood burning could increase the market potential for these pressed wood products.

Charcoal

Sold as briquettes, charcoal has a more limited market for new manufacturers as there are a few industries dominating this market currently. There is some potential for innovative products such as easy lighting briquettes. Breaking into larger markets is not likely, but some local market niches could be developed, especially in charcoal for filters and other non-burning uses.

Wood Briquettes

Briquettes made from wood is a newer idea that may develop. They do not require starter fluid and may have environmental appeal to the consumer.

Cooking Wood

This is chunks of chips of wood, used in cooking. Common woods to use are mequite, alder, apple, cherry, maple, pecan, and hickory. They are sold as flavor enhancers in wood cooking. Typically, the profit is small per pound of wood, so larger operations are required to become profitable.

Wood Pellets

Pellets from wood must be low in moisture content and may be more of a specialized market with little or no long-term options. People use these for central heating wood-fired furnaces. (Anyone who remembers the old coal stoker furnaces can appreciate why wood pellets at any price are nowhere as nice as natural gas!)

Pulp

Wood chips from slabs, edgings, and trims are often used for pulp. Pulp chips will be an alternative disposal for residues but will never be profitable.

Pulp Market

This market will probably always exist and thrive if

- C harvest of softwoods are curtailed,**
- C chip harvesting of hardwoods is restricted, and/or**
- C the demand for paper from other countries increases.**

At times, there is a surplus of raw material for pulping, and so the sale of chips from sawmills is often cutoff or restricted. Plus, with so many small mills, the ability of the sawmill industry to control prices and demands for shipment is minimal, at best.

Composite Products

Occasionally, sawmill residues have been sold for particle board or other composite products. However, there is a trend within the board industry to make lighter weight boards; oak and other dense hardwood residues are no longer so desirable because of this.

Animal Bedding and Soil Amendment/Conditioner

Chips, shavings, and sawdust, especially from pine, cedar, cottonwood, aspen, and basswood, can be used for animal bedding and litter products. (There are over 12,000 pet stores in the U.S.)

- ! pine is probably the most common species;
- ! cedar odor is well known by pet owners;
- ! cottonwood is respected for its cleanliness.

In general, the lighter weight woods are more absorbent than the heavier species.

Wood contains no appreciable fertilizer chemicals including nitrogen. As a result, although wood can be mixed with soils and will improve the tilth of the soil, the action of bacteria in the decomposition of the wood ties up much of the available soil nitrogen, creating a condition, for any plants growing on the wood fortified soil, called “nitrogen starvation.” Ammonium nitrate (100 pounds per ton of wood) can be added to the soil offset this effect. Pre-decomposition or composting before spreading the wood is an alternative as well. (Note: This residue must be 100 percent wood with no waxes, glues, finishes, etc. Always check with appropriate state officials to make sure there are no restrictions).

An attractive solution for the nitrogen starvation problem is to use the wood as animal bedding prior to spreading on the soil. Wood bedding helps significantly reduce manure runoff and also helps control odors. After use as bedding, the wood/manure material is spread as a soil amendment, with the manure providing the nitrogen needed for decay by bacteria. The addition of 50 pounds of superphosphate is suggested as it “locks” the nitrogen from the manure into the soil rather than letting it leach out.

Dry wood (usually around 12 percent moisture content; drier gets dusty), especially planer shavings, is desired for poultry bedding and some domestic animal bedding. Although the smell from cedar makes it the most desired wood for home pet care, other species can be used. The freedom from splinters and the clean smell of aspen and cottonwood make them desirable for some animals, including mink.

Wood mulches are sometimes used, although bark is the more favored material. Various colored dyes can be used on the wood to give them more “eye appeal,” for example, a gray color to the chips and chunks, makes them look “aged.” The larger the pieces, the better they withstand wind blowing and the slower they decay, avoiding any nitrogen starvation problems.

Wood chips, sawdust, and bark can be used as bulking material in composting sewer sludge. Check state regulations.

Animal Feed

Ruminant animals can easily derive energy from cellulose, a major component of wood. However, in most wood, the cellulose is surrounded by another chemical, lignin, that makes wood extremely indigestible. However, certain species, most notably aspen, has been shown to be highly digestible by ruminant animals. In fact, elk often browse on aspen twigs and sprouts in the winter, achieving a food value equal to medium quality hay. Perhaps compacted aspen (pellets, for example) could be developed as an emergency food supply for wild animals such as elk when natural supplies are scarce. The use of wood for cattle intended for human consumption is questioned by some because of the concern for the safety of the meat.

Packaging

Wood has long been used for fruit berry boxes and crates. Excelsior was often used for cushioning material. Plastics products have substituted for wood over the years. However, with the growing environmental consumerism, wood packaging may again be the material of choice. Wood is a biodegradable packaging material. Look for companies interested in developing environmentally sensitive materials.

Specialty Products

Many of the byproducts of lumber manufacturing can be the raw material for a variety of specialty wood products, including the needs of woodworkers. A list of some of the many potential products is provided in the following table.

A Wisconsin wood manufacturing firm has baskets of dried trim pieces that are sold in a retail outlet for \$.25 to \$.50 a pound. Many mills have found that short pieces of lumber can be dried and sold to schools and hobbyists for \$3 per BF.

Specialty Wood Products Potentially Made from Sawmill Residues		
Almond knockers	Flooring	Plaques and Trophies
Arrows	Game Calls	Playground Equipment
Bats	Gavels	Pool Cues
Baskets	Golf Club Heads	Pulley Blocks
Battery Separators	Gunstocks	Molding
Bean Shooters	Hammer Heads	Reels and Spools
Bee Keeping Supplies	Handles	Rollers
Bird Feeders	Hay Forks	Rolling Pins
Bird Houses	Knobs and Handles	Rulers and Yardsticks
Board Games, incl. Chess	Lamps and Parts	Seats--Toilet, Sauna, Others
Bowls	Landscape Floral Planters	Shoe Trees
Butcher Blocks	Lath and Slats	Signboards
Candlesticks	Lattices	Signs
Canes/Walking Sticks	Letters and Numerals	Snow Fences
Carvings	Mallets	Spokes
Clack Cases	Mashers, Potato	Stakes (Tree and Garden)
Clothes Hangers	Novelties and Toys	Toys
Clothespins	Nutcrackers	Trays
Clubs	Paddles and Oars	Trellises
Craft Wood	Paint Stirring Sticks	Wood Snow Scoops
Croquet Sets	Pallets and Skids	Wood Burning
Cutting Boards	Patio Steps	Wood Jewelry
Decoys	Picnic Tables	Woodenware
Dowels	Picture Frame Materials	Woodworker's Lumber
Fence Rails		

Source: U.S. Forest Products Laboratory

Checklist: Byproduct Utilization

The following suggest ways to use your wood residue:

Slabs

— resaw into short pieces

Edging Strips

— remanufacture into small pieces of lumber

End Trim

— short lumber

Wood Sawdust

— fuel

— color chips for mulch

— soil amendment

Chips

— fuel

— pulp

— bedding

— mulch

— soil amendment

Defective Lumber

See listing of specialty products above.

Using Sawdust and Shavings for Absorbent Qualities (Source: U.S. Forest Products Laboratory)

Bedding: Stables and Cattle Pens	
Sawdust	Green or Dry
Shavings	Green or Dry
Species	White pine, basswood, ponderosa pine, and other softwoods and hardwoods
Specifications	Soft, absorbent, non-resinous woods preferred. Woods containing tannins not desired.
Users or Purchasers	Chiefly farmers and dairies
Market Location	Countrywide
Economical Shipping Distance	50 miles
Annual Consumption	Large
Remarks	Use subject to expansion to utilize valuable liquid stable manure commonly lost

Bedding: Laboratory Animal Cages	
Sawdust	Dry
Shavings	Dry
Species	Southern pine, true firs, birch, maple, beech
Specifications	Fine shavings, soft, absorbent, non-resinous woods preferred. Woods containing tannins not desired.
Users or Purchasers	Hygiene and clinical laboratories via dealers
Market Location	Countrywide
Economical Shipping Distance	Nationwide
Annual Consumption	Small
Remarks	May need sterilization. Particles smaller than 20 mesh cause infant mortality in rats.

Bedding: Kennels	
Shavings	Dry
Species	Eastern red cedar
Specifications	Dry shavings.
Users or Purchasers	Sawdust dealers
Annual Consumption	Small

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Floor Covering: Factories, Fish Markets, Garages, Hotel Kitchens, Machine Shops, Meat Markets, Packing Plants, Tanneries, Taverns, Vegetable Markets, Warehouses	
Sawdust	Principally dry sawdust used
Shavings	Some shavings accepted
Species	“Box Shop,” a mixture of hardwoods and softwoods as produced at box factories, furniture factories, and other woodworking plants.
Specifications	Dry, nonresinous, lightweight species preferred
Users or Purchasers	Sawdust dealers or directly from producer.
Market Location	Many urban centers
Economical Shipping Distance	Local
Annual Consumption	Relatively large
Remarks	Absorbents are perhaps the greatest single outlet for dry sawdust from small mills. Green sawdust should be acceptable in some cases.

Grasshopper Bait	
Sawdust	Green or Dry
Species	Ponderosa pine, cottonwood
Specifications	Weathered pine (2 years), green or dry cottonwood.
Users or Purchasers	Government and local authorities
Market Location	Northern Plain States
Economical Shipping Distance	500 miles or less
Annual Consumption	Small
Remarks	Poisoned with arsenic. Used only in critical years.

Leather Working	
Sawdust	Dry
Species	White pine or other lightweight, light-colored, non-staining woods
Specifications	Soft, clean, non-staining species
Users or Purchasers	Tanneries
Economical Shipping Distance	Local

Mulch/Soil Conditioner	
Sawdust	Green or Dry
Shavings	Green or Dry
Species	Mixed; may include bark.
Specifications	Low extractive content preferable
Users or Purchasers	Farmers and nurseries, landscapers, architectural firms
Market Location	Rural areas for agricultural uses, municipalities for turf grass uses
Economical Shipping Distance	Local
Annual Consumption	Medium, expanding
Remarks	Should be combined with or used as a carrier of fertilizing matter; improved by composting.

Signal Rockets and Fireworks	
Sawdust	Dry
Specifications	Sifted, fine, for impregnating chemicals
Economical Shipping Distance	Local
Annual Consumption	Small

Mud Control	
Sawdust	Green or Dry
Shavings	Green or Dry
Species	Mixed softwoods and hardwoods
Users or Purchasers	Construction companies
Market Location	Countrywide
Economical Shipping Distance	Local
Annual Consumption	Small

Using Sawdust and Shavings for Abrasive Qualities (Source: U.S. Forest Products Laboratory)

Cleansing Soaps	
Sawdust	Dry
Species	Softwoods preferred
Specifications	Screened to 36 mesh
Users or Purchasers	Specialty manufacturers, paint works, garages, machine shops, factories
Market Location	Countrywide
Economical Shipping Distance	Local
Annual Consumption	Small
Remarks	Absorbent qualities also beneficial in removing grime from hands

Floor Sweeping Compounds: Commercial	
Sawdust	Dry
Species	Any species
Specifications	Dry stock sifted to 16 to 20 mesh or finer. Light-colored, lightweight woods preferred.
Users or Purchasers	Made and distributed by numerous oil, chemical, and janitor supply companies for use in schools, stores, office buildings, and the like.
Market Location	Many urban centers
Economical Shipping Distance	Up to 300 miles
Annual Consumption	Moderate amounts
Remarks	Green sawdust used in one type now being tried.

Floor Sweeping Compounds: Household	
Sawdust	Green
Species	Any species
Specifications	Dry stock sifted to 16 to 20 mesh or finer. Light-colored, lightweight woods preferred.
Users or Purchasers	Householders
Market Location	Countrywide
Economical Shipping Distance	Local

Floor Sweeping Compounds: Household	
Annual Consumption	Small
Remarks	As a dust retardant for sweeping basement floors; as a material for sprinkling on icy steps; domestic outlets in small but numerous lots are possible.

Fur Working: Cleaning	
Sawdust	Dry
Species	Kiln-dried sugar maple, a little birch, and a small amount of softwood
Specifications	Forty mesh maple (cleaning), 16 to 36 mesh for dressing and dyeing
Users or Purchasers	The fur manufacturing trade concentrated in New York City; also numerous cleaners elsewhere. Users usually supplied by sawdust dealers.
Market Location	Dressing and dyeing industry, chiefly in New York City; cleaning in all cities.
Economical Shipping Distance	1,000 to 2,000 miles
Annual Consumption	Moderate amounts
Remarks	Stock coming largely from maple flooring plants

Metal Finishing: Cleaning, Drying, Polishing (from pickling bath, plating solution, lathes, machines, and the like)	
Sawdust	Dry
Shavings	Dry
Species	For cleaning, drying and polishing plated ware, kiln-dried sugar maple is preferred. For other cleaning and drying, light soft woods are desirable. Species of high tannin, resin or acid content not acceptable.
Specifications	Platers' sawdust is dry hard maple 16 mesh and finer. Often screened to get uniform size and free of chips.
Users or Purchasers	Sawdust dealers
Market Location	Industrial Centers
Economical Shipping Distance	Usually supplied from local plants
Annual Consumption	Moderate amounts
Remarks	Used chiefly in tumbling drums

Poultry Picking	
Sawdust	Dry
Species	Lightweight species

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Poultry Picking	
Specifications	Sifted, fine
Remarks	Believed to be only occasional use

Synthetic Abrasives: Carborundum	
Sawdust	Green
Users or Purchasers	Manufacturers of abrasives
Market Location	Eastern cities, New York, New England, Niagara Falls
Annual Consumption	Small

Using Sawdust and Shavings for Bulk Qualities (Source: U.S. Forest Products Laboratory)

Circus Rings and Riding Stables	
Sawdust	Green or Dry
Shavings	Dry
Species	Mixed
Users or Purchasers	Regular dealers and riding stables
Market Location	Circus towns
Economical Shipping Distance	Local
Annual Consumption	Medium

Clay Products-Special: Porous Brick and Tile	
Sawdust	Green or Dry
Species	Species not important
Specifications	Often sifted for uniform size
Users or Purchasers	Specialty manufacturers
Annual Consumption	Relatively small
Remarks	For reducing density and weight

Composition Flooring	
Sawdust	Dry
Shavings	Dry
Species	Hardwoods or mixed hardwoods and softwoods
Specifications	Varied, usually dry, soft species, non-staining, non-acid, four to 50 percent as filler. Coarse softwood base. Fine hardwood top. Usually sifted for size.
Users or Purchasers	Limited commercial experimentation
Annual Consumption	Small
Remarks	Used with various cements to give insulating and resilient properties.

Molded Novelties	
Sawdust	Dry
Shavings	Dry
Species	Lightweight hardwoods and softwoods

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Molded Novelties	
Specifications	Dry stock, ground to proper fineness. Must be clean.
Users or Purchasers	Furniture parts and novelty producers
Economical Shipping Distance	CA: 100 miles
Annual Consumption	Moderate
Remarks	Plaques, novelty jewel cases, furniture ornaments, etc.

Packing: Glass, China, Canned and Bottled Goods, Metal Ware	
Sawdust	Dry
Shavings	Dry
Species	Various species, but low density preferred
Specifications	Non-tannic or non-acidic species for packing metal ware. Light-colored, light weight, soft absorptive stock preferred. All stock dry and clean.
Users or Purchasers	Shippers of liquids, glass, china, and other fragile items
Market Location	Widely dispersed
Economical Shipping Distance	Local
Annual Consumption	Moderate
Remarks	Wood flour used for plate glass to protect surface from scratches

Packing: Building Stone	
Shavings	Dry
Species	White pine, basswood, ponderosa pine
Specifications	Light-colored, light weight, non-staining stock
Users or Purchasers	Shippers of building stone
Market Location	Indiana, New York and other quarrying regions
Annual Consumption	Small
Remarks	Packed between finished stone on flat cars, and the like

Packing: Grapes, Fruit	
Sawdust	Dry
Species	Spruce, Douglas-fir, white fir
Specifications	Cubical stock, air-dried, clean, sifted

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Packing: Grapes, Fruit	
Users or Purchasers	California grape growers
Market Location	Central and southern California
Annual Consumption	Few thousand tons
Remarks	Often made specially by cutting

Packing: Nursery Stock	
Shavings	Dry
Species	White pine, Ponderosa pine and other light-colored, light-weight woods
Specifications	Soft, absorbent woods, chiefly shavings and shingle tow.
Users or Purchasers	Nurseries
Market Location	Countrywide
Remarks	Packing about roots of plants, shrubs, and the like, in shipping

Plaster Board	
Sawdust	Dry
Shavings	Dry
Species	White pine, Ponderosa pine and other light-colored, light-weight woods
Specifications	Medium-coarse stock of species listed. Must be non-staining and non-acid.
Users or Purchasers	Certain plants making plaster board
Annual Consumption	Several thousand tons
Remarks	Usual mix four to five percent by weight is being replaced by foaming compounds

Sawdust-Cement Concrete: Cast Blocks and Panels	
Sawdust	Green or Dry
Species	Permissible species not definitely established. Spruce, red pine, jack pine, and aspen reported satisfactory. Leached stock of other species may be satisfactory. Woods said to be avoided: cottonwood, oak, birch, maple, Douglas-fir, western red cedar
Specifications	Large, coarse, hard particles of woods having no detrimental extractives. (Extractive content and decay are factors affecting setting of the cement)
Users or Purchasers	Building contractors
Remarks	For interior use only; includes ceratin patented formulas and special trade names.

Wood Flour: Special Types for Burn-out Mesh in Ceramics	
Sawdust	Green

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Wood Flour: Special Types for Burn-out Mesh in Ceramics	
Shavings	Green
Species	Southern pine
Users or Purchasers	Some manufacturers of firebrick and ceramics
Market Location	A few limited locations
Annual Consumption	Relatively small

Wood Flour: Usual Types	
Sawdust	Dry
Shavings	Dry
Species	White pine, Ponderosa pine, Douglas-fir, maple, aspen, birch, hemlock
Specifications	Dry stock (nine percent moisture content and lower); softwood preferred; any size. Southern pine if low in resin.
Users or purchasers	Specialized plants drawing waste from planing mills, box factories, millwork plants
Market Location	Scattered in different sections in East, Midwest, and West
Economical Shipping Distance	Up to approximately 500 miles
Annual Consumption	Approximately 80,000 tons
Remarks	Gradually increasing use in manufacture of plastics, and the like; use for linoleum now decreasing

Using Sawdust and Shavings for Non-conductive Qualities (Source: U.S. Forest Products Laboratory)

Concrete Protection	
Sawdust	Green
Shavings	Dry
Species	Mixed
Specifications	Non-staining species
Users or Purchasers	Building contractors
Market Location	South
Annual Consumption	Small
Remarks	Coverage to prevent too rapid drying; now largely replaced by chemical additives to mix
Thermal Insulation	
Sawdust	Dry
Shavings	Dry
Species	All species
Specifications	Dry sawdust and shavings; any kind but lightweight and light color (clean) preferred
Users or Purchasers	Builders
Annual Consumption	Moderate
Remarks	Used formerly more than now. Replaced by foam plastics, mineral fiber, and glass wool

Using Sawdust and Shavings for Granular Qualities (Source: U.S. Forest Products Laboratory)

Display Window Decoration	
Shavings	Dry
Species	Mostly specially cut; light color
Specifications	Suitable for dyeing for staining to different colors
Market Location	Urban stores
Annual Consumption	Small, occasional

Texturing Oatmeal Wallpaper, Paints	
Sawdust	Dry
Species	Any species
Specifications	Screened for size
Users or Purchasers	Specialty paper/paint manufacturers
Annual Consumption	Small