

# UTILIZATION OF OAK RESIDUES

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**ABSTRACT.** Residues should be thought of as a raw material for specific uses rather than as a waste. Fines and solid wood residues are usually kept separated in waste-collection system, but species are rarely kept separated. The properties of each species dictate what uses can be made of them. Quantity, location, cost, moisture content, physical size, and presence of foreign matter should be known if the raw material is to be marketed for a specific use. Each kind of residue has certain potentials for use. Case examples cited indicate how firms are marketing their residues.

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**S**LABS, EDGINGS, end trim, sawdust, planer shavings, and bark generated by the forest-products industry can be referred to either as *residue* or *waste*.

If residues are considered as being a waste—useless, and having no value—then they will be treated as such, to be disposed of as quickly and inexpensively as possible. The right way to treat residues is to consider them as byproducts to be used for some purpose. This is the key to the utilization of residues.

## KINDS OF RESIDUES

In making lumber, less than half of the original log is converted into the primary product at the sawmill. The rest of the log becomes residue in the form of slabs, edgings, end trim, sawdust, and bark. Residues from secondary remanufacturing include solid wood residue, sawdust, sander dust, and shavings.

Residues generated by these industries can be put into two classes. First is solid wood

residues, which include slabs, edgings, end trim, and lumber scraps that are not designated for paper chips. The second class includes the fine wood residues—sawdust, sander dust, and shavings. Bark will be treated separately.

## PROBLEMS WITH UTILIZING

One difficulty in the use of oak residues is that they are rarely kept separate from the residues of other hardwood species being manufactured. Sawmills and wood-manufacturing firms normally process species separately, but their residue-collection systems are not designed to keep the residues segregated by species. However, there are firms that specialize in processing and manufacturing oak products exclusively, or a major portion of whose production is in the oaks species group. This facilitates marketing the oak residues as a single species group. Unless a specific market is developed that would pay a premium price to warrant separating oak from other hardwood residues, I doubt

that operators would take the time and trouble to do this.

Certain problems are inherent in utilizing and marketing wood residues. These range from the properties of the species themselves to the general economic situation. For example, certain properties of the oaks—such as high tannic acid content, dark color, and disagreeable odor when wet—make them unsuitable for commercial uses like wood flour.

### **Condition of Raw Material**

The condition of the residue material will dictate whether it can be used in its present form or will have to be altered in some way to make it marketable. Consider:

*Quantity.*—What volume is available on a continuous basis? Will it be too much or too little to supply a market outlet? If too little, can other sources of similar material be obtained?

*Location.*—Where is the source of the material in relation to the market outlet? Very often the supply is too distant from the market outlet. Transportation cost often exceeds the value of the market price for the material.

*Cost.*—Is a value assigned to the residue itself? If so, is it a minus, zero, or plus value? If a plus value, will it be too high with the added costs of processing (if necessary), handling, and transporting to a market outlet to make it noncompetitive or unmarketable?

*Moisture content.*—Is the material green or dry? If green, will it have to be dried to sell? Can the drying costs be recovered in the selling price, or will the added cost of drying make the finished product noncompetitive or unmarketable?

*Particle size.*—Size of particles has a bearing on the uses that can be made of residues. For example, sander dust cannot be used in foundry molds: it is too fine. It may have a use as wood flour, extender, or filler in adhesives and plastics, or as an additive in a molded product. The fine sawdust particles from a bandsaw can be used by the carbon industry, but sawdust from circular saws is too coarse. Coarse and fine sawdust particles are being experimented with as a roughage in feed mixes for cattle. Perhaps one size of particle will

be preferable over the other. Solid wood scraps may have to be hammermilled, hogged, or ground to a certain size to be marketed. The cost of processing has to be recovered in the sale price.

*Foreign material.*—Soil, grit, and stones are present in bark residue. This foreign matter makes the residue unsuitable for use as a boiler fuel because of excessive clinkering and glazing of fire grates. Ponding or washing logs would reduce this problem. There probably is a technique for removing this material from the bark residue, but the expense may be too high to make it practical.

*Species.*—Certain species are in higher demand than others. A combination of birch, beech, and maple have ready markets for some purposes.

### **Other Considerations**

Once the raw-material conditions are known and evaluated in relation to the market outlet, then a reasonable estimate can be made to determine the profitability of processing the material and transporting it to market.

Several intrinsic factors make utilizing residues difficult. One is the relatively low value associated with the products. Because most residues do not command a high price in the market place, they cannot be transported too great a distance. Animal bedding, for instance, is normally marketed within a 50-mile radius of the supply. On the other hand, attractively packaged bark mulch nuggets are shipped nationwide by rail for distribution to retail market outlets.

A considerable investment may be required to handle, process, bale, package, transport, and market residues. This can be undertaken by the firm that generates the residue, or by an independent firm specializing in processing and marketing residues. Assistance from brokers, wholesalers, and consultants may be necessary.

Sawmills and secondary remanufacturing firms should have certain basic equipment for handling and storing residues for marketing. They would need a bucket loader, an elevated storage bin, an open or closed pole-type storage shed, large tandem dump-

or flat-bed trucks, and possibly mechanical conveyors and blowers. Waste-collection systems may have to be altered to make residues available for market. Unless a reliable market for the residues is assured, these firms are reluctant to discontinue their present methods of disposal by burning and dumping and to invest in additional equipment for processing and handling residues.

### CASE EXAMPLES

Perhaps more than anything else the aggressiveness and ingenuity of the individual faced with a residue-disposal problem are the key marketing factors. Other less aggressive firms may be forced into action because of the enactment and enforcement of state laws against dumping and burning. Several firms have faced this problem and have taken the necessary steps to market their residues. Others have been farsighted enough or have seen the profit potential for marketing their residues and are doing this. Several case examples are outlined below to give an idea of how some mills are marketing their residues.

#### ***Pallet Manufacturing Firm***

This plant generates about 30 tons of green hard maple and beech lumber scraps and 75 tons of green sawdust and shavings per week. Their former method of disposal was to convey and blow all their waste into a wigwam burner.

Their first step was to erect a bin for the sawdust and shavings to be sold to local dairy farmers as bedding. But experience indicated that only a small percentage of the material could be used in this way, and the rest had to be burned. In addition, slow demand for the bedding material during the off season made the bin useless for extended periods of time. Enforcement of the air-pollution laws against burning has caused this firm to increase its efforts to market their residues.

The next step they took was to purchase a 5-ton stake-body dump truck and equip it with a blower to deliver sawdust and shavings to local dairy farmers for bedding (fig. 1). Economical trucking distance for this size truck is about 25 to 50 miles. They are thinking about purchasing a 20-ton truck and equipping it in the same manner

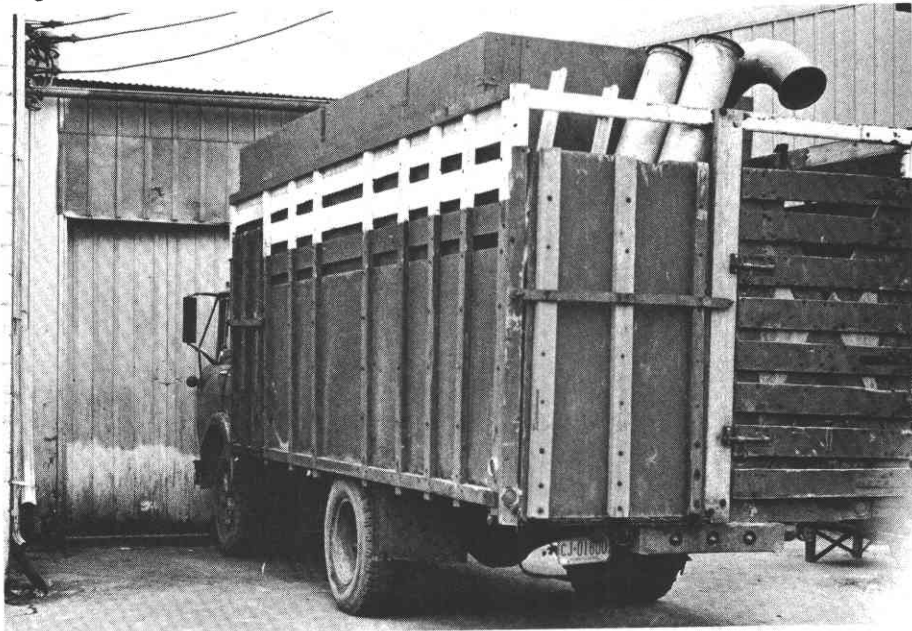


Figure 1.—A 5-ton stake-body truck equipped with motor and blower for delivering sawdust and shavings to local dairy farmers.

to extend their marketing radius to 100 to 150 miles.

They have worked closely with the county agent to advise local dairy farmers about the availability of the residues for bedding. They also have exhibited at an agricultural field day and have advertised in farm journals and local newspapers. Income from the sales is paying for the initial investment and allows a small margin of profit.

Competition from local sawmills has made it difficult to enlarge this market. The firm has had little success with other means of utilizing the residues, such as baling or packaging them for retail sales as a mulch, or the manufacture of pulp chips. They are searching for a suitable dumping site for their sawdust and shaving accumulations where these residues may be reclaimed for future use.

### **Medium-Size Sawmill**

This sawmill generates about 30 tons of green oak bark and 40 tons of green mixed hardwood sawdust per week. In past years all bark was dumped at the mill site and the sawdust was stockpiled in an open pole-shed storage building. The sawdust was marketed to local dairy farmers for bedding.

Markets for these residues has completely altered this past year. All sawdust is being trucked by van to the Buffalo area for the carbon industry. In addition, this mill is buying sawdust from several other local sawmills for this market. The supplying mills have erected bins to facilitate loading the van (fig. 2).

Bark is now being shredded and blown into an open pole-shed storage building (fig. 3). It is loaded by a bucket loader and is trucked to local dairy farmers for bedding. Use of bark as a bedding material is being cautiously accepted by the farmers. Their main complaint is the dark color, which makes the bedding area look dirty and unattractive.

Several other markets for the shredded bark are being investigated. A large local nursery will be using the material this spring after it has aged for several months.



Figure 2.—A large steel tank used as a sawdust bin to load an open trailer van. Sawdust is trucked to Buffalo for the metallurgical industry.

It is being considered as a mulch for strip-mine reclamation projects and as an industrial boiler fuel. The sawmill owner has experimented in baling bark with a conventional hay baler, but had little success. The material would not compact so it could be held together with baler twine.

### **Bark Mulch Processing Plant**

A centralized bark-processing plant was established last year to manufacture shredded hardwood bark mulch for the home consumer market. It was designed and located to procure bark from three to four local sawmills. The predominant species being used are oak, cherry, and hard maple.

The raw bark is trucked by the mills to the processing plant in tandem dump-trailer loads. This bark is then stockpiled for a period of several months to allow it to age before processing. One of the principal

suppliers is reclaiming bark from a dump pile; the other purchased a tandem dump trailer and is diverting his bark from a burner waste conveyor to the truck. This is a good example of how burning may be eliminated and the material may be utilized for a useful mulch product.

The aged bark is processed through a hammermill, after which the fines are screened out by passing the shredded bark over a  $\frac{3}{8}$ -inch vibrating screen. The screened material is then conveyed to a bagging hopper by a 45° idler belt conveyor. The open-mouth bags are filled by an inclined screw conveyor, using a preset limit switch (fig. 4). The 3-cubic-foot bags are then heat-sealed, flattened, and transferred to pallets.

Most of the bagged material is shipped in 800-bag trailer loads to distributors or directly to retail garden-supply outlets. Shipping distances vary from 50 to 250 miles. Smaller quantities are delivered locally

within a 50-mile radius. Buyers may pick up their orders at the plant, using their own trucks. Approximately 50,000 3-cubic-foot bags were sold during the first year of operation.

This kind of processing plant helps to alleviate the bark-residue problem the mills face, and at the same time affords an opportunity for a new business to be established. Several of these centralized bark-processing plants could be established in Pennsylvania to help reduce the bark-disposal problem. Some words of caution. The mulch product business is very competitive. The management of a bark-processing plant should have the background and knowledge of the nursery industry to successfully market the product.

### SUGGESTIONS

What is the best procedure for marketing sawmill residues? Look at it from the viewpoint of a sawmill operator who is

Figure 3.—Open pole-shed storage building for bark and sawdust. Bark is shredded and blown into compartment on left. Sawdust is blown into compartment on right. Material is loaded into open trailer van with 2½-cubic-yard rubber-tired bucket loader.



generating bark, sawdust, slabs, edgings, or end trim. Suppose he cannot dump or burn at the mill site and must market (or dispose of) the residues elsewhere. What are the alternatives? Some suggestions are offered below.

### **Economics**

There are outlets for residues, but they must be explored. True, using the outlets may not bring in a profit, but at least the residues will be moved. The operator should know what it is costing him to dispose of the material. This cost can be equated as a negative value because there is no return for disposal.

If enough income can be realized from the sale of the residues to bring the negative cost to zero, the owner still would be reducing his costs. An additional cost may be incurred in marketing the residues, and the operator should get a return from the sales to warrant the extra expense. Of course the best situation would be where the owner realizes a profit from the sales of his residue. In many cases this is not possible.

Some day there may be a choice between either marketing the residues or going out of business. In the future this situation will become more prevalent as enforcement of

the air-pollution and solid-waste disposal laws become a reality.

### **Sawdust**

The best market outlet for sawdust is animal bedding. Several approaches may be taken to market this material. One is to work with the local county agent to locate dairy farmers within a reasonable trucking distance. Personal contact, a sales or personal letter, or advertising in local newspapers are methods that may be used to advertise sawdust for sale. More extensive marketing areas may be covered by advertising in farm trade journals and other publications. Newsletters, prepared and mailed by extension service personnel, are another means of advertising the product. A sign erected at the mill to advertise sawdust for sale or free is another means of attracting customers.

Other possible uses for sawdust are poultry litter, mulch, soil conditioner, metallurgical uses, foundry uses, wood flour, particleboard, and industrial fuel. Each use must be investigated in detail to determine if a possible market exists and if it could be exploited economically. Advertising methods and sales contacts should be handled in a manner similar to those mentioned for cattle bedding.



Figure 4.—Filling 3-cubic-foot open-mouth plastic bags with shredded hardwood bark mulch. Preset push-button limit switch is to the immediate left of the drop chute.

Examples of local uses for sawdust include insulating natural gas lines during construction and protective covering on salt and cinder piles to prevent caking. A sawmill operator was able to convince several farmers to erect their own bins at his mill and be responsible for keeping them cleaned out. The latest use for sawdust being investigated is as a roughage in cattle feed. This use has not yet been proved satisfactory. Even if there is a demand for sawdust as a feed mix, the supplying mills would have to be in close proximity to a feed mix mill. This use does not offer much hope for Pennsylvania sawmills.

### **Slabs, Edgings, and End Trim**

Marketing slabs, edgings, and end trim poses a different set of problems. Here we are dealing with solid wood residue. The best possible market outlets for this material in its present form are for firewood and charcoal. Selling solid wood residue for charcoaling has its limitations because of the location of the charcoal plants. Maximum trucking distance for this outlet would be about 150 miles. At this distance it would be only a break-even proposition.

Selling solid wood residue to the vacationist and home owner for firewood is probably the best alternative. Preparing the material for sale would help to market it. This could be done by cutting it into fire-place length and either boxing, packaging, or strapping it into bundles suitable for handling. The firewood could be ranked into salable units or piled loose. It could be

sold at the mill site by the package or bundle, or by the trunk or truck load. It could be delivered by the mill or marketed by an independent dealer. Advertising at the mill or in the local newspapers would be helpful in marketing the material.

### **Bark**

Selling bark is a new experience for most mills. In the past 5 years hardwood bark has become known and accepted as a mulching and bedding material. Mills should stockpile their bark where it can be easily reclaimed. They should keep their piles free of debris. I know of one case where a large stockpile of bark could not be used for processing into a shredded mulch because it was one big junk pile for everything discarded by the mill.

Wide-scale marketing of raw bark is not possible without further processing and packaging. Some mills sell small quantities to local nurseries, homeowners, and farmers for mulch and bedding. The minimum processing for retail sale would be to age the material for several months, screening out the larger pieces and packaging in 3-cubic-foot bags for ease in handling. Hammermilling should be done to get a uniform particle size or shred.

Specialized merchandising techniques have to be employed to market large quantities of bark mulch. This may be accomplished by the bark mulch processor, a broker or distributor of nursery materials, or a salesman hired specifically for this job. Very rarely does the sawmill owner have the time, interest, or know-how to market his entire bark product.