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# **AVAILABILITY OF WOOD RESIDUE FROM PROCESSING PLANTS IN MAINE**

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# AVAILABILITY OF WOOD RESIDUE FROM PROCESSING PLANTS IN MAINE

Craig E. Shuler<sup>1</sup> and Barry J. Kotek<sup>2</sup>

*"Conservation means the wise use of the earth and its resources."*

*Gifford Pinchot*

These words from the father of American forestry continue to be the cornerstone of our efforts in the handling of our timber resources. As pressures continually increase on our timber supply and forest land, it becomes increasingly important that our "wise use" be concerned with both efficient and economical use.

For the past several years new emphasis has been placed on two common problems: 1) reducing the amount of residue generated in the production of wood products, and 2) increasing the utilization of those residues that are generated. Improvements have been made over the years; but on a national level, considerable quantities of wood residue are still being produced. These residues may be classified into three categories: **forest residues** are unused materials left in the woods as a result of harvesting, insect and disease damage, and precommercial thinnings; **primary mill residues** result from primary processing from roundwood such as lumber and veneer production; **secondary plant residues** result from manufacturing operations such as furniture and millwork production.

In 1970 throughout the United States there were an estimated 9.6 billion ft<sup>3</sup> of forest residue, essentially all of which were unused. For that same year, there were nearly 4 billion ft<sup>3</sup> of primary mill residue with all but 1 billion ft<sup>3</sup> being utilized. Data on secondary plant residues are not generally available, but they have been estimated at about 900 million ft<sup>3</sup> per year (1, 2, 3).

On a national level these figures are quite impressive, especially considering the fact that our annual national consumption of wood products is approximately 12 billion ft<sup>3</sup>. There are, however, two important factors which should be considered before concluding that

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residue utilization is the answer to our wood supply problems. The first is that these residues often do not come in a form which our current technology can readily convert to the desired products. The second, and possibly the more important, is that these residues are often widely distributed and in a form such that collecting and concentrating them at a particular production site may not be economically feasible.

It is thus apparent that figures which are more specific than national estimates are necessary in order to determine the suitability of increasing the wood residue utilization within a certain region. To this end a survey was conducted, within the State of Maine, to gather data regarding location, availability, and types of primary mill and secondary plant residues currently being generated.

### SURVEY COVERAGE

This survey was conducted during the summer and fall of 1975. The primary intent of this survey was to evaluate the extent of a residue base to provide raw materials for a particleboard industry in Maine. An economic feasibility analysis of such an industry was also made, and this analysis will be published in a subsequent report.

Since most particleboard operations require relatively high output levels to be economically feasible, most of the plants included in the residue survey were expected to generate a minimum of 50 oven dry ton (ODT) of residue per week. This figure was arrived at by assuming a medium sized particleboard plant producing 65 million square feet (3/4" basis) yearly as a base. Average plant production figures indicate that 1.52 ODT of wood input are necessary to produce one thousand square feet (3/4" basis) (4). It was assumed that 60 percent of the required input would be residue with the remaining 40 percent being roundwood, and that any plant which could not provide at least 5 percent of the weekly residue requirement would not be included in this survey. On the basis of these values, this 5 percent requirement was calculated as 57 ODT/week.

A "rule of thumb" conversion factor of 1.1225 ODT of residue generated per thousand board feet of production was arrived at through discussion with some primary processors. Thus a production level of 2.3 million board feet per year would generate the 5 percent residue requirement. Plants to be contacted were obtained by consulting the "Maine Primary Forest Products Manufacturing Survey" which ranks individual companies according to their annual production (5). All plants which were listed in the 1000-2499 thousand board feet class and higher were included in the residue survey.

One hundred twenty-eight companies were thus selected for surveying. From the above figures it is apparent that some of these may

have generated only approximately 25 ODT of residue per week. It should also be noted that many of these 128 companies included secondary manufacturing operations also.

### SURVEY PROCEDURE

In an effort to ensure a high return of the survey forms, each of the 128 companies was initially contacted by telephone. Due to plant closings and changes in operations, the number of surveyed plants was reduced to 112. Each of these plants was then mailed a survey form. After approximately one month a follow-up letter was sent to all companies which had not yet responded. A very favorable response was obtained (76 percent) with 87 of the 112 companies supplying information for this survey.

### SURVEY RESULTS

Figure 1 depicts the results of the survey according to the type, quantity, and relative percentage of the residues that were found to be **available**. Of the 87 firms responding, 10 indicated they had no residue available and were generally in the market for residue for products and/or fuel. Forty-four firms utilized residue in some manner while half of these stated their utilization was strictly as fuel.

Sixty-seven plants were selling wood residue in some form. The results of responses to questions regarding "mill prices of the residue" were inconclusive since there was such a wide variation in end use, moisture content, and access to high demand markets. Estimates of **average** mill prices are shown below, however, for purposes of general information.

Range of Average Mill Prices (\$/ODT)		
shavings	2.40	-- 8.00
dedusted shavings	40.00	-- 60.00
sawdust	1.70	-- 6.50
(mean)		(2.57)
chips	15.00	-- 34.00
slabs, edgings		6.00
bark	1.00	- 10.00

From the comments obtained, it was apparent that competition for these residues has increased over the past few years. A large percentage of this material is now being used for fuel. Most defective products, slabs, and edgings are converted to pulp chips with smaller quantities sold as

firewood. Sawdust and shavings are used for agricultural purposes, wood flour, pulp, fuel, or in scientific laboratories after dedusting. Bark is primarily utilized for fuel although there were some instances of it being sold for mulch.

The results of this survey indicate that the quantity of actually available, or unused, wood residue is relatively low. From the surveyed plants there was an annual availability of 35,150 ODT of wood fiber (sawdust, shavings, slabs, etc.) and an additional 51,480 ODT of bark. These figures represent a sampling of approximately 25 percent of all the state's primary manufacturers and possibly as high as 75 percent of the state's total timber utilization.

Most of the available residue can be considered to be located in the following generalized county areas: central Aroostook; central and northern Penobscot; southern Somerset; eastern Franklin; northern Kennebec; Oxford. For the particleboard analysis (6), four sites were selected as possible plant locations with one of the criteria for selection being that it was within 50 miles of and somewhat centrally located to an available residue supply. Thus it was determined that 38 percent of the available residue was within 50 miles of Ashland, 7 percent was within 50 miles of Lincoln, 31 percent was within 50 miles of Anson, and 37 percent was within 50 miles of Leeds Junction (sum of percentages exceeds 100 because of overlapping areas).

### **THEORETICAL CONSIDERATION OF RESIDUE GENERATION AND UTILIZATION IN MAINE**

By employing some "logical estimates" to the annual timber harvest, it is possible to calculate the expected amounts of residue that might be generated. These values can then be compared with the results obtained in the residue survey to estimate the apparent residue utilization within the state.

#### **Conversion Factors and Assumptions:**

1. 1000 board feet mill production results in 1.1225 ODT of residue (assuming circular saw headrigs; band saws would produce somewhat less residue)
2. bark composes 11% of the volume of the log
3. 1 cord of green bark (60% moisture content dry basis) is 1 ODT
4. 1000 board feet equals 2 cords
5. bark is the only residue generated from pulpwood
6. imports and exports of roundwood are approximately equal

## RESIDUE GENERATED

## Wood Fiber Residue

hardwood <sup>3</sup>	110,000 Mbd ft x 1.1225	123,500 ODT
softwood <sup>3</sup>	480,000 Mbd ft x 1.1225	<u>538,800 ODT</u>
		<u>662,300 ODT</u>

## Bark

pulpwood <sup>3</sup>		2,490,000 cds
sawtimber <sup>3</sup>	590,000 Mbd ft x 2	<u>1,180,000 cds</u>
		3,670,000 cds

$$3,670,000 \text{ cds} \times 11\% = 403,700 \text{ cds} = \underline{\underline{403,700 \text{ ODT}}}$$

## MILLS SURVEYED

## Wood Fiber Residue

estimated combined hardwood and softwood  
mill production<sup>4</sup> 418,000,000 bd ft

estimated residue generated  
418,000 Mbd ft x 1.1225 469,200 ODT

percent of possible residue included in survey

$$\frac{469,200}{662,300} = 71\%$$

reported residue available 35,150 ODT

estimated utilization  
 $\frac{469,200 - 35,150}{469,200} = 92\%$

<sup>3</sup>Maine Timber Cut Report for 1975. Bureau of Forestry, Augusta, Maine. April 1, 1976.

<sup>4</sup>Maine Primary Forest Products Manufacturers. Bureau of Forestry, Augusta, Maine. May 14, 1975.



## Bark

mill production plus pulpwood<sup>4</sup>                      2,836,000    cds

estimated bark generated

$$2,836,000 \text{ cds} \times 11\% = 311,960 \text{ cds} = 311,960 \text{ ODT}$$

percent of possible bark included in survey

$$\frac{311,960}{403,700} = 77\%$$

reported bark available                                      51,480 ODT

estimated bark utilization

$$\frac{311,960 - 51,480}{311,960} = 83\%$$

Although both of the above utilization figures seem somewhat inflated, the bark figure appears more out of line from what would logically be expected on the basis of general knowledge and observation of wood products manufacturing within the state. There are several possible explanations for these high estimates. One would be the lack of actual measurements or records of residue generation and use by the firms responding to the survey. Also the assumptions made and the procedure followed for calculating the total residue may have tended to estimate utilization on the high side.

There are two specific factors which may affect the bark value. The first of these is that the availability estimates received may reflect an anticipated non-availability on the basis of new and planned installations of bark-fed boilers at some plants. The second factor is that the amount of bark generated is probably high since not all of the roundwood is debarked before further processing. This would definitely cause the utilization estimate to be greater than it should be.

It should also be emphasized that these figures are directly applicable only to those plants surveyed and that only those plants processing at least a million board feet a year were included. Consequently, the timber not included in the survey is processed by the smaller operations which often tend to be less efficient in both manufacturing and utilization. It is possible, therefore, that very little of the residue generated in those operations is utilized. Recalculating the utilization figures on a statewide basis with these considerations in mind results in a wood fiber residue

utilization value of approximately 70 percent and a bark utilization value of between 50 and 60 percent.

### SUMMARY

1. Approximately 25 percent of Maine's primary forest products manufacturers were surveyed regarding the types and quantities of wood residue which were available for sale or utilization.

2. The output of the 87 firms responding to the survey is estimated to represent approximately 75 percent of the state's total production.

3. From the plants responding to the survey it is estimated that 90 percent of their wood fiber residue generated each year is currently being utilized for pulp, agricultural purposes, fuel, or other products. About 80 percent of the bark they generate is being utilized, primarily as fuel.

4. In adjusting the percent utilization figures to take into consideration operations beyond those surveyed, it is estimated that the statewide figures are at least 70 percent for wood fiber residue and between 50 and 60 percent for bark.

5. The types and quantities of residue which the responding plants reported as presently being unused are as follows:

Type of Residue	Annual Availability in	
	Oven Dry Tons	or Cubic Feet
softwood sawdust	15,800	1,266,000
hardwood sawdust	6,300	505,000
mixed sawdust	600	48,000
softwood shavings	4,800	384,000
hardwood shavings	100	8,000
slabs, edgings, def. prod.		
softwood	6,400	513,000
hardwood	1,200	96,000
	<hr/>	
wood fiber	35,200	2,820,000
	<hr/> <hr/>	
softwood bark	34,400	2,755,000
hardwood bark	9,800	785,000
mixed bark	7,200	577,000
	<hr/>	
bark	51,400	4,117,000
	<hr/> <hr/>	

6. Increased utilization of this residue should be encouraged, but this may be limited by the quantity available and its geographic distribution.

7. It should be emphasized that this survey did not attempt to include forest residues. If national figures hold true for Maine, then these forest residues may be 10 times greater than the unused manufacturing residues. Thus this category may offer a greater possibility for providing significant quantities of material to our resource base if questions concerning the economics of collection and handling can be answered.

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**TOTAL RESIDUE AVAILABLE ANNUALLY - 86,600 Oven Dry Tons**

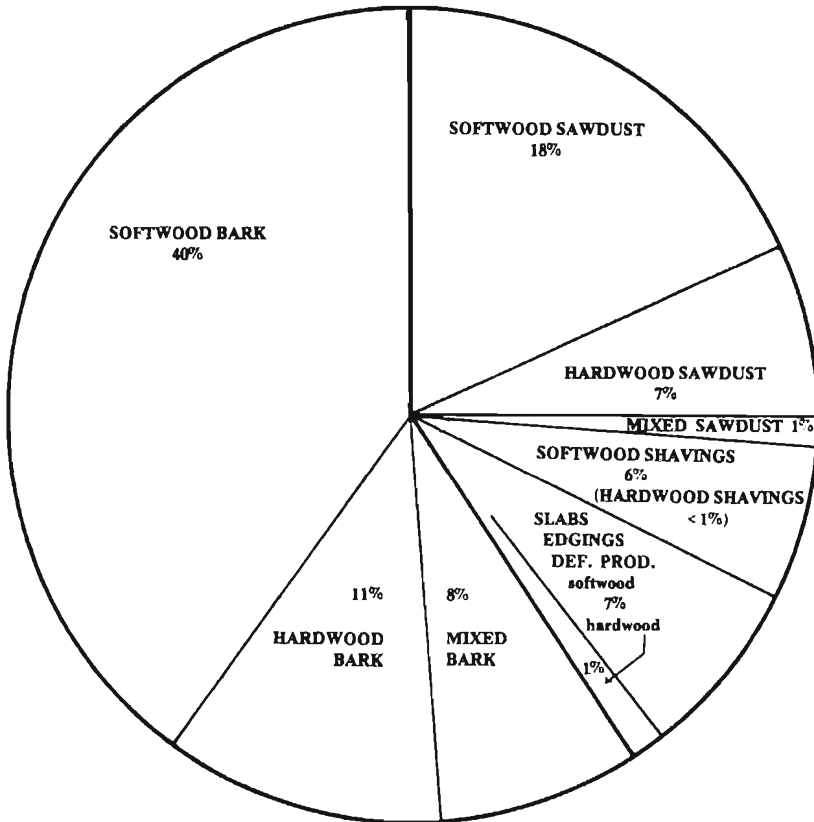


Figure 1. Availability of Wood Residues from 87 Manufacturing Plants in Maine.