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PARTICLEBOARD, MEDIUM-DENSITY FIBERBOARD, AND MENDE PROCESS BOARD PLANTS IN THE UNITED STATES—

CAPACITY, PRODUCTION, AND RAW MATERIAL TRENDS, 1956-1976

Resource
Bulletin
FPL-6

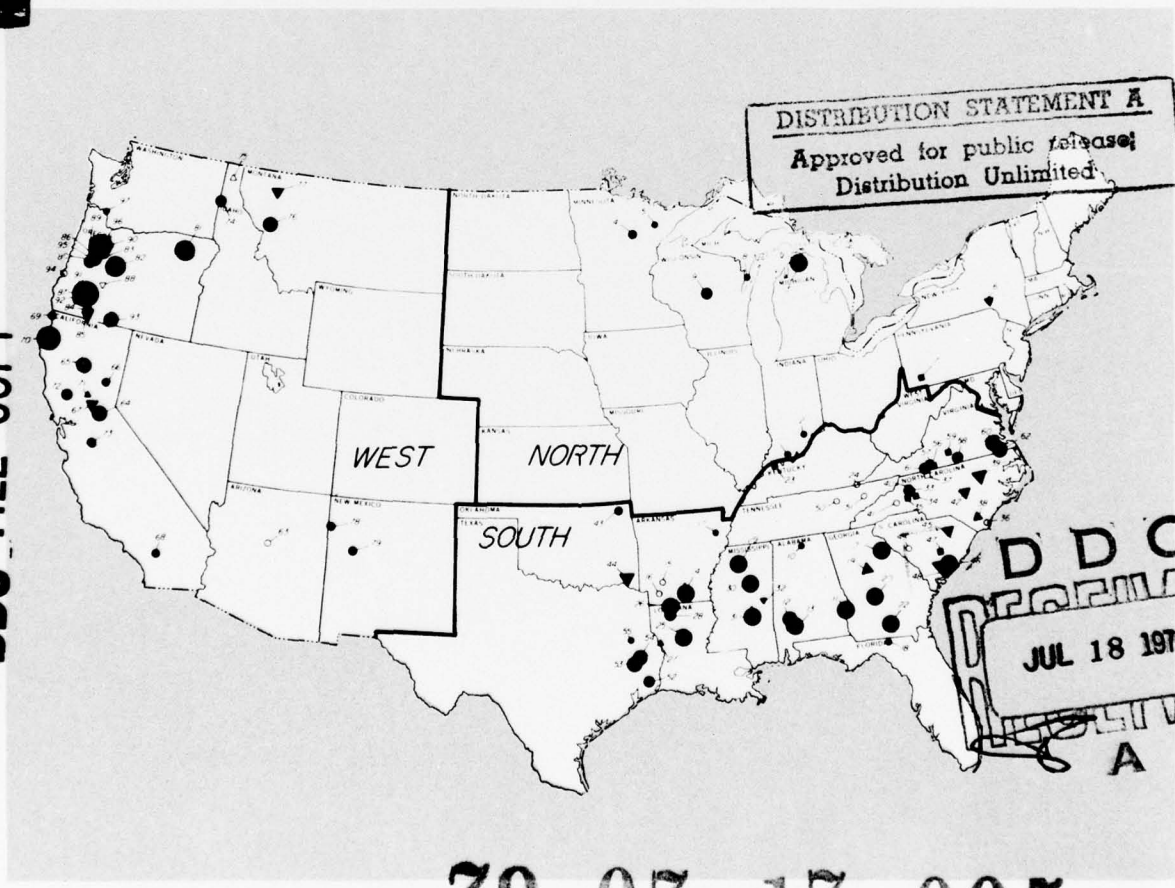
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Forest Products Laboratory
Forest Service
U.S. Department of Agriculture

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Abstract

This report provides estimates of plant capacities for particleboard, medium-density fiberboard (MDF), and Mende Process board plants for 1976. The location, type, and capacity of each plant in 1976 is enumerated. Industry production trends are reported for particleboard for 1956, 1966, 1971, and 1976; and MDF for 1971 and 1976. Particleboard raw material requirements are also reported.



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6 **PARTICLEBOARD, MEDIUM-DENSITY FIBERBOARD,
AND MENDE PROCESS BOARD PLANTS IN THE
UNITED STATES—CAPACITY, PRODUCTION,
AND RAW MATERIAL TRENDS, 1956-1976.**

12 24 p.

By

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and

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9 Resource Bulletin

Forest Products Laboratory,¹ Forest Service, U.S. Department of Agriculture

Introduction

This report provides estimates of capacities for particleboard, medium-density fiberboard (MDF) and Mende Process board plants for 1976. Industry production trends are also presented and discussed for particleboard for 1956, 1966, 1971, and 1976; and MDF for 1971 and 1976. Particleboard raw material requirements will also be discussed.

The first nationwide particleboard plant and production data were compiled and published by Reid in 1958 (15).² Reid estimated that in 1955 the particleboard industry produced 83 million square feet (¾-inch basis) of board. Since that time the industry has grown dramatically and now produces a diversity of board products.

In this report, capacity is defined to be the quantity of particleboard, MDF or Mende Process board (¾-inch basis) that can be pro-

duced under normal operating conditions with continuous shifts 24 hours a day during a production year of approximately 300 days (20).

Particleboard Plant Capacity and Production Trends

Particleboard can be manufactured by either the extrusion or flat-platen press method. Extrusion presses squeeze the particle and resin mixture through a heated die which sets the resin and produces the board in a continuous sheet (8). The more commonly used mat-formed process compresses the particles and resins in heated presses producing boards in individual sheets (7). In 1957 the extrusion process accounted for about 20 percent of the total annual production (17). Since then, the extruded process has steadily declined in importance—accounting for about 3 percent of total particleboard plant capacity in 1976 (13).

¹ Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

² Italic numbers in parentheses refer to literature cited at the end of report.

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In 1976, there were 68 active particleboard plants (extruded and platenboard process) in the United States with a combined capacity estimated to be 4.5 billion square feet per year (3/4-inch basis) (table 1, figs. 1 and 2). Average annual plant capacity was approximately 66 million square feet (table 1, fig. 3). The number of plants and total annual capacity has increased rapidly since 1956 when there were 25 plants with a combined capacity of 206 million square feet. Industry capacity growth from 1956 to 1971 averaged 20.4 percent per year. Since 1971, the rate of capacity growth dropped to 5.9 percent per year. Over the 20-year period (1956 through 1976), capacity increased at an average annual rate of 16.6 percent.

Particleboard production traditionally has been well below industry capacity. In 1976, total particleboard production in the United States was 3.2 billion square feet, 72 percent of capacity (table 2, fig. 4). In 1956 production amounted to little more than 50 percent of industry capacity. The growth in production, however, has kept pace with capacity growth, increasing at an annual rate of

22.7 percent from 1956 to 1971 and then dropping off to 6.0 percent per year from 1971 to 1976. Over the 20-year period (1956 through 1976), production increased at an average rate of 18.3 percent. Production and estimated value of particleboard production by year are shown in table 3.

Individual plant locations and capacities for 1976 are shown in table 4 and the map at the end of the report. Numbers of plants and capacities for 1976 by state, region, and type are shown in table 5.

Regional Capacity and Production

Capacity.—The South and the West were nearly equal in capacity in 1976 with 2.2 billion square feet in the South compared with 2.0 billion square feet in the West (table 1, fig. 5). The West, however, had ten fewer plants than the South resulting in an average annual plant capacity of 80 million square feet, compared to 62 million square feet in the South (table 1, figs. 3 and 6). The North had only eight active plants in 1976 with a combined capacity of 269 million square feet per year and an average annual plant capacity

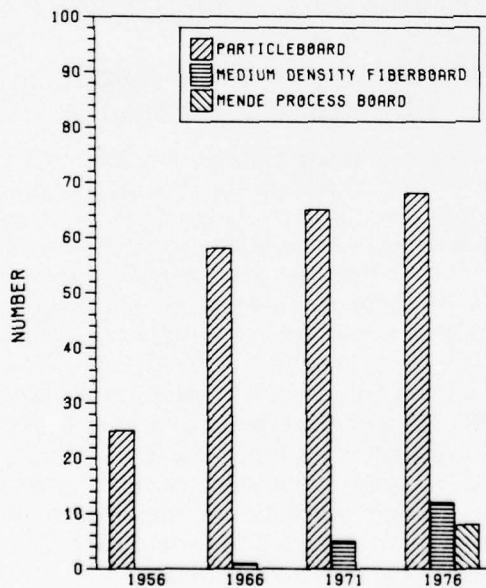


Figure 1.—Number of particleboard, medium-density fiberboard and Mende Process board plants in the United States, 1956-1976.

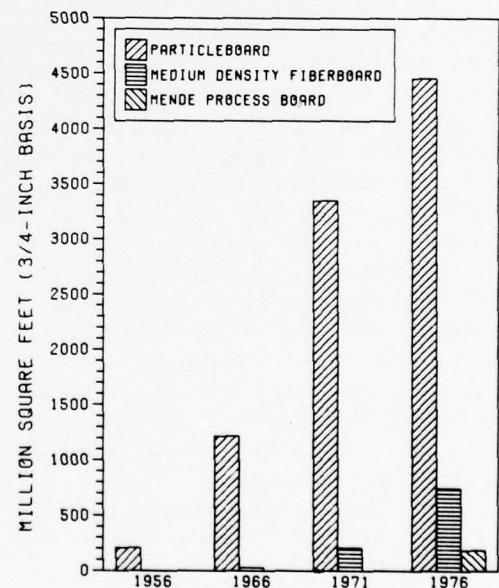


Figure 2.—Annual capacity of particleboard, medium-density fiberboard and Mende Process board plants in the United States, 1956-1976.

of 34 million square feet. Since 1956, the South has had more particleboard plants than any other region while the West has consistently maintained larger plants, on the average. The North has always had the fewest plants and lowest capacity. Growth in regional capacity during the 20-year period 1956 through 1976 has been fairly uniform with capacity in the West growing fastest at 17.3 percent per year, the North slowest at 14.8 percent per year, and the South at 16.3 percent per year.

Production.—The South led all regions in the production of particleboard in 1976 with 1.6 billion square feet, utilizing 74 percent of the region's capacity (table 2). Production in the West was a close second at 1.4 billion square feet and 70 percent of capacity. The North produced only 190 million square feet of particleboard in 1976, utilizing 71 percent of available capacity. Since 1956, production in the South increased at an average annual rate of 20.9 percent, 2 percent faster than the United States average. Production in the West and the North grew at 16.5 percent per year, nearly 2 percent slower than the United States average.

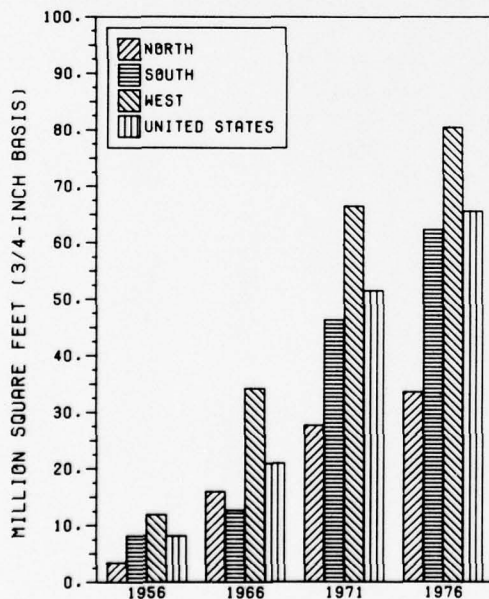


Figure 3.—Average annual capacity of particleboard plants by region and the United States, 1956-1976.

Raw Material Requirements for Particleboard

Because of the rapid expansion of particleboard industry capacity in the late 1960's and early 1970's, the U.S. Forest Service conducted a questionnaire survey of all particleboard plants³ which determined the types and quantities of wood raw materials required (2,3,4). Responding plants accounted for 92 percent of all particleboard produced in 1973. These plants used, on the average, 1.5 tons of wood raw material (dry weight basis) for each 1,000 square feet (3/4-inch basis) of finished board produced. The typical plant used a variety of wood raw materials with sawmill planer shavings being most preferred, when available. Specific material use data, by region, is shown in table 6.

In general, the particleboard industry in the South and West has been quite dependent on sawmill residues. This residue source is likely to be a poor prospect for future needs because sawmills are constantly installing more efficient equipment

³ This survey did not include MDF or Mende Process board plants.

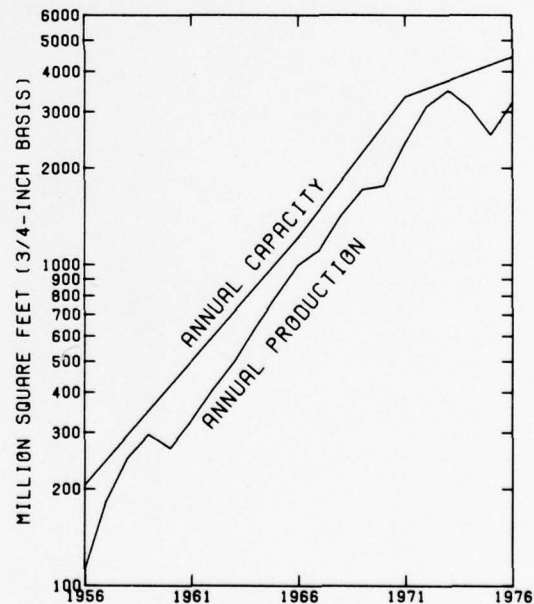


Figure 4.—Annual particleboard capacity and production in the United States, 1956-1976.

which produces less residue (11). In a study completed in 1973 of softwood sawlog conversion efficiency, it was projected that in 15 to 20 years, using current technology, sawmill planer shavings would be reduced in the United States by 23 percent. Sawdust volume could be reduced by 36 percent (16). The U.S. Forest Service has recently developed and implemented a nationwide industry service program to increase sawmill lumber recovery rates and thus reduce residue volumes. The Sawmill Improvement Program (SIP) is a cooperative effort of U.S. Forest Service divisions of State and Private Forestry, Forest Service Research, and state forestry agencies (10). Approximately 700 sawmills have participated in this program. Therefore, the projected decrease in sawmill residues may soon be felt by many particleboard producers.

Nationwide, there is a strong trend among wood products manufacturers toward the use of their own residue for fuel. This will heighten the competition for the decreasing supply of mill residues.

On a regional basis, the long-term raw material outlook for particleboard plants in the West and South is not as good as in the

North if they continue to look to traditional sources of supply, which are largely shavings and sawdust from sawmills. In the North and South, particleboard plants are using a combination of softwoods and hardwoods (2). They are also drawing their residue materials from many different types of wood processors. In the North, nearly half the furnish is from roundwood and most of the remainder is from course mill residues. Roundwood or green forest residue use is likely to become more popular nationwide as traditional sources of mill residues become more scarce and costly (11).

Medium-Density Fiberboard Plant Capacity and Production Trends

Medium-density fiberboard (MDF) product classification has been the subject of considerable discussion since it was first commercially manufactured in 1965 (7). It has been classified as both a hardboard and a particleboard product. In 1973 a United States Custom Court ruled that MDF was subject to the same tariff regulations as hardboard (9). However, in 1976, the Depart-

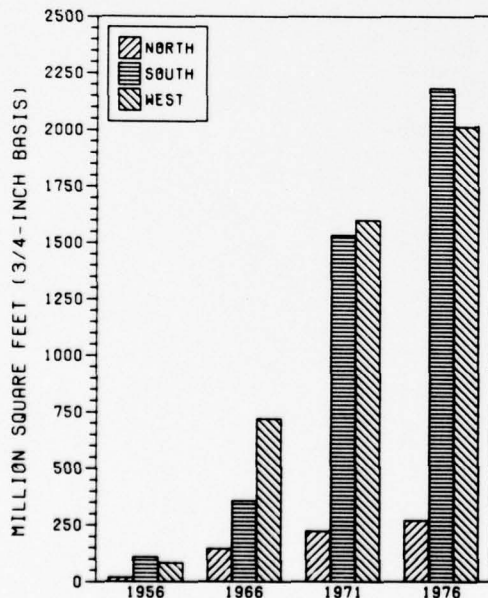


Figure 5.—Annual capacity of particleboard plants in the United States by region, 1956-1976.

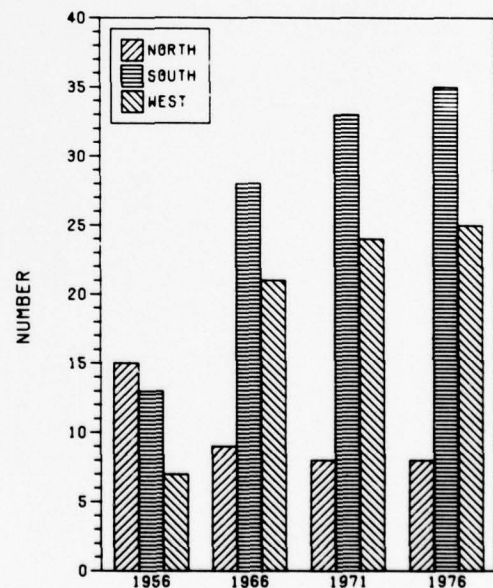


Figure 6.—Number of particleboard plants in the United States by region, 1956-1976.

ment of Commerce included MDF production in its annual particleboard report (19).

Medium-density fiberboard capacity developed rather slowly during the late 1960's. The MDF industry expanded from the 28 million square feet ($\frac{3}{4}$ -inch basis) annual capacity of the first plant in Deposit, New York, to approximately 210 million square feet ($\frac{3}{4}$ -inch basis) in 1971 for the five plants existing at that time (table 7, figs. 1 and 2). Production data which were available for two of the five plants in 1971, indicated production levels much lower than capacity (table 7).

Estimates of total MDF plant capacity for the United States in 1976 are difficult to make because several plants were modifying and/or improving their equipment. The National Particleboard Association estimated that actual available capacity was about 525 million square feet ($\frac{3}{4}$ -inch basis) and optimum capacity i.e., when plant modifications are completed, would be over 700 million square feet.* Table 8 shows the estimate of 1976 optimum capacity, excluding the one plant currently idle, and production for either 1975 or 1976 as data were available. At that time most plants were operating well below 75 percent of optimum capacity. In fact, the MDF industry, excluding the closed Pope and Talbot plant, was operating at only about 45 percent of optimum capacity during the 1975-1976 period. In 1978, actual available MDF capacity was estimated to be 592 million square feet ($\frac{3}{4}$ -inch basis) with optimum capacity remaining at over 700 million square feet (12).

Mende Process Board Plant Capacity and Production

Mende Process board, sometimes called thin panelboard, or thin particleboard, has been commercially manufactured in the United States since 1972 (1). Like medium-density fiberboard, thin particleboard is not officially classified as a separate product, but separate production data have been reported by the trade. All plants producing this

* Recommended in NPA cover letter accompanying the NPA publication "Capacity Survey Particleboard and Medium Density Fiberboard Industries," January 1, 1977 (13).

board have equipment designed for a continuous sheet process.

Since the Mende type particleboard plants have been in existence less than 5 years, there is little to report in regard to production or capacity trends. In terms of capacity, these plants tend to be much smaller than other types of particleboard plants built in the last 10 years. But like other particleboard plants where production has been reported, it has been well below the rated capacities (table 9, figs. 1 and 2).

Summary and Conclusions

Particleboard plant capacity has grown quite rapidly since the emergence of the industry in the United States during the mid-1950's. By 1976 total capacity for the matformed and extruded board segments of the industry had reached nearly 4.5 billion square feet ($\frac{3}{4}$ -inch basis) annually. Medium-density fiberboard capacity in 1976 was about as difficult to estimate as the product has been to classify. Modifications of equipment at existing plant locations are expected to boost capacity to well over 700 million square feet ($\frac{3}{4}$ -inch basis), but actual 1976 capacity was about 525 million square feet ($\frac{3}{4}$ -inch basis). Mende Process board plants have only been in existence since 1972, and total annual capacity in 1976 was estimated at about 188 million square feet ($\frac{3}{4}$ -inch basis).

Reported production for all types of particleboard tends to lag well behind rated capacities. Although production and capacity were not compared on a year by year basis, it appears that most plants in the industry operate at only 70 to 80 percent of their capacity except for brief periods of strong demand which are the exception rather than the rule. While particleboard demand has expanded quite rapidly, industry plant capacity has in general expanded well in advance of demand. Thus competition among firms for a share of the market has been quite strong.

The particleboard industry has thrived on sawmill residues, that have been relatively inexpensive. Until the energy crisis of the early 1970's, adhesives were also relatively inexpensive. The future prospect is for a lower volume of sawmill residues and continued increases in adhesive costs.

Perhaps the most limiting factor for further expansion of the particleboard industry, with its current production mix of mostly low cost interior board products, is the problem of finding more low cost wood raw materials from the industry's traditional sources—the secondary wood processors. These processors will continue to improve their technology and management capabilities which will result in less wood residue, and they may have more attractive alternative uses and/or markets for these residues such as fuel wood. The particleboard industry will likely find it increasingly difficult to produce low cost interior-type board products unless new sources of low cost residues are found and utilized. This is evidenced by the North's inability to increase production relative to the South and West, given the North's heavy dependence on high cost roundwood furnish.

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Table

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Table 1.--Number of particleboard plants and annual capacity for the United States, by region, 1956, 1966, 1971, and 1976^{1/}

Year	United States				North				South				West			
	Annual capacity		Plants		Annual capacity		Plants		Annual capacity		Plants		Annual capacity		Plants	
	Total	Average	No.	Million sq. ft. (3/4-in. basis)	Total	Average	No.	Million sq. ft. (3/4-in. basis)	Total	Average	No.	Million sq. ft. (3/4-in. basis)	Total	Average	No.	Million sq. ft. (3/4-in. basis)
1956	206	8.2	5	3.4	17	3.4	5	17	106	8.2	13	106	8.2	7	83	11.9
1966	1,217	21.0	9	16.0	144	16.0	9	144	355	12.7	28	355	12.7	21	718	34.2
1971	3,346	51.5	8	27.7	222	27.7	8	222	1,529	46.3	33	1,529	46.3	24	1,595	66.5
1976	4,459	65.6	8	33.6	269	33.6	8	269	2,180	62.3	35	2,180	62.3	25	2,010	80.4

^{1/} Does not include medium-density fiberboard and Mende Process board in 1976.

Sources: Wright, M. G., and R. B. Phelps, "Particleboard, Insulation Board and Hardboard, Industry Trends, 1956-66." 1967 (20) National Particleboard Association, "Capacity Survey--Particleboard and Medium Density, Fiberboard Industries, January 1977" (13); selected editions of Forest Industries and U.S. Forest Service estimates.

Table 2.--Annual capacity, annual production, and production as a percent of particleboard industry capacity in the United States, by region, 1965, 1966, 1971, and 1976^{1/}

Year	United States						North			South			West			
	Annual capacity	Annual production	Production as a percent of capacity	Pct	Million sq. ft. (3/4-in. basis)	Pct	Annual capacity	Annual production	Production as a percent of capacity	Pct	Million sq. ft. (3/4-in. basis)	Pct	Annual capacity	Annual production	Production as a percent of capacity	Pct
1956	206	111	54	54	17	9	53	53	34	107	36	34	83	66	80	80
1966	1,217	997	82	82	144	103	72	72	91	356	325	91	718	569	79	79
1971	3,346	2,394	72	72	222	179	81	81	71	1,529	1,082	71	1,595	1,133	71	71
1976	4,459	3,202	72	72	269	190	71	71	74	2,180	1,603	74	2,010	1,409	70	70

^{1/} Does not include medium-density fiberboard and Mende Process board.

Sources: Wright, M. G. and R. B. Phelps, "Particleboard, Insulation Board and Hardboard, Industry Trends, 1956-66." 1967 (20); National Particleboard Association, "Capacity Survey--Particleboard and Medium Density Fiberboard Industries, (13); U.S. Department of Commerce, Bureau of the Census, 1976 (19); NPA Releases 1976 Particleboard Production Figures (14); selected editions of Forest Industries and U.S. Forest Service estimates.

Table 3.--Particleboard production by type and total annual estimated value of United States production, 1956-1976

Year	Production ^{1/}			Value of Production ^{2/}
	Total	Platenboard	Extruded	
	Million sq. ft. (3/4-in. basis)			
1956	^{3/} 111.0	(NA)	(NA)	11.7
1957	182.9	144.5	38.4	19.2
1958	^{4/} 250.0	(NA)	(NA)	26.3
1959	295.8	255.3	40.5	31.1
1960	268.4	232.0	36.4	28.2
1961	326.3	291.4	34.9	34.3
1962	407.6	366.0	41.6	42.8
1963	496.5	455.8	40.7	52.1
1964	638.4	591.7	46.7	67.0
1965	802.7	753.0	49.7	90.5
1966	996.9	947.6	49.3	100.1
1967	1,115.2	1,074.2	41.0	103.0
1968	1,425.0	1,391.2	33.8	147.5
1969	1,716.1	1,681.9	34.2	213.3
1970	1,763.5	1,731.4	32.1	169.1
1971	2,393.8	2,359.2	34.6	214.8
1972	3,116.9	3,079.1	37.8	294.5
1973	3,493.7	3,460.5	33.2	396.8
1974	3,103.8	3,074.5	29.3	360.8
1975	2,538.9	2,502.6	36.3	274.0
1976	^{5/} 3,202.2	^{5/} 3,188.9	^{5/} 13.3	^{5,6/} 365.0

^{1/} Does not include medium-density fiberboard and Mende Process board.

^{2/} USDA Forest Service estimate.

^{3/} Reid, William H. (15).

^{4/} Wright, M. G., and R. B. Phelps (20).

^{5/} Plywood and Panel. 1978. NPA Releases 1976 Particleboard Production Figures (14).

^{6/} Value of shipments.

(NA)--Not available.

Source: Except as noted, U.S. Department of Commerce, Bureau of the Census, Facts for Industry and Current Industrial Reports (17,18,19).

TABLE 4.--PARTICLEBOARD PLANTS IN THE UNITED STATES, BY LOCATION, TYPE OF PLANT AND CAPACITY, 1976

PLANT NO.	PLANT NAME	PLANT LOCATION	ANNUAL CAPACITY			
			PLATENBOARD PARTICLEBOARD	EXTRUDED PARTICLEBOARD	MEDIUM DENSITY FIBERBOARD	MENDE PROCESS BOARD

MILLION SQ. FT. (3/4-IN. BASIS)						
NORTH						
INDIANA						
1	SWAIN INDUSTRIES	EVANSTON	12.0	.0	.0	.0
2	SWAIN INDUSTRIES	SEYMOUR	12.0	.0	.0	.0
	TOTAL	2 ACTIVE PLANTS	24.0	.0	.0	.0
MICHIGAN						
3	CHAMPION INTERNATIONAL	GAYLORD	108.0	.0	.0	.0
	TOTAL	1 ACTIVE PLANTS	108.0	.0	.0	.0
MINNESOTA						
4	BLANDIN WOOD PRODUCTS CO.	GRAND RAPIDS	33.0	.0	.0	.0
5	PUBLISHERS PAPER CO.	VIRGINIA	12.0	.0	.0	.0
	TOTAL	2 ACTIVE PLANTS	45.0	.0	.0	.0
NEW YORK						
6	CELOTEX CORP.	DEPOSIT	.0	.0	28.0	14.0
	TOTAL	2 ACTIVE PLANTS	.0	.0	28.0	14.0
PENNSYLVANIA						
7	WOODCORE, INC.	SCOTSDALE	.0	6.0	.0	.0
	TOTAL	1 ACTIVE PLANTS	.0	6.0	.0	.0
WISCONSIN						
8	RODMAN INDUSTRIES, INC.	MARINETTE	24.0	.0	.0	.0
9	MEYERHAEUSER CO.	MARSHFIELD	62.0	.0	.0	.0
	TOTAL	2 ACTIVE PLANTS	86.0	.0	.0	.0
	TOTAL, NORTH	10 ACTIVE PLANTS	263.0	6.0	28.0	14.0
SOUTH						
ALABAMA						
10	GILES KENDALL, INC.	HUNTSVILLE	7.0	.0	.0	.0
11	LOUISIANA-PACIFIC CORP.	EUFULA	108.0	.0	.0	.0
12	MACMILLIAN-BLOEDEL, INC.	PINE HILL	100.0	.0	.0	.0
13	OLINKRAFT, INC.	MONROEVILLE	105.0	.0	.0	.0
	TOTAL	4 ACTIVE PLANTS	320.0	.0	.0	.0
ARKANSAS						
14	GEORGIA-PACIFIC CORP.	CROSSETT	105.0	.0	.0	26.5
15	INTERNATIONAL PAPER CO.	MALVERN	.0 / 1	.0	.0	.0

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TABLE 4.--PARTICLEBOARD PLANTS IN THE UNITED STATES, BY LOCATION, TYPE OF PLANT AND CAPACITY, 1976--CONT.

PLANT NO.	PLANT NAME	PLANT LOCATION	ANNUAL CAPACITY				
			PLATENBOARD PARTICLEBOARD	EXTRUDED PARTICLEBOARD	MEDIUM DENSITY FIBERBOARD	WENDE PROCESS BOARD	
						MILLION SQ. FT. (3/4-IN. RAGS)	
16	PERMANER CORP.	HOPE	.0	.0	.0	.0	.0
17	SINGER CO.	TRUMANN	22.0	.0	.0	.0	.0
	TOTAL	3 ACTIVE PLANTS	127.0	.0	.0	.0	26.5
FLORIDA							
18	FLORIDA PLYWOODS, INC.	GREENVILLE	10.0	.0	.0	.0	.0
	TOTAL	1 ACTIVE PLANTS	10.0	.0	.0	.0	.0
GEORGIA							
19	GEORGIA-PACIFIC CORP.	MONTICELLO	.0	.0	.0	.0	60.0
20	GEORGIA-PACIFIC CORP.	VIENNA	100.0	.0	.0	.0	.0
21	TEMPLE INDUSTRIES, INC.	THOMSON	100.0	.0	.0	.0	.0
22	WEYERHAEUSER CO.	ADEL	80.0	.0	.0	.0	.0
	TOTAL	4 ACTIVE PLANTS	280.0	.0	.0	.0	60.0
KENTUCKY							
23	JASPER-AMERICAN	HENDERSON	.0	9.0	.0	.0	.0
24	PERMANER CORP.	MIDDLESBORO	.0	.0	.0	.0	.0
	TOTAL	1 ACTIVE PLANTS	.0	9.0	.0	.0	.0
LOUISIANA							
25	LOUISIANA-PACIFIC CORP.	URANIA	95.0	.0	.0	.0	.0
26	OLINKRAFT, INC.	LILLIE	100.0	.0	.0	.0	.0
27	VANCOUVER PLYWOOD CO.	MANY	.0	.0	.0	.0	21.6
28	WILLAMETTE INDUSTRIES	RUSTON	69.0	.0	.0	.0	.0
	TOTAL	4 ACTIVE PLANTS	263.0	.0	.0	.0	21.6
MISSISSIPPI							
29	CHAMPION INTERNATIONAL	OXFORD	120.0	.0	.0	.0	.0
30	GEORGIA-PACIFIC CORP.	LOUISVILLE	91.0	.0	.0	.0	.0
31	GEORGIA-PACIFIC CORP.	TAYLORSVILLE	120.0	.0	.0	18.5	16.0
32	KROENLER MANUFACTURING CO.	MERIDIAN	.0	.0	.0	18.5	.0
	TOTAL	5 ACTIVE PLANTS	331.0	.0	.0	.0	16.0
NORTH CAROLINA							
33	ABITIBI CORP.	ROARING RIVER	.0	.0	43.8	.0	.0
34	BROYHILL INDUSTRIES, INC.	LENOIR	27.0	24.3	.0	.0	.0
35	BROYHILL INDUSTRIES, INC.	NEWTON	.0	4.0	.0	.0	.0
36	BROYHILL INDUSTRIES, INC.	RUTHERFORD	.0	4.0	.0	.0	.0
37	CAROLINA FOREST PRODUCTS	WILMINGTON	.0	.0	.0	.0	.0
38	DIXIE CHTPBOARD CO.	RURAL HALL	.0	.0	.0	.0	.0
39	GEORGIA-PACIFIC CORP.	WHITEVILLE	.0	.0	.0	.0	30.0
40	MASONITE CORP.	SPRING HOPE	.0	.0	.0	84.0	.0
41	NU-WOOD INC.	LENOIR	17.0	.0	.0	.0	.0
42	PERMANER CORP.	BLACK MOUNTAIN	.0	.0	.0	.0	.0

TABLE 4.--PARTICLEBOARD PLANTS IN THE UNITED STATES, BY LOCATION, TYPE OF PLANT AND CAPACITY, 1976--CONT.

PLANT NO.	PLANT NAME	PLANT LOCATION	ANNUAL CAPACITY			
			PLATENBOARD PARTICLEBOARD	EXTRUDED PARTICLEBOARD	MEDIUM DENSITY FIBERBOARD	MENDE PROCESS BOARD
			MILLION SQ. FT. (3/8-IN. BASIS)			
43	MEYERMAEUSER CO. TOTAL	MONCURE 9 ACTIVE PLANTS	44.0	.0 32.3	72.0 199.6	.0 30.0
OKLAHOMA						
44	WARD INDUSTRIES, INC.	MIAMI	30.0	.0	.0	.0
45	MEYERMAEUSER CO. TOTAL	BROKEN BOW 2 ACTIVE PLANTS	.0 30.0	.0 .0	80.0 80.0	.0 .0
SOUTH CAROLINA						
46	CELOTEX CORP.	MARION	.0	.0	57.3	.0
47	GEORGIA-PACIFIC CORP.	RUSSELLVILLE	120.0	.0	.0	.0
48	GEORGIA-PACIFIC CORP.	SUMTER	.0	8.6	.0	.0
49	HOLLY HILL LUMBER CO.	HOLLY HILL	.0	.0	140.0	.0
50	INTERNATIONAL PAPER CO. TOTAL	GREENWOOD 4 ACTIVE PLANTS	.0 120.0	.0 8.6	.0 197.3	.0 .0
TENNESSEE						
51	DYNA-TEX	SUNBRIGHT	.0	/1	.0	.0
52	TENN-FLAKE INC. TOTAL	MORRISTOWN 0 ACTIVE PLANTS	.0 .0	.0 .0	.0 .0	.0 .0
TEXAS						
53	KIRRY LUMBER CO.	SILSREEF	70.0	.0	.0	.0
54	LOUISIANA-PACIFIC CORP.	CORRIGAN	100.0	.0	.0	.0
55	TEMPLE INDUSTRIES, INC.	DIBOLL	100.0	.0	.0	.0
56	WYNNEWOOD PRODUCTS, INC. TOTAL	JACKSONVILLE 4 ACTIVE PLANTS	1A.0 288.0	.0 .0	.0 .0	.0 .0
VIRGINIA						
57	AMERICAN FURNITURE CO.	MARTINSVILLE	.0	10.0	.0	.0
58	RASSETT INDUSTRIES	RASSETT	.0	.0	24.0	.0
59	CHAMPION INTERNATIONAL	SOUTH ROSTON	64.0	.0	.0	.0
60	LANE CO.	ALTAVISTA	.0	19.5	.0	.0
61	MASONITE CORP.	WAVERLY	80.0	.0	.0	.0
62	STUART LUMBER CORP.	STUART	60.0	.0	.0	.0
63	UNION CAMP CORP. TOTAL, SOUTH	FRANKLIN 7 ACTIVE PLANTS	84.0 288.0	.0 29.5	.0 24.0	.0 .0
WEST						
64	SOUTHWEST FOREST IND., INC.	FLAGSTAFF	.0	.0	.0	.0
			2101.0	79.4	519.6	154.1

TABLE 4.--PARTICLEBOARD PLANTS IN THE UNITED STATES, BY LOCATION, TYPE OF PLANT AND CAPACITY, 1976--CONT.

PLANT NO.	PLANT NAME	PLANT LOCATION	ANNUAL CAPACITY				
			PLATENBOARD PARTICLEBOARD	EXTRUDED PARTICLEBOARD	MEDIUM DENSITY FIBERBOARD	WENDE PROCESS BOARD	
			MILLION SQ. FT. (3/4-IN. BASIS)				
	TOTAL	0 ACTIVE PLANTS	.0	.0	.0	.0	.0
CALIFORNIA							
65	AMERICAN FOREST PRODUCTS CORP.	MARTELL	95.0	.0	.0	.0	.0
66	CHAMPION INTERNATIONAL	SHASTA/REDDING	85.0	.0	.0	.0	.0
67	COLLINS PINE CO.	CHFSTER	28.0	.0	.0	.0	.0
68	FIBREBOARD CORP.	ROCKLIN	.0	.0	66.0	.0	.0
69	GOLDEN STATE BUILDING PRODS.	REDLANDS	36.0	.0	.0	.0	.0
70	HAMBRO FOREST PRODUCTS	CRESCENT CITY	26.0	.0	.0	.0	.0
71	LOUISIANA-PACIFIC CORP.	ARCATA	170.0	.0	.0	.0	.0
72	LOUISIANA-PACIFIC CORP.	OROVILLE	.0	.0	.0	.0	20.0
73	LOUISIANA-PACIFIC CORP.	UKIAH	81.0	.0	.0	.0	.0
74	SEQUOIA FOREST PRODUCTS	CHONCHILLA	36.0	.0	.0	.0	.0
	TOTAL	10 ACTIVE PLANTS	557.0	.0	66.0	.0	20.0
IDAHO							
75	POTLATCH CORP.	POST FALLS	57.0	.0	.0	.0	.0
76	TENEX INC.	SANDPOINT	.0	.0	.0	.0	.0 /1
	TOTAL	1 ACTIVE PLANTS	57.0	.0	.0	.0	.0
MONTANA							
77	LOUISIANA-PACIFIC CORP.	MISSOULA	96.0	.0	.0	.0	.0
78	PLUM CREEK LUMBER CO.	COLUMBIA FALLS	.0	.0	70.0	.0	.0
	TOTAL	2 ACTIVE PLANTS	96.0	.0	70.0	.0	.0
NEW MEXICO							
79	NAVAJO FOREST PRODUCTS IND.	NAVAJO	30.0	.0	.0	.0	.0
80	PONDEROSA PRODUCTS INC.	ALBUQUERQUE	45.0	.0	.0	.0	.0
	TOTAL	2 ACTIVE PLANTS	75.0	.0	.0	.0	.0
OREGON							
81	ROHEMIA, INC.	EUGENE	66.0	.0	.0	.0	.0
82	BOISE CASCADE CORP.	LAGRANDE	150.0	.0	.0	.0	.0
83	BROOKS-WILLAMETTE CORP.	REND	140.0	.0	.0	.0	.0
84	CLEAR FIR PRODUCTS	SPRINGFIELD	.0	.0 /1	.0	.0	.0
85	DOWN RIVER FOREST PRODUCTS CO.	WHITE CITY	75.0	.0	.0	.0	.0
86	MEDFORD CORP.	MEDFORD	.0	.0	64.5	.0	.0
87	PERMANER CORP.	BROWNVILLE	.0	.0 /1	.0	.0	.0
88	PERMANER CORP.	DILLARD	30.0	.0	.0	.0	.0
89	POPE & TALBOT, INC.	OAKRIDGE	.0	.0	43.3	.0	.0 /1
90	PUBLISHERS PAPER CO.	PHILOMATH	16.7	.0	.0	.0	.0
91	PUBLISHERS PAPER CO.	SWEET HOME	15.0	.0	.0	.0	.0
92	ROSEBURG LUMBER CO.	ROSEBURG	276.0	.0	.0	.0	.0
93	TIMBER PRODUCTS CO.	MEDFORD	81.0	.0	.0	.0	.0
94	MEYERMAEUSER CO.	KLAMATH FALLS	95.0	.0	.0	.0	.0

TABLE 4.--PARTICLEBOARD PLANTS IN THE UNITED STATES, BY LOCATION, TYPE OF PLANT AND CAPACITY, 1976--CONT.

PLANT NO.	PLANT NAME	PLANT LOCATION	ANNUAL CAPACITY			
			PLATENBOARD PARTICLEBOARD	EXTRUDED PARTICLEBOARD	MEDIUM DENSITY FIBERBOARD	
					PLATENBOARD PARTICLEBOARD	EXTRUDED PARTICLEBOARD
			MILLION SQ. FT. (3/4-IN. BASIS)			
95	MEYERHAEUSER CO.	NORTH BEND	.0	.0	.0	.0
96	MEYERHAEUSER CO.	SPRINGFIELD	100.0	.0	.0	.0
97	WILLAMETTE INDUSTRIES	ALBANY	169.0	.0	.0	.0
	TOTAL	13 ACTIVE PLANTS	1213.7	.0	64.5	.0
WASHINGTON						
98	INTERNATIONAL PAPER CO.	LONGVIEW	11.0	.0	.0	.0
	TOTAL	1 ACTIVE PLANTS	11.0	.0	.0	.0
	TOTAL, WEST	29 ACTIVE PLANTS	2009.7	.0	200.5	20.0
	TOTAL, UNITED STATES	87 ACTIVE PLANTS	4373.7	85.4	748.1	188.1

1/ PLANT IDLE, EXCLUDED FROM TOTALS.

SOURCES: NATIONAL PARTICLEBOARD ASSOCIATION (13), FOREST INDUSTRIES (5,6), AND U.S. FOREST SERVICE ESTIMATES.

TABLE 5.--NUMBER AND CAPACITY OF ACTIVE PARTICLEBOARD PLANTS IN THE UNITED STATES, BY REGION, STATE AND TYPE, 1976

REGION AND STATE	TOTAL		PLATEBOARD PARTICLEBOARD		EXTRUDED PARTICLEBOARD		MEDIUM DENSITY FIBERBOARD		MENDE PROCESS BOARD	
	PLANTS	ANNUAL CAPACITY TOTAL AVERAGE	PLANTS	ANNUAL CAPACITY TOTAL AVERAGE	PLANTS	ANNUAL CAPACITY TOTAL AVERAGE	PLANTS	ANNUAL CAPACITY TOTAL AVERAGE	PLANTS	ANNUAL CAPACITY TOTAL AVERAGE
	NO. MILLION SQ. FT. (3/4-IN. BASIS)		NO. MILLION SQ. FT. (3/4-IN. BASIS)		NO. MILLION SQ. FT. (3/4-IN. BASIS)		NO. MILLION SQ. FT. (3/4-IN. BASIS)		NO. MILLION SQ. FT. (3/4-IN. BASIS)	
NORTH										
INDIANA	2.	24.0	12.0	24.0	0.	0.	0.	0.	0.	0.
MICHIGAN	1.	108.0	108.0	108.0	0.	0.	0.	0.	0.	0.
MINNESOTA	2.	45.0	22.5	45.0	0.	0.	0.	0.	0.	0.
NEW YORK	2.	42.0	21.0	0.	0.	0.	28.0	28.0	1.	14.0
PENNSYLVANIA	1.	6.0	6.0	0.	0.	6.0	6.0	0.	0.	0.
WISCONSIN	2.	86.0	43.0	86.0	0.	0.	0.	0.	0.	0.
TOTAL	10.	311.0	31.1	263.0	7.	6.0	28.0	28.0	1.	14.0
SOUTH										
ALABAMA	4.	320.0	80.0	320.0	0.	0.	0.	0.	0.	0.
ARKANSAS	3.	153.5	51.2	127.0	0.	0.	0.	0.	0.	0.
FLORIDA	1.	10.0	10.0	10.0	0.	0.	0.	0.	0.	0.
GEORGIA	4.	340.0	85.0	280.0	0.	0.	0.	0.	0.	0.
KENTUCKY	1.	9.0	9.0	0.	0.	9.0	9.0	0.	0.	0.
LOUISIANA	4.	284.6	71.1	263.0	0.	0.	0.	0.	0.	0.
MISSISSIPPI	5.	365.5	73.1	331.0	0.	0.	0.	0.	0.	0.
NORTH CAROLINA	9.	306.1	34.0	44.0	3.	32.3	10.8	18.5	1.	16.0
OKLAHOMA	2.	110.0	55.0	30.0	0.	0.	0.	80.0	0.	0.
SOUTH CAROLINA	4.	325.9	81.5	120.0	1.	8.6	8.6	98.6	0.	0.
TEXAS	4.	288.0	72.0	268.0	0.	0.	0.	0.	0.	0.
VIRGINIA	7.	341.5	48.8	288.0	2.	29.5	14.7	24.0	0.	0.
TOTAL	48.	2854.1	59.5	2101.0	7.	79.4	11.3	519.6	5.	154.1
WEST										
CALIFORNIA	10.	643.0	64.3	557.0	0.	0.	0.	66.0	1.	20.0
IDAHO	1.	57.0	57.0	57.0	0.	0.	0.	0.	0.	0.
MONTANA	2.	166.0	83.0	96.0	0.	0.	0.	70.0	0.	0.
NEW MEXICO	2.	75.0	37.5	75.0	0.	0.	0.	0.	0.	0.
OREGON	13.	1278.2	98.3	1213.7	0.	0.	0.	64.5	0.	0.
WASHINGTON	1.	11.0	11.0	11.0	0.	0.	0.	0.	0.	0.
TOTAL	29.	2230.2	26.9	2009.7	0.	0.	0.	200.5	1.	20.0
UNITED STATES	87.	5395.3	62.0	4373.7	8.	85.4	10.7	748.1	62.3	7.
										186.1
										26.9

SOURCE: TABLE 4.

Table 6.--Wood raw materials used by particleboard plants
in the United States and by region, 1973

Type of raw material	Percent of plants using material				Percent of all materials used			
	United States	North	South	West	United States	North	South	West
Roundwood	9	40	12	0	7	44	11	0
Veneer core	4	0	<u>1/</u>	<u>1/</u>	<u>2/</u>	0	<u>2/</u>	<u>2/</u>
Planer shavings	85	40	80	100	65	18	61	74
Plywood mill waste	40	0	44	33	10	0	11	9
Slabs, edgings and trimmings	21	20	16	16	3	<u>2/</u>	2	4
Sawdust	47	0	44	24	9	0	9	10
Chips	34	40	48	14	5	38	4	2
Other	6	0	<u>1/</u>	<u>1/</u>	1	0	2	<u>2/</u>
Totals					100	100	100	100

1/ Information omitted to avoid disclosure.
2/ Less than 0.5 percent.

Table 7.--Medium-density fiberboard plants by location, ownership, production, and capacity, 1971

State	City	Company name	Production	Capacity
			<u>Million sq. ft.</u> <u>(3/4-in. basis)</u>	
New York	Deposit	Celotex Corp.	16.7	28.0
Mississippi	Meridian	Kroehler Mfg. Co.	13.0	18.5
North Carolina	Moncure	Evans Products, Inc.	N/A	72.0
Oklahoma	Broken Bow	Weyerhaeuser Co.	N/A	60.0
Oregon	Oakridge	Pope & Talbot, Inc.	N/A	30.0
Total			N/A	208.5

Source: Selected editions of Forest Industries.

Table 8.--Medium-density fiberboard plants by location, ownership, production, and capacity, 1976

State	City	Company name	Production Capacity ^{1/}	
			Million sq. ft. (3/4-in. basis)	
California	Rocklin	Fibreboard Corp.	^{2/} 10.8	66.0
Mississippi	Meridan	Kroehler Mfg. Co.	^{3/} 8.1	18.5
Montana	Columbia Falls	Plum Creek Lumber Co.	^{3/} 35.0	70.0
New York	Deposit	Celotex Corp.	^{2/} 21.3	28.0
North Carolina	Moncure	Weyerhaeuser Co.	40.0	72.0
	Spring Hope	Masonite Corp.	50.0	84.0
	Roaring River	Abitibi Corp.	N/A	^{2/} 43.8
Oklahoma	Broken Bow	Weyerhaeuser Co.	^{2/} 57.9	80.0
Oregon	Medford	Medford Corp.	47.0	64.5
	Oakridge	Pope & Talbot Inc. ^{4/}	^{2/} 33.3	43.3
South Carolina	Holly Hill	Holly Hill Lumber Co.	16.0	140.0
	Marion	Celotex Corp.	^{2/} 30.0	57.3
Virginia	Bassett	Bassett Industries	N/A	24.0
Total				^{5/} 748.1

^{1/} Sources: Except as noted all capacities are from the National Particleboard Association Capacity Survey (13). These are considered optimum capacities expected by 1978 after certain plant modifications. Actual available capacities in 1976 were less due to plant equipment problems. Actual available capacity in 1976 was estimated by NPA at 525 million sq. ft. 3/4-in. basis.

^{2/} 1975 data from Forest Industries, March 1976 (5).

^{3/} 1976 data from Forest Industries, March 1977 (6).

^{4/} Plant closed and advertised for sale in 1976 Forest Industries, Nov. 1976 (7).

^{5/} Excludes the closed Pope and Talbot plant at Oakridge, Oregon.

Table 9.--Mende Process board plants by location, ownership, production, and capacity, 1976

State	City	Company name	Production ^{1/}	Capacity ^{2/}
			Million sq. ft. (3/4-in. basis)	
Arkansas	Crossett	Georgia-Pacific Corp.	15.0	26.5
California	Oroville	Louisiana-Pacific Corp.	16.6	20.0
Georgia	Monticello	Georgia-Pacific Corp.	39.2	60.0
Idaho	Sandpoint	Tenex, Inc.	N/A	3/
Louisiana	Many	Vancouver Plywood Co.	0.6	21.6
Mississippi	Taylorville	Georgia-Pacific Corp.	N/A	16.0
New York	Deposit	Celotex Corp.	N/A	14.0
North Carolina	Whiteville	Georgia-Pacific Corp.	3.5	30.0
Total			74.9	188.1

1/ Source: Forest Industries, 1977 (6).

2/ Source: National Particleboard Assoc. Capacity Survey Particleboard and Medium Density Fiberboard Industries (13).

3/ Plant idle.

Literature Cited

- Dickerhoof, H. Edward.
1975. Insulation board, hardboard, and particleboard industries: past accomplishments, future problems, and opportunities. *For. Prod. J.* 25(4):10-16.
- Dickerhoof, H. Edward.
1976. Particleboard production, markets, and raw materials in the United States. *For. Prod. J.* 26(10):16-20.
- Dickerhoof, H. Edward.
1977. Particleboard production, markets, and raw material use in Western United States surveyed by USDA. *Plywood and Panel.* 17(9):22-23.
- Dickerhoof, H. Edward.
1977. Particleboard production, markets, and raw material requirements in the South. *USDA For. Serv. Res. Pap.* SE-157. 7 p.
- Forest Industries.
1976. *Directory of panel plants—USA.* 103(3):122-133.
- Forest Industries.
1977. *Directory of panel plants—USA.* 104(3):94-112.
- Forest Industries.
1976. Pope and Talbot closes Oakridge plant. 103(12):13.

8. Forest Products Laboratory.
1974. Wood-base fiber and particle panel materials. Chapter 21 of Wood Handbook, USDA, Agric. Handb. 72 (rev.).
9. Lambert, Herb.
1974. Board industry's problem in '73 was meeting demand for the product. *Forest Ind.* 101(8):37-39.
10. Lunstrum, Stanford J.
1974. The sawmill improvement program. *Southern Lumberman*. December 15.
11. Maloney, Tom.
1978. Board talk . . . Plywood and Panel. 19(1):22-23.
12. Morschauer, Charles R.
1978. MDF is burning up the marketplace. *Plywood and Panel*. 19(1):33-34.
13. National Particleboard Association.
1977. Capacity survey, particleboard and medium density fiberboard industries. Silver Springs, Md. 6 p.
14. Plywood and Panel.
1978. NPA releases 1976 particleboard and production figures. 18(12):44-45.
15. Reid, William H.
1958. This particleboard industry. *The Lumberman* 85(7):38-41.
16. U.S. Department of Agriculture, Forest Service.
1973. Study of softwood sawlog conversion efficiency and the timber supply problem. USDA For. Serv., Forest Prod. Lab., Madison, Wis. Project 791. 202 p.
17. U.S. Department of Commerce.
1959. Bureau of the Census. Particle board 1957. Facts for Industry Series BDSAF-SI-2-07. April. 1 p.
18. U.S. Department of Commerce.
1960. Bureau of the Census. Particle board 1959. Current Industrial Reports. Series BDSAF-582-09. October. 2 p.
19. U.S. Department of Commerce.
1976. Bureau of the Census. Particleboard and medium density fiberboard. *Curr. Ind. Rep. Ser. MA-24L(75)*4. 5 p.
20. Wright, Maurice G. and Robert B. Phelps.
1967. Particleboard, insulation board, and hardboard industry trends, 1956-66. USDA For. Serv. Res. Pap. WO-5. September. 21 p.

Glossary of Terms

Capacity

The quantity that could be produced during a stated time period with full use of equipment and an adequate supply of raw materials and labor, with each plant operating under normal conditions.

Extruded Particleboard

A particleboard manufactured by forcing a mass of particles coated with an extraneous binding agent through a heated die with the applied pressure parallel to the faces and in the direction of extruding.

Medium-Density Fiberboard (MDF)

A panel product manufactured from lignocellulosic fibers combined with a synthetic resin or other suitable binder. The panels are manufactured by the application of heat and pressure by a process in which the inter-fiber bond is substantially created by the added binder.

Mende Process Board

A particleboard manufactured in a continuous ribbon from wood particles with thermosetting resins used to bond the particles. Thickness ranges from 1/32 to 1/4 inch. Other names are thin board, thin panel board, and thin particleboard.

Particleboard

A generic term used to describe panel products made from discrete particles of

wood or other ligno-cellulosic material. Other materials can be added during the production process to improve the board. Thermosetting resins are added to the particles to serve as a binder. The particles are bound into a solid board when the particles and resins are placed under heat and pressure.

Platenboard Particleboard

A particleboard in which the coated particles are formed first into a mat having substantially the same length and width as the finished board before being flat-platen pressed. Also called mat-formed particleboard.

Sources: Dickerhoof, H. Edward
Insulation board, hardboard and particleboard industries: past accomplishments, future problems, and opportunities. For Prod. J. 25(4):10-16. 1975.

American Society for Testing and Materials. Annual Book of ASTM Standards. Part 16. Wood, adhesives. 1973. 978 p.

Acoustical and Board Products Association and National Particleboard Association. Proposed American National Standard for Medium Density Fiberboard. 1975. 8 p.

