United States
Environmental Protection
Agency

Office of
Water Planning and Standards
Washington, DC 20460

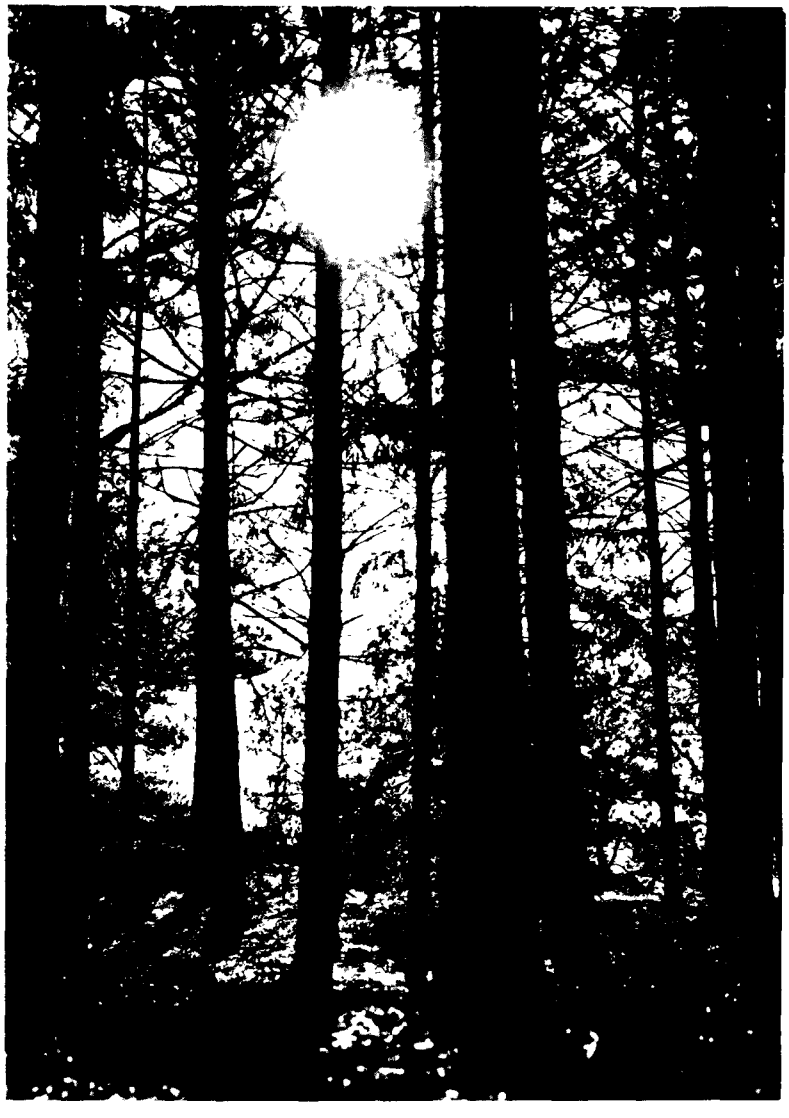
EPA 440/2-79-017

Water

EPA

Economic Impact Analysis of Alternative Pollution Control Technologies

Wet Process Hardboard and Insulation Board Subcategories of the Timber Products Industry



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September 1979

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I. EXECUTIVE SUMMARY

A. SCOPE OF WORK

The U.S. Environmental Protection Agency (EPA) is required by Section 301 (d) of the Clean Water Act to review and revise, if necessary, effluent limitations promulgated pursuant to Sections 301, 304, and 306 within five years of promulgation of these regulations. This study presents an economic impact analysis of alternative pollution control technologies for the insulation board and wet process hardboard subcategories of the timber products industry. It characterizes each industry subsegment; summarizes alternative technologies and their related costs of compliance,* and analyzes and discusses the anticipated economic impact on those plants that would require investments to be in compliance with alternative regulation options. The EPA assisted in the analysis by surveying the board products industry through a Financial 308 Letter.

The study does not address the costs and economic impacts that might or might not be incurred as a result of other environmental or other federal regulations, such as EPA solid waste regulations, EPA air pollution regulations, EPA pesticide regulations or Occupational Safety and Health Administration regulations.

B. INDUSTRY CHARACTERIZATION

1. Insulation Board

The insulation board industry comprises establishments engaged in the production of structural and decorative fiberboard products constructed from inter-felted ligno-cellulosic fibers and having a density of less than 31 pounds per cubic foot.

Twelve companies, one of which is privately held, operate the 17 insulation board plants in the United States. Eleven of these companies are large, diversified corporations: five have major interests in forest products, and six have major interests in other building products. Two of the companies have more than one insulation board plant.

The basic operating technology of the industry is very similar to the fourdrinier paper process and has not changed substantially since its inception. Ten of the seventeen plants are located in the South, with the remainder in Maine, Michigan, Minnesota, Pennsylvania and Oregon. Plant capacities range from 54 million to 400 million square feet, ½" basis, but stated capacities can vary according to the product mix. Plant locations are evenly distributed among rural, suburban, and urban areas. Seven of the seventeen plants can also manufacture hardboard.

Insulation board products are primarily used in the construction industry as building board, insulating roof deck, roof insulation, ceiling tile, lay-in-panels, sheathing and sound deadening board. Between 1965 and 1976, U.S. production has fluctuated between 3 billion square feet, ½" basis, and 3.9 billion square feet. The value of shipments in 1976, was estimated at $275 million.

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*Derived from *Revised Technical Review of Best Available Technology, Best Demonstrated Technology and Best Demonstrated Technology and Pretreatment Technology for the Timber Products Point Source Category*, as prepared for the Environmental Protection Agency by Environmental Science & Engineering, Inc.

However, insulation board is threatened by substitute products and/or technologies in many of its applications. Thus, in contrast to an average annual growth rate of 1.6% from 1965 to 1976, Arthur D. Little, Inc., forecasts a decline at an average annual rate of 5% into the 1980's.

Since 1960, the industry has become more concentrated: currently four companies (Celotex, Armstrong Cork, Weyerhaeuser, and United States Gypsum) operate 56% of U.S. capacity. As insulation board is capital intensive compared to other solid wood products and requires a secure wood source, there are significant barriers to the entry of new firms.

Since 1965, price changes in insulation board have been moderate compared to price changes of other wood products with which it competes. The median value of after-tax profitability is about 3% of sales, with a range from zero to 7%.

2. Wet Process Hardboard

The wet process hardboard industry comprises establishments producing hardboard in densities generally ranging from 31 to 65 pounds per cubic foot from inter-felted wood fiber, using a wet forming and either a wet or dry pressing process.

There are 15 producers operating 28 wet and dry process plants in the United States. The industry is composed of 3 private firms and several large corporations. Of the 15 hardboard producers, 7 operate more than one hardboard plant. Wet process plants represent 16 of the 28 facilities and are operated by 11 producers; 4 of these producers operate more than one wet process plant.

As with the insulation board industry, hardboard mills frequently are integrated back to raw materials sources as owners of woodlands and the larger publicly owned companies also operate captive distribution systems that handle a portion of their output. The remaining producers sell their products through independent wholesalers or through the captive distribution systems of other companies.

Hardboard products serve four general markets; interior paneling, exterior siding, industrial, and do-it-yourself. Most of the mills have associated fabricating facilities to produce a wide variety of finished products.

Imports have ranged from 4.6% to 15.6% of domestic consumption during the 1970's. Volumes vary, depending on the level of U.S. demand, and tend to fill a market need at the lower-value end. In 1978, shipments from domestic plants totaled 7.7 billion square feet, reflecting an average annual growth rate of 7.9% since 1964. During the same period, domestic consumption has grown at 7.5% per year, totaling an estimated 8.7 billion square feet, 1/8" basis, in 1978.

While wet process hardboard plants generally compete in the market against the output of dry process mills, the latter use minimal amounts of process water and are closed systems. Wet process mills are those operations that use a pulping process that requires large amounts of water and a wet mat forming system similar to the paper process.

A typical wet process plant produces about 230 million square feet, 1/8" basis, with individual plant capacities ranging from 52 to 1850 MMSF. Of the 16 wet process plants in the United States, 8 were constructed before 1958 and 2 since 1968. No new wet hardboard plants have come on stream since 1971; however, several locations have added substantial capacity. While Arthur D. Little, Inc., forecasts future growth in demand at about 3% per year, it is highly likely that capacity additions to meet this increased demand will come in the form of incremental expansion at existing facilities or perhaps through the conversion of under-utilized insulation board capacity.

The five largest firms (Masonite, Abitibi, Weyerhaeuser, Boise-Cascade, and Superwood) operate more than 70% of total hardboard and wet process hardboard capacity. As with insulation board, there are significant barriers to the entry of new firms, including its capital intensity, market structure, need for a fiber source, and the required sales effort.

In 1976, the median, after-tax profit for a 200-million-square-foot wet process hardboard plant was about 7%; the industry range was from 1% to 13%.

C. CURRENT EFFLUENT STATUS AND COST OF COMPLIANCE

Two of the plants producing only insulation board discharge into navigable waters, whereas five discharge into municipal sewers and five have no process water discharge. Of the eleven wet process hardboard plants, nine discharge into navigable waters, one discharges into municipal sewers and one has no discharge. Of the five plants producing both insulation board and hardboard three discharge into navigable water, one into a municipal system, and one has no discharge. Thus many plants have pollution control equipment in place and, for several plants, current treatment will be sufficient to meet revised effluent guidelines. However, seven plants producing wet process hardboard may be required to install new equipment to meet the revised regulations. An eighth plant is in the process of installing a pretreatment system.

Investment costs under the two control options defined by the Environmental Protection Agency for wet process hardboard range from $183,000 to $7.4 million, depending on the size of the facility and the control option defined (Table I-1). Annual operating costs range from $51,000 to $2.3 million.

A candidate new source performance standard for insulation board and wet process hardboard plants calls for zero discharge. The total investment required also varies by plant size and process type, and ranges from $2.9 million to $5.5 million for insulation board, and from $2.0 million to $5.1 million for wet process hardboard. Land requirements for an S2S wet process hardboard are up to 720 acres.

D. ECONOMIC IMPACT OF COMPLIANCE WITH REGULATIONS

An analysis of economic impact of the revised water effluent regulation options was performed for each of the seven affected plants. The price increase required to recover the cost of compliance varies widely among the wet process hardboard plants but, in general, Option 1 will produce a lower impact upon costs than would Option 2. (Table I-2).

TABLE I-1

COST OF COMPLIANCE FOR PLANTS
IMPACTED BY REVISED EFFLUENT REGULATIONS
($000)

Option 1	Type of Product	Investment			Operating Costs
		Total	Land	Other Investment	
Plant 2002	S1S	285	5	280	51
Plant 2003	S2S	7,266	40	7,226	2,219
Plant 2004	S1S	1,320	105	1,215	179
Total Option 1		8,871	150	8,721	2,449
Option 2					
Plant 2001	S1S	6,856	188	6,668	796
Plant 2002	S1S	1,105	46	1,059	107
Plant 2003	S2S	7,436	40	7,396	2,300
Plant 2004	S1S	2,938	300	2,638	274
Plant 2007	S1S	183	0	183	101
Plant 2012	S1S	599	0	599	173
Plant 2099	S1S	1,228	30	1,198	107
Total Option 2		20,345	604	19,741	3,858

Source: Environmental Science and Engineering, Inc.

Hardboard, on average, is expected to be in tight supply over the next five to ten years with demand expected to grow annually at approximately 2% per year. To satisfy this demand, new capacity will be necessary. The minimum price necessary to support new capacity is over $100 per thousand square feet. This price is over 30% higher than the 1977 price and is higher than any price increase computed in Table I-2 for the affected plants as being necessary to recover cost increases and maintain profitability.

Profitability of wet process hardboard plants impacted by revised regulations will be reduced in the absence of price increases and all but one plant will cover cash costs and depreciation, assuming that the 1976 operating results are representative of cost conditions likely to prevail in 1984. To the extent that price increases to support new capacity outstrip cost increases for the affected plants, the reduction in profitability occasioned by the regulation will be mitigated.

The EPA is proposing Option 2 as the Best Conventional Pollutant Control Technology for wet process hardboard. Under Option 2, two plants have capital requirements of less than 100% of cash flow, two plants have investment requirements of 100% to 200% of annual cash flow and three plants have investment requirements of 200% to 350% of cash flow.

TABLE I-2

REVENUE REQUIRED TO RECOVER THE COST OF
COMPLYING WITH REVISED REGULATIONS FOR HARDBOARD PLANTS

Plant Type/Code	(1) 1976 Revenue ($000)	1976 Price** $/MSF	Recovery of Compliance Cost: Required Δ Revenue $/MSF	Recovery of Compliance Cost: % Δ 1977 Price
Option 1				
Plant 2002	20,000	78	0.80	1
Plant 2003	>30,000	78	9.93	13
Plant 2004	8,400	78	6.60	9
Plant 2013*	20,400	78	6.10	8
Option 2				
Plant 2001	>30,000	78	3.96	5
Plant 2002	20,000	78	2.60	4
Plant 2003	>30,000	78	10.23	13
Plant 2004	8,400	78	13.40	17
Plant 2007	9,600	78	1.75	2
Plant 2012	>30,000	78	0.30	0
Plant 2013*	20,400	78	6.10	8
Plant 2099	5,500	78	8.30	11

*This plant is in the process of installing a pollution control system, and those specific costs were used in the analysis.

**The average price for wet process hardboard for 1976.

Source: Arthur D. Little, Inc., estimates.

Had Option 1 been selected, four fewer plants would have been affected and the required price increase to recover cost would have been slightly lower.

The number and size of insulation board plants will be unaffected by the proposed regulations. However, one hardboard plant, 2003, may close as a result of Option 1 or 2 because of the large capital requirements and the reduction in plant profitability. If this plant closes approximately 300 jobs will be affected with attendant impacts on community employment.

New hardboard capacity probably will be built at existing plants rather than at greenfield sites and will not be influenced significantly by revised new source regulations.

II. INDUSTRY CHARACTERIZATION — INSULATION BOARD

A. INDUSTRY DEFINITION

The insulation board industry (a subset of the building board industry, SIC 2261) comprises establishments engaged in the production of structural and decorative fiberboard products constructed from inter-felted ligno-cellulosic fibers and having a density of less than 31 pounds per cubic foot.

B. TYPES OF FIRM

1. Size of Firms

Twelve companies, one of which is privately held, operate the 17 insulation board plants in the United States (Table II-1). Eleven of these companies are large diversified corporations, five have major interests in forest products and six have major interests in other building products. There are only two multi-plant companies; Celotex, the largest producer, operates four plants and U.S. Gypsum operates three.

TABLE II-1

SALES BY INSULATION BOARD MANUFACTURERS, 1977
($ million)

Company	Total Corporate	Insulation Board[1]
Abitibi Paper Co., Ltd.	880	12
Armstrong Cork	981	31
Boise Cascade	2316	16
Celotex/Jim Walter[2]	525/1422	59
Flintkote	587	16
Georgia Pacific	3675	16
Huebert Fiberboard	2	2
Kaiser Gypsum	212	12
National Gypsum	748	15
Temple/Time Inc.	340/1038	17
U.S. Gypsum	1177	21
Weyerhaeuser	3283	23

1. At 80% of capacity and $97/MSF, 1/2".
2. Fiscal year ended August 31.

Source: Dun and Bradstreet Directory, 1978, Directory of Corporate Affiliates, 1978.

The percentage of sales revenues contributed to each company by insulation board products varies considerably from company to company (Table II-1). Although they may hold sizeable insulation board capacity, most of the companies are involved in many other businesses and do not have significant capital committed to the industry relative to their total business. Annual sales of the 12 companies, including sales from other operations such as lumber, plywood, and non-wood products, range from $2 million to more than $3.6 billion (Table II-1).

2. Integration/Diversification

The major forest products firms are normally fully integrated backward to timber ownership or control and forward to distribution systems. Insulation board is usually manufactured to take advantage of the volumes of locally available waste from other wood products mills and to broaden the company's product line.

Four of the forest products firms (Abitibi, Boise Cascade, Georgia Pacific, and Weyerhaeuser) have major capital interests in various segments of the paper industry as well as a full spectrum of building products. Temple Industries, a subsidiary of Time, Inc., produces a wide range of solid wood products.

Five of the building products firms involved in the insulation board industry (U.S. Gypsum, National, Kaiser Gypsum, Flintkote and Celotex, a division of Jim Walter Corporation) are highly diversified into both residential and nonresidential building materials. Armstrong Cork has major interests in both residential and commercial interior finishing materials, including floor coverings, wall coverings, and furniture. The general building products firms produce insulation board to complement their product lines. While these firms are characterized by well-developed captive distribution systems, they generally are not integrated backward to timber control. The remaining company, Huebert Fiberboard, is privately held and insulation board apparently constitutes its major business.

C. PRODUCT DESCRIPTION

1. Types of Products

Insulation board is known in the marketplace under many different names, i.e., fiberboard, sheathing board, backer board, or asphalt board. Insulation board products can be divided into seven major categories, as follows:

- *Building Board* — a general-purpose product for interior construction.
- *Insulating Roof Deck* — a three-in-one component which provides roof deck, insulation, and a finished interior ceiling surface. Insulation board sheets are laminated together with waterproof adhesives.
- *Roof Insulation* — insulation board designed for use on flat roof decks.
- *Ceiling Tile* — insulation board embossed and decorated for interior use. It is also valued for acoustical qualities.
- *Lay-in-Panel* — a finished tile board used in suspended ceilings.
- *Sheathing* — a board used in exterior construction because of its insulative and noise control qualities, its bracing strength, and its low price.
- *Sound Deadening Insulation Board* — a special product designed to control noise levels in buildings.

The American Society for Testing and Materials, American National Standards Institute, U.S. National Bureau of Standards, and other agencies set standard specifications for these and other product categories.

2. Market Size and Future Growth

Since 1965, total U.S. production, as reported by the Bureau of the Census, has fluctuated between a low of 1.16 million tons (3.0 billion square feet, ½" basis) in 1970 to a high of 1.55 million tons (3.9 billion square feet) in 1973 (Table II-2). In 1971 and 1972, the insulation board industry seemed to be slowly losing its market and steadily becoming more unprofitable as plants continued to close. Six plants had closed since 1960 and operations at two more plants were severely cut back in 1977. Since 1975, per capita consumption of insulation board has fluctuated between 11.3 and 13.5 pounds per person although total U.S. production in 1976 was still below the 1973 peak (Table II-2). While the future trend for insulation board demand is a declining one, the current (1978) high levels of housing construction and the demand for insulation have stabilized production levels.

TABLE II-2

PRODUCTION OF INSULATION BOARD, 1965-1976

	Production		
Year	Total[1] (000 tons)	Per Capita (pounds)	Per $ Billion of New Construction[2] (000 tons)
1965	1258	12.9	15.9
1966	1155	11.7	14.5
1967	1176	11.8	15.1
1968	1133	11.3	13.8
1969	1352	13.3	16.4
1970	1219	11.9	15.5
1971	1446	14.0	16.9
1972	1529	14.6	16.6
1973	1547	14.7	16.6
1974	1295	12.2	16.2
1975	1240	11.7	17.9
1976	1450	13.5	19.8

1. Annual growth rate 1.6%.
2. Constant 1967 dollars.

Note: Government import/export data are unreliable. The volumes are generally offsetting and less than 2.5% of sales; therefore, the data are not shown.

Source: "The Demand and Price Situation for Forest Products, 1976-1977" USDA, Forest Service Miscellaneous Publication 1357.

Trade directories indicate that 64% of the world's insulation board capacity is in the United States. Government data on insulation board imports and exports are unreliable; the volumes are small and offsetting; therefore, the data are not shown. However, according to U.S. Forest Service data, imports have generally been less than 2.5% of domestic production.

Interior products account for 30% of the total production (on a ½-inch basis) and are mainly prefinished building board and ceiling tile (Figure II-1).* Exterior products, principally sheathing board and roof insulation board, represent 58% of production. The remaining 12% includes insulation board used in industrial applications, principally trailer (mobile home) board.

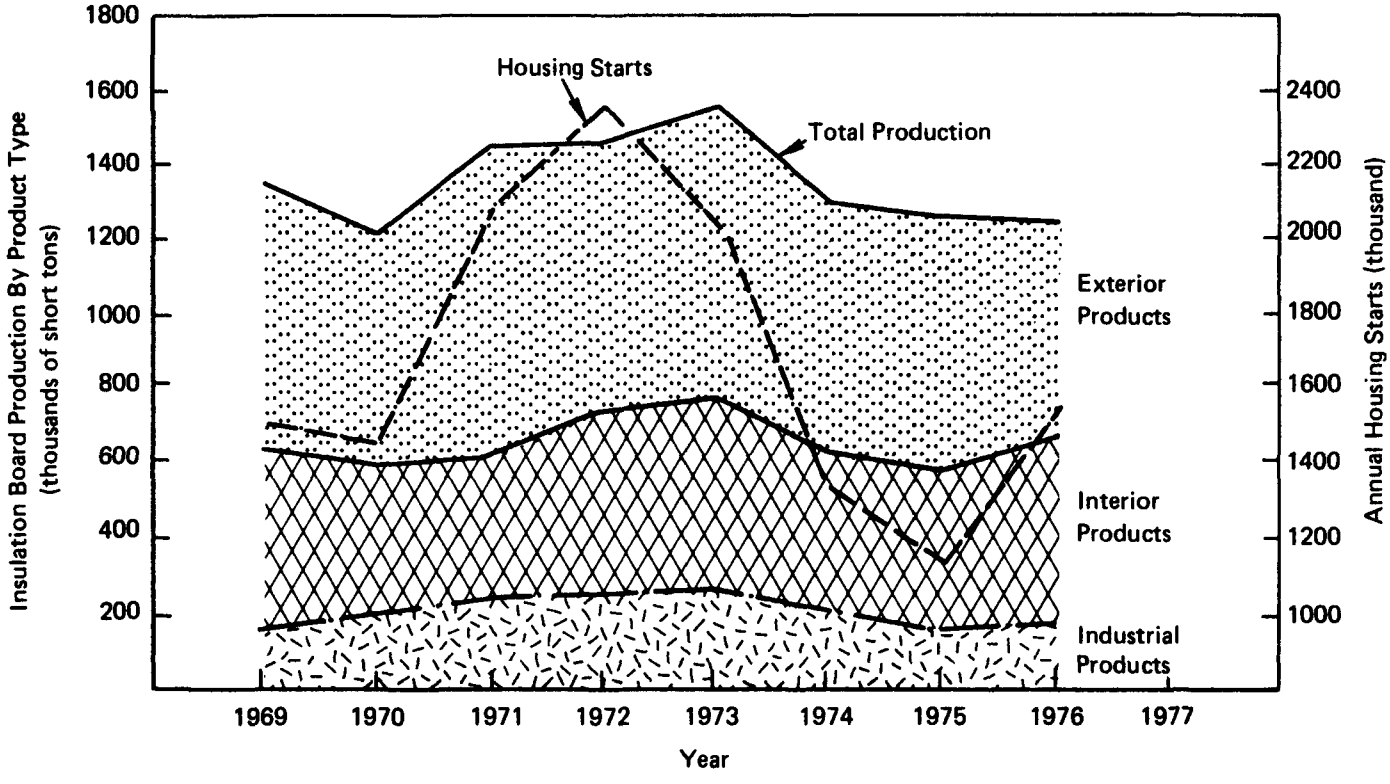
The largest interior products market has traditionally been nonacoustical ceiling tile and lay-in panels. This market has dropped from 530 million square feet in 1972 to 321 million square feet in 1976, largely as a result of the inclusion of stricter flame spread requirements in building codes. The product, which had been widely used in nonresidential construction, is now limited to the residential repair and remodeling market. Improvements in some fire resistance qualities have helped the acoustical tile market grow from 172 million square feet to 201 million square feet over the 1972-1976 period and have kept regular tile products from losing even more of their market. Over the same period, sound-deadening board has suffered heavy market losses, with volume slipping from 114 million square feet to 46 million square feet. The future of the interior products markets is highly dependent on the ability of the manufacturers to develop a better fire resistant board. Arthur D. Little forecasts that the interior products market will decline 5-6% annually through 1982.

The largest of the exterior products markets is sheathing. In this application, insulation board is frequently used as a backup to brick veneer. Over the period from 1972 to 1976 sheathing volume decreased from 1,608 million square feet to 1,368 million square feet; however, 1972 insulation board sheathing production was the highest in the past nine years. The availability of price-competitive products and the fact that many building codes permit exterior wood sidings to provide rack** resistance, previously provided by plywood sheathing or brick, are forcing a cutback in the insulation board sheathing market. Also, insulation board sheathing products have an R-value of approximately 2.64 (°F ft². Btu/inch), which is considerably lower than that of most true insulation products like fiberglass and foams. Furthermore, the sheathing panels are usually ½ inch thick, with a resulting R-value of only 1.32, which is less than what is being required in energy conserving construction.

Gypsum sheathing is insulation board's chief competitor in the sheathing market. The 1977-1978 housing boom, however, has caused a shortage of gypsum, thus resulting in more insulation board being used than would otherwise have been the case. Gypsum is a good example of a preferred cost-competitive product. New products such as foil-backed structural foams are also competing in the sheathing market. On the other hand, roof insulation board has made a recovery, with production going from a nine-year low of 261 million square feet in 1972 to 549 million square feet in 1976. As a result, over the 1972-1976 period, the total exterior products market volume has increased 1.6%. The exterior product demand will weaken as housing construction slows and as capacity comes on-stream from competing products (approximately 10

* For a more detailed breakdown, see Appendix A.

** Racking strength — the ability of the structural unit to withstand shear and bending stresses resulting from various building loads.



Source: U.S. Department of Commerce, *Current Industrial Reports,* M26A.

FIGURE II–1 INSULATION BOARD PRODUCTION, 1969–1976

plywood mills and at least two foam panel plants are under construction). In view of these downward pressures on demand, Arthur D. Little forecasts the exterior products market to drop by 2.5-3.0 percent annually through 1982.

The industrial market for insulation board has declined from a nine-year high of 718 million square feet in 1972 to 418 million square feet in 1976. Most of this loss is attributable to a decline of 243 million square feet over the 1972-1976 period in the trailer board market, which was largely a result of flame spread requirements in mobile homes. The use of insulation board for expansion joint strips has also declined dramatically. Arthur D. Little estimates that the industrial market will decrease 7-8% annually through 1982.

The insulation board industry is indirectly affected by the level of hardboard imports; should the hardboard demand growth require more domestic capacity, some insulation board capacity can be converted to produce hardboard. A conversion from hardboard to insulation board capacity, although it is not likely, may also occur during periods of weak demand for hardboard.

Most insulation board is used in remodeling or new construction; therefore, the demand for it is cyclical. To minimize the influence of cyclicality, various historic growth rates were calculated, based on data in Table A-1, using a least squares time trend line. Over the 1969-1976 period, the market for exterior insulation board products grew at 0.74% per year, while interior and industrial products grew at an annual rate of 0.55% and -1.6%, respectively, and the average annual growth rate for total production was 0.35%. At the same time, the economy in general has experienced real growth of about 3.0% per year, thus confirming our discussion about insulation board losing market share to competitive products for a long time. The factors which have contributed to the current favorable supply/demand balance for insulation board in 1977-78 are temporary; the strong housing market combined with the shortage of gypsum sheathing will not persist. Further competition from competing products will become more intense. In view of these considerations, the aggregated market for insulation board is projected to decline at an average rate of 5% annually through 1982 (Figure II-2). However, because of the cyclicality of construction, this market will reflect the same short periods of growth and construction typical of most building materials.

D. PLANT CHARACTERISTICS OF THE EXISTING INDUSTRY

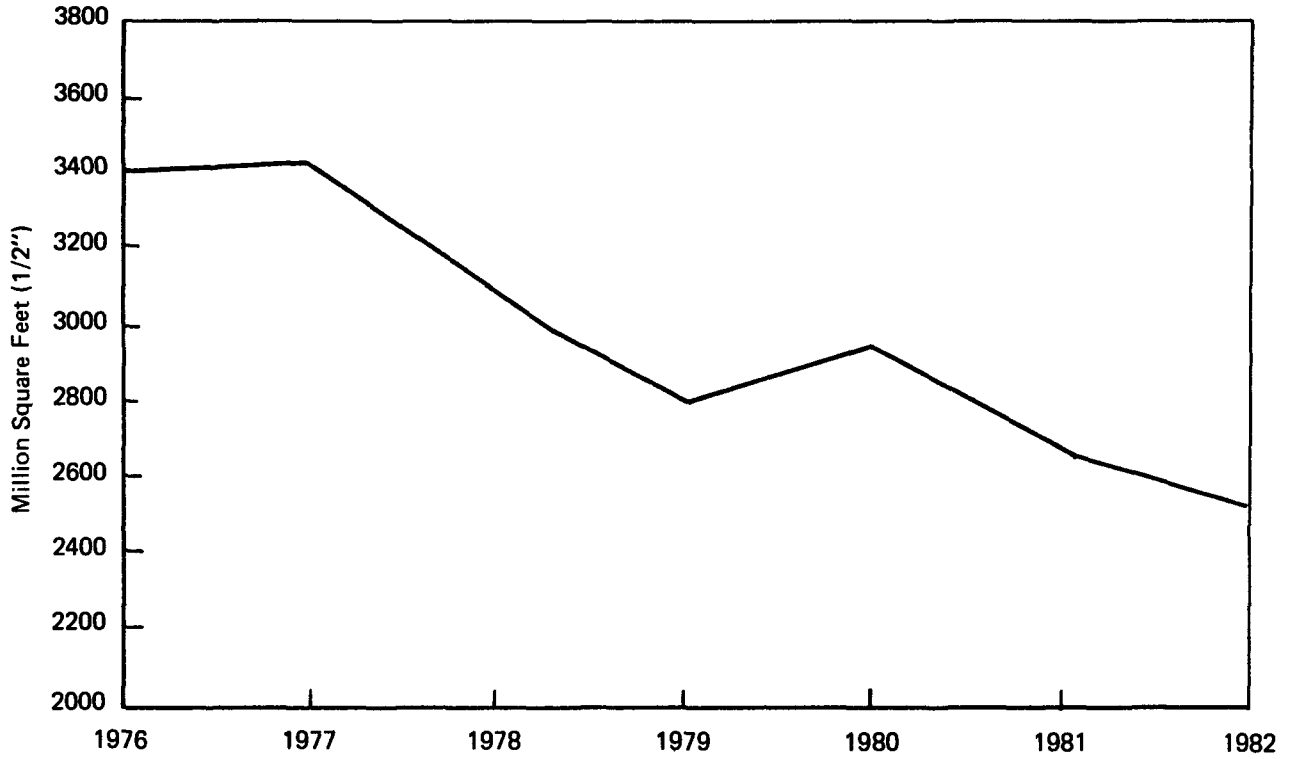
1. Process Technology

The basic operating technology of the industry is very similar to the fourdrinier paper process and has not changed substantially since its inception. A cylinder screen type of mat forming system is also used. Some technical improvements have been made in the fiber refining stage of the production process.

Technical changes in the product also have had a significant impact on the industry and have been market-driven. These have resulted in production process modifications.

2. Size of Plants

Existing plant capacities, on a ½ inch-thick basis, range from 54 million to 400 million square feet (Table II-3). The mix of structural and tile products at a given mill can have a substantial impact on the stated mill capacity figures. For example, because of trim losses and



Source: Arthur D. Little, Inc., estimates.

FIGURE II–2 INSULATION BOARD DEMAND, 1976–1982

TABLE II-3

INSULATION BOARD PLANTS IN THE UNITED STATES, 1977

Company	Location	Annual[1] Capacity (MMSF-1/2")	Other Products Manufactured
Abitibi	Blountstown, FL[3]	150	
Armstrong Cork	Macon, GA	400[2]	
Boise Cascade	International Falls, MN	210	Hardboard
Celotex	Dubuque, IA	737	
Celotex	Marrero, LA[4]		
Celotex	L'Anse, MI[3]		
Celotex	Sunbury, PA[3]		
Flintkote	Meridian, MS	200	
Georgia Pacific	Jarratt, VA[3]	210	Hardboard (1978)
Huebert Fiberboard	Boonville, MO	50	
Kaiser Gypsum	St. Helens, OR	150	
National Gypsum	Mobile, AL	192	
Temple Industries	Diboll, TX	220	Hardboard
U.S. Gypsum	Lisbon Falls, ME	271	Hardboard (all facilities)
U.S. Gypsum	Pilot Rock, OR[3]		
U.S. Gypsum	Greenville, MS		
Weyerhaeuser	Broken Bow (Craig), OK	300	Hardboard
Total		3090	

1. These are approximate capacities as they depend upon product mix. Figures quoted are for mills operating 24 hours/day, 6-2/3 days/week, 50 weeks/year.
2. Understated due to heavy tile production. If operated as a sheathing mill, capacity would increase 20%.
3. No effluent.
4. Not considered in this analysis.

Sources: 1976 *Directory of the Forest Products Industry,* American Board Products Association, and Arthur D. Little, Inc., estimates.

product configuration, a mill that produces interlocking ceiling tile will produce 20% less board than an identical mill producing sheathing. Plants producing prefinished building board and lay-in ceiling tile will also have trim losses considerably in excess of identical sheathing mills.

3. Age Distribution

Age is a factor in overall plant efficiency. Twelve of the plants are more than 20 years old and all but one are more than 10 years old (Table II-4).*

TABLE II-4

AGE DISTRIBUTION OF INSULATION BOARD PLANTS

Age (Years)	Number of Plants
0-19	5
20-29	5
30+	7
Total	17

Source: EPA Financial 308 Letter.

4. Location

Ten of the 17 plants are located in the South and the remainder are in Maine, Michigan, Minnesota, Pennsylvania, and Oregon. This distribution developed because of the availability of wood fiber close to the market and insignificant competition for wood resources in the South at the time the plants were constructed. The sites are evenly distributed between rural, suburban, and urban areas.

Wood resources that are owned or controlled under long-term contracts typically supply 30-50% of the plants' raw fiber needs. The remainder of each plant's fiber requirement is made up by open market purchases. Four of the mills are part of multi-plant forest products production complexes and derive a substantial portion of their fiber requirements from the waste of other operations.

5. Employment

The 1972 Census of Manufactures indicates that the industry supported 6,100 employees on a payroll of $59 million. Most of the plants operate with over 200 employees (Table II-5); however, compared to the more basic wood products, such as lumber and plywood production, it is one of the less labor-intensive segments of the industry.

E. CHARACTERISTICS OF NEW PLANTS

In the past nine years, only one new insulation board plant has opened. Since 1960, six plants have shut down. In 1976 and 1977, two large plants announced major cutbacks in their

*The Celotex plant in Marrero is excluded from this analysis because it does not use wood fiber as a raw material but is included in the discussion in order to present a complete picture of the industry.

TABLE II-5

EMPLOYMENT LEVEL OF
INSULATION BOARD PLANTS

Number of Employees	Number of Plants
0-199	5
200-299	5
300-399	3
400+	4
Total	17

Source: EPA Financial 308 Letter.

operations. In 1978, Georgia Pacific was expected to add hardboard siding capacity in Jarratt, Virginia, to its insulation board and will operate both production lines. No companies have announced any intentions, plans, or desires to build additional insulation board capacity.

F. COMPETITIVE STRUCTURE

1. Market Structure

Since 1960, when 23 insulation board plants were operated by 17 firms, the industry has become more concentrated. Currently, the top three firms control 47% of industry capacity and the top five firms control 63% (Table II-6). As product demand declines and plants close or convert to other products, the industry is expected to become even more concentrated.

TABLE II-6

CONCENTRATION IN THE
INSULATION BOARD INDUSTRY

Firm	% Capacity
Celotex	24
Armstrong Cork	13
Weyerhaeuser	10
U.S. Gypsum	9
Temple	7
All Others (7)	37
Total	100

Sources: American Board Products Association, and Arthur D. Little, Inc., estimates.

2. Pricing Mechanism

The economic justification for construction of insulation board plants was based on the use of waste from other forest products mills as the basic raw material supply. Initially, this raw material was very inexpensive; but, since 1972, increased competition for wood chips and rising energy, labor and pollution control costs have increased insulation board costs (Table II-7).

TABLE II-7

PRICES OF SELECTED INSULATION BOARD PRODUCTS[1], 1965-1978
(dollars per thousand square feet)

Year	1/2-Inch[2] Sheathing	Roof Insulation[3] Board	Ceiling Tile[4]
1965	37.09	63.78	83.05
1966	36.45	65.15	83.75
1967	36.01	65.02	87.24
1968	38.17	64.17	91.78
1969	40.73	65.15	97.88
1970	36.91	67.16	103.38
1971	37.78	66.06	109.14
1972	42.06	66.19	112.28
1973	44.98	67.56	113.32
1974	49.23	84.59	117.16
1975	50.20	100.13	121.87
1976	58.31	107.80	130.42
1977	66.05	N/A	N/A
1978 (March)	74.87	N/A	N/A

1. f.o.b. mill, with freight allowed to destination.
2. Standard density, 1/2" x 2' x 8' to 4' x 9', with asphalt impregnation or water-resistant coating, manufacturer to wholesaler.
3. 1" x 2' x 4', asphalt treated, manufacturer to roofing contractor.
4. 1/2" x 1' x 1', 1 x 2', or 1 x 3', factory-painted plain surface, beveled edges, manufacturer to wholesaler or retailer.

Source: U.S. Bureau of Labor Statistics.

Insulation board prices are usually quoted on a dollar per thousand square feet basis, f.o.b. shipping point, with full freight allowed to the destination. Between 1965 and 1976, insulation board sheathing prices increased 57%, including a 30% increase since 1973. Since 1965, the price of ceiling tile has also increased 57%, but the increase since 1973 has been only 15%. Ceiling tile prices reflect the higher value-added manufacturing steps and are more than double the price of sheathing; therefore, while the percentage increases for the 1965-1976 period are equal, the absolute dollar price increases for ceiling tile are more than double the price increases for sheathing.

The major pricing constraint for insulation board is created by price levels of substitute products rather than intra-industry competition. The price comparisons must be made on the basis of performance value, not unit costs. The triple role of insulation board as a structural, decorative, and insulation product makes price comparisons particularly difficult. To illustrate, the March 1977 price of ½-inch insulation board sheathing was $58.71 per thousand square feet, while the price of ½-inch plywood sheathing was $190. On this basis, the insulation board appears to be a better value. However, in use, a siding material must be applied over the sheathing. An alternative wall construction is to use fiber glass insulation and a plywood or hardboard siding product that provides the strength of the sheathing, a finished outside wall, and a better R-value for the complete wall. The construction costs of the fiber glass/siding wall are less than a sheathing/siding wall and the higher-quality insulation will result in lower long-term heating costs. Ultimately, what appeared to be a major price advantage for insulation board becomes insignificant. Gypsum sheathing has been very competitive with insulation board on a price/utility basis for years and has established itself as the preferred sheathing material in many areas. Structural foams are also beginning to appear on the market and will also compete strongly with insulation board on the basis of performance value.

In the past, commercial structures have used large quantities of insulation board for ceiling tile, lay-in panels, and roof deck insulation. But fire code restrictions have severely cut back the use of the material in these applications. The insulation board roof decking has also met with strong competition from perlite and rigid fiber glass boards. Until a fire-retardant insulation board ceiling tile is on the market and widely accepted in building codes, the price of insulation will not stimulate demand, and plastic or mineral board substitutes will dominate the non-residential market.

3. Price Elasticity of Demand

Changes in the price of insulation board from 1965 to 1976 have been moderate compared to those of lumber, plywood, and other wood products with which it competes (Table II-8). While the 1976 wholesale price index (WPI) for insulation board products was 160.8 (1967=100), the WPI for all construction products had risen to 187.7. But the general inflation index was at 159.0; thus, insulation board prices have kept pace with general inflation and thus have experienced no real price increases. There are several factors that contribute to this situation.

First, the recent cost-price relationship based on improved plant efficiency and resulting lower costs may have allowed the industry to maintain its accepted level of profitability without increasing prices. However, given the recent history of wood costs, competition for fiber, and costs of finishing materials, this relationship is not likely to continue to be a major factor.

Second, the industry may have absorbed the impact of lower margins per unit by increasing production volumes with added shifts and small incremental investments to increase existing plant capacities. The closure of six plants since 1960 while production continued to increase slightly is an indication that this has happened in the remaining plants. This course of action at a facility could, depending on volume-price relationships, result in level rates of return as a consequence of lower per unit margins on greater volumes.

Finally, there is a market-price relationship. Insulation board may have to keep down its prices to meet competition from substitute products such as gypsum and maintain its market shares. While there is probably some cross-elasticity of demand between insulation board and competing products, price is not the principal reason for utilizing insulation board.

TABLE II-8

PRICE INDEXES FOR SELECTED INSULATION BOARD PRODUCTS[1], 1965-1978
(1967 = 100)

Year	All Construction Materials Price Index	1/2-Inch[2] Sheathing	Roof Insulation[3] Board	Ceiling Tile[4]	All Insulation Board	Percentage[5] Change Over Previous Year
1965	95.8	103.0	98.1	95.2	98.2	–
1966	98.8	101.2	100.2	96.0	98.4	0.2
1967	100.0	100.0	100.0	100.0	100.0	1.6
1968	105.6	106.0	98.7	105.2	103.0	3.0
1969	111.9	113.1	100.2	112.2	108.8	5.6
1970	112.5	102.5	103.3	118.5	110.5	1.6
1971	119.5	104.9	101.6	125.1	114.4	3.6
1972	126.6	116.8	101.8	128.7	119.0	3.9
1973	138.5	124.9	103.9	129.9	121.7	2.3
1974	160.9	136.7	130.1	134.3	133.9	10.0
1975	174.0	139.4	154.0	139.7	144.0	7.5
1976	187.7	161.9	165.8	149.5	161.0	11.8
1977	204.9	183.4	N/A	N/A	177.9	10.5
1978 (March)	221.9	207.9	N/A	N/A	196.8	10.6

1. f.o.b. mill, with freight allowed to destination.
2. Standard density, 1/2" x 2' x 8' to 4' x 9', with asphalt impregnation or water-resistant coating, manufacturer to wholesaler.
3. 1" x 2' x 4', asphalt treated. manufacturer to roofing contractor.
4. 1/2" x 1' x 1', 1 x 2', or 1 x 3', factory-painted plain surface, beveled edges, manufacturer to wholesaler or retailer.
5. Changes in composite index for all insulation board products.

Source: U.S. Bureau of Labor Statistics.

4. Barriers to Entry of New Firms

Insulation board is capital intensive compared with the production of other solid wood products such as plywood and lumber. Other than capital requirements, the significant barriers are securing a wood source and, depending on the product line, the scale of the required marketing effort. Tile products would require a larger sales effort than sheathing because of the proprietary nature of the product.

5. Other Regulatory Factors

A result of government timber policy restricting the harvest of federal timber on the West Coast would be to lower supplies and push up prices of lumber and plywood. This would probably result in increasing demand for fiberboard and would allow substantial price increases. An easing of government timber policy that would allow a higher level of removals from West Coast forests, which is equally likely at this time, would have the opposite effect.

G. FINANCIAL PROFILE

Plant sales vary directly with production (Table II-9). However, plant book values differ for plants of similar size because of plant age and other factors.

While the distribution of manufacturing cost differs by size of plant, there appear to be significant differences in relative costs due to other factors. A number of insulation board plants appear to be operating at a loss, and operating margins overall are small compared with those of hardboard plants. The outlook for insulation board demand indicates that the financial condition of some insulation board plants will worsen as capacity utilization rates fall. Insulation board plants are also likely to shut down or convert to other products in the face of falling demand.

TABLE II-9

FINANCIAL PROFILES
PRO-FORMA INCOME STATEMENT INSULATION BOARD PLANTS

Sales (1976)	$8,500,000 (range $3-30 Million)
Capacity	125 Million Square Feet
Capacity Base	1/2"

Pro-Forma Cost of Manufacture	**Median Value (%)**	**Range of Values (%)**
Sales	100	100
Cost of Goods Sold		
Labor	25	15-31
Materials	35	30-50
Depreciation	4	2-8
Other Expenses	20	2-44
Total Cost of Goods Sold	84	
Gross Margin	16	8-24
Selling General & Administrative	10	7-18
Interest	–	
Profit Before Tax	6	< 0-13
Profit After Tax	3	< 0-7
Plant Book Value	$7,000,000	$500,000-$25,000,000

Source: EPA Financial 308 Letter. Excludes plants producing both insulation board and hardboard.

III. INDUSTRY CHARACTERIZATION — WET PROCESS HARDBOARD

A. INDUSTRY DEFINITION

Wet process mills are only one segment of the hardboard production capacity. The industry* is composed of three segments: wet, wet-dry and dry processes, that serve the same markets with similar products and are largely operated by the same companies. Inherent differences in physical product characteristics developed by each process, however, make some products better suited to some application.

The wet process hardboard industry comprises establishments producing hardboard in densities generally between 31 and 65 pounds per cubic foot from inter-felted wood fiber using a wet forming and either a wet or dry pressing process (known respectively as wet-wet and wet-dry). The dry process segment of the industry uses a dry forming and dry pressing process to manufacture hardboard.

B. TYPES OF FIRMS

1. Size of Firm

There are 15 producers operating 28 wet and dry process plants (Table III-1). The industry is composed of three private firms and several large corporations. Seven of the 15 hardboard producers operate more than one hardboard plant. Wet process plants represent 16 of the 28 facilities and are operated by 11 producers, four of which operate more than one wet process plant.

The larger corporations in the wet process board industry are Masonite, Abitibi, Champion International, Weyerhaeuser, and U.S. Gypsum. The largest private company, Superwood, is the fourth-ranked producer in the industry whereas the two remaining private firms are among the smallest producers.

Total annual sales for companies in the wet process segment of the hardboard industry, including sales from operations such as lumber, plywood, paper, chemicals, and others, range from $25 million to more than $3.6 billion (Table III-2). The importance of a particular plant to each firm varies with each case.

2. Ownership/Integration/Product Diversification

Of the 12 wet process hardboard mills, 8 are owned by publicly held corporations; the 4 remaining mills are owned by 3 private companies.

Frequently, as owners of woodlands the public corporations are integrated back to raw material sources, which typically supply 35-45% of their raw material needs. The private companies are also likely to own some woodlands but, unlike the public companies, they do not typically derive as large a percentage of their wood requirements from these sources.

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* Standard Industrial Classification 2499, "Wood Products Not Elsewhere Classified," includes, among other industries, medium-density fiberboard, wet process hardboard, and dry process hardboard. SIC data do not distinguish among these three industries.

TABLE III-1

HARDBOARD PRODUCTION CAPACITY, 1977
(million square feet — 1/8" basis)

WET-WET PLANTS[1]

Company	Location	Annual Capacity
Abitibi[2]	Alpena, MI	200
Abitibi	Roaring River, NC	315
Evans Products	Corvallis, OR	110
Forest Fiber	Forest Grove, OR	114
Masonite	Laurel, MS	1850
Masonite	Ukiah, CA	560
Superior Fiber	Superior, WI	158
Superwood	Duluth, MN	380
Superwood	N. Little Rock, AK	130
Champion International	Dee, OR	76
	Subtotal	3893

WET-DRY PLANTS[2]

Abitibi[2]	Alpena, MI	329
Boise Cascade	International Falls, MN	700
Temple	Diboll, TX	244
Weyerhaeuser	Craig, OK	175
U.S. Gypsum	Danville, VA	230
U.S. Gypsum	Pilot Rock, OR	86
U.S. Gypsum	Greenville, MS	155
	Subtotal	1919
	Total — Wet Process	5812

DRY PLANTS[3]

Boise Cascade	Phillips, WI	80
Celotex	Paris, TN	195
Champion International	Catawba, SC	225
Champion International	Lebanon, OR	107
Georgia Pacific	Conway, NC	265
Georgia Pacific	Coos Bay, OR	201
Louisiana Pacific	Oroville, CA	150
Masonite	Towanda, PA	490
Publishers Forest Prods.	Anacortes, WA	52
Superwood	Bemidji, MN	90
Weyerhaeuser	Doswell, VA	315
Weyerhaeuser	Klamath Falls, OR	290
	Total Dry Process Capacity	2460
	Total Hardboard Capaticy	8272

1. The Masonite mills and the Abitibi mill in Alpena, MI, use combinations of the wet-wet and wet-dry processes.
2. There are wet-wet and wet-dry operations at this location.
3. Does not include medium-density fiberboard (MDF) plants because it is a different product used in different applications.

Sources: 1976 *Directory of the Forest Products Industry,* American Board Products Association, and Arthur D. Little, Inc., estimates.

TABLE III-2

1977 HARDBOARD SALES
(all producers, $MM)

Company	Total Corporate Sales*	Total** Hardboard Sales	Wet Process** Hardboard Sales
Abitibi Paper Co. Ltd.	800	72	72
Boise Cascade	2316	66	60
Celotex/Jim Walter[1]	525/1422	17	–
Champion International	3127	34	7
Evans Products	941	9	9
Forest Fiber	N/A	9	9
Georgia Pacific	3675	40	–
Louisiana Pacific	794	13	–
Masonite[1]	445	247	206
Publishers/Times Mirror Co.	NA/976	5	–
Superior Fiber/Carlson Companies	NA/650	13	13
Superwood	N/A	–	44
Temple/Time Inc.	340/1038	21	21
U.S. Gypsum	1177	40	40
Weyerhaeuser	3283	66	15

1. Fiscal year ends August 31.

Sources: *Dun and Bradstreet Directory, 1978, Directory of Corporate Affiliations, 1978.
**Arthur D. Little, Inc., estimates, based upon an operating rate of 100% and the prices for 1977 shown in Table III-9.

Six of the parent companies operate captive distribution systems that handle a portion of their output. The remaining producers sell their products through independent wholesalers or through the captive distribution systems of other companies.

In addition to hardboard products, all of the parent companies are involved in the production and distribution of a wide range of other wood products — both competing and non-competing — and various building materials. Many hardboard operations are parts of forest products complexes that may produce various combinations of lumber, plywood, particleboard, fiberboard, pulp, and/or paper. The parent companies generally have a strong orientation towards forest products (five are involved in the paper industry) and may produce other building materials such as gypsum board. Three of the firms are significantly diversified beyond building materials businesses.

C. PRODUCT DESCRIPTION

1. Types of Hardboard Products

Hardboard products can be divided into four classes on the basis of water resistance, modulus of rupture, and tensile strength. The four classes, listed in order of decreasing strength properties, are as follows:

(1) tempered
(2) standard
(3) service-tempered
(4) service

Hardboard products serve four general markets: interior paneling, exterior siding, industrial and do-it-yourself. Most of the mills have associated fabricating facilities for prefinished paneling, panel stock, siding, perforated board, embossed, and/or cut-to-size products.

Hardboard serves a very wide range of end uses involving about 800 different sets of specifications. Marketing efforts have usually been aimed at displacing traditional products such as gypsum, plaster, stucco, and plywood in specific applications. Hardboard is challenging and being challenged by these products and others in various markets and applications.

Interior paneling may be manufactured from any of the four classes of hardboard in thicknesses of ⅛ to ¼ inch. Panels up to 5 feet wide or 12 feet long are available. Hardboard was used as the substrate in about 20% to 40% of the interior paneling sold in 1973, with its major competition being inexpensive lauan plywood, domestic hardwood plywood, and thin particleboard. It is used for both wood-grain prints and tileboard panels. The surface of the panel may be embossed to provide a surface texture or pattern before a finish is applied. The hardboard manufacturer may produce and sell prefinished paneling, unfinished paneling stock, or both.

Siding is manufactured specifically for exterior use. Lap siding is manufactured in thicknesses of ⅜ inch and greater, widths from 4 to 12 inches, and lengths up to 16 feet in two-foot increments. Panel siding is fabricated in sheets 4 feet wide, 4 to 12 feet long and usually ¼ inch thick or thicker. Hardboard was introduced to the siding market in the late 1940's and now competes against PVC, aluminum, brick, stucco, plywood, and other wood siding materials.Textures simulating most other siding materials, as well as improved finishes, have increased hardboard's market share in residential siding and will probably continue to do so. Hardboard siding is now also gaining market share in mobile home applications and Arthur D. Little expects this trend to continue.

The industrial market for hardboard encompasses a very wide range of end-user and OEM (original equipment manufacturer) applications, including: displays, furniture, transportation, electronics, interior construction, factory equipment, and toys. The list of actual and possible uses is extremely diversified. Most industrial markets require the hardboard manufacturer to meet a unique set of specifications pertaining to board characteristics and/or fabrication requirements. The industrial market is so diversified that competition from substitute products in any one segment has only minimal impact on the overall hardboard industry. However, companies that concentrate on only a few markets can be impacted.

2. Market Size and Future Growth

Recent economic trends have been generally favorable to the industry (Table III-3). Per capita consumption has increased about 4.0% annually since 1964. Shipments from domestic plants totalled 7.7 billion square feet in 1978, reflecting an average annual growth rate of 7.9% since 1964. The industry slowdown in 1974 and 1975 was followed by a strong recovery in 1976 that continued into 1979.

TABLE III-3

SHIPMENTS, IMPORTS, AND APPARENT CONSUMPTION, 1964-1978
(million square feet — 1/8" basis)

	U.S. Shipments	Imports	Apparent Consumption	Imports as a % of Consumption
1964	2689	471	3160	14.9
1965	2921	572	3493	16.4
1966	3083	443	3526	12.6
1967	3038	426	3464	12.3
1968	3710	648	4358	14.9
1969	4247	708	4955	14.3
1970	4384	457	4841	9.4
1971	5225	634	5859	10.8
1972	5798	1070	6868	15.6
1973	6050	1039	7089	14.7
1974	5654	750	6404	11.7
1975	5681	277	5958	4.6
1976	6485	494	6979	7.1
1977	7714	627	8341	7.5
1978	7843	920	8763	10.5

Source: American Board Products Association.

Reliable data on exports are unavailable but exports are believed to be less than 2% of domestic production. In contrast, imports of hardboard have been up to 16.4% of domestic consumption. Although producers in developing countries generally enjoy lower costs and no entry duties, imports are very sensitive to economic conditions in the United States. Imports suffered a severe market share setback in 1975-1976 and are only beginning to recover; in 1975, imports were only 4.6% of consumption (Table III-3). The quality of imports appears to be generally adequate to satisfy the lower end of the hardboard market; it is believed that U.S. domestic producers are frequently the purchasers of foreign hardboard in order to satisfy domestic demand during periods of rapid demand growth. At those times, domestic suppliers generally prefer to upgrade the quality of product they supply in order to improve average margins.

Brazil is by far the largest source of hardboard imported by the United States; the U.S.S.R., Sweden, and Canada are also significant, with Poland, Romania, Korea and other countries selling hardboard in U.S. markets in varying quantities. Brazil, Argentina, Romania and Korea are among the developing countries that now face no U.S. tariffs. Most other countries, except the U.S.S.R. (30%), pay a 7.5% *ad valorem* duty for imports into the United States. The United States will remain a net importer of hardboard, despite the declining trend in imports, due to the relatively low cost of hardboard purchased from foreign sources.

Capacity utilization declined significantly in 1972 because of a 30% increase in capacity in that year, and again in 1974/1975 as a result of market conditions and a conversion of insulation board capacity to hardboard production (Table III-4). Demand strengthened in 1976 and the industry has operated at 83-94% of capacity since. Precise data on 1977/1978 are unavailable but the industry is believed to have operated at rates of 85% to 95%.

TABLE III-4

CAPACITY UTILIZATION BY HARDBOARD INDUSTRY, 1967-1978
(million square feet – 1/8" basis)

	Annual Capacity	U.S. Shipments	Capacity Utilization (%)
1967	4555	3038	67
1968	4648	3710	80
1969	5019	4247	85
1970	5335	4384	82
1971	6000	5225	87
1972	7753	5798	75
1973	7916	6050	76
1974	8723	5654	65
1975	8348	5681	68
1976	7771	6485	83
1977	8272	7714	93
1978	8284	7843	95

Source: American Board Product Association.

Historically, losses in one market have been offset to a greater or lesser extent by gains in another. For example, hardboard continues to lose automotive markets; the technological trend toward light automobiles has resulted in the use of lightweight plastics in applications where hardboard was formerly dominant. On the other hand, the minimal quantities of petrochemical adhesives and relatively low energy intensity required in hardboard manufacture protect the

industry from what could be a severely negative impact of increased resin costs increases in the cost of plastics, and other siding products such as brick and have helped to stimulate demand for hardboard siding.

Roughly 60% of hardboard is used directly in construction or is affected by construction demand, while most of the remainder is used in industrial applications. Shipments of hardboard follow the construction industry trends but the volatility of hardboard shipments is dampened somewhat by its industrial market (Figure III-1). Analysis of 1964-1978 shipments and consumption using a least squares linear-time trend results in annual growth rates of 7.9% and 7.4% respectively. Growth rates in the 1972-1978 period for shipments and consumption were 5.2% and 4.2%, respectively, because of an industry slowdown in 1974 and 1975. The slower growth rates for consumption are a result of fluctuations in the level of imports.

The consumption growth rates indicate that hardboard's share of the construction materials market has increased. The economy in general experienced a growth rate of about 3.0% per year for the period, and construction since 1973 has remained below 1973 constant dollar levels. This market share growth trend can be expected to continue, and long-term growth in consumption will average up to 2.0% annually through 1984, with short-term trends following the construction cycle (Figure III-2).

D. PLANT CHARACTERISTICS OF THE EXISTING INDUSTRY

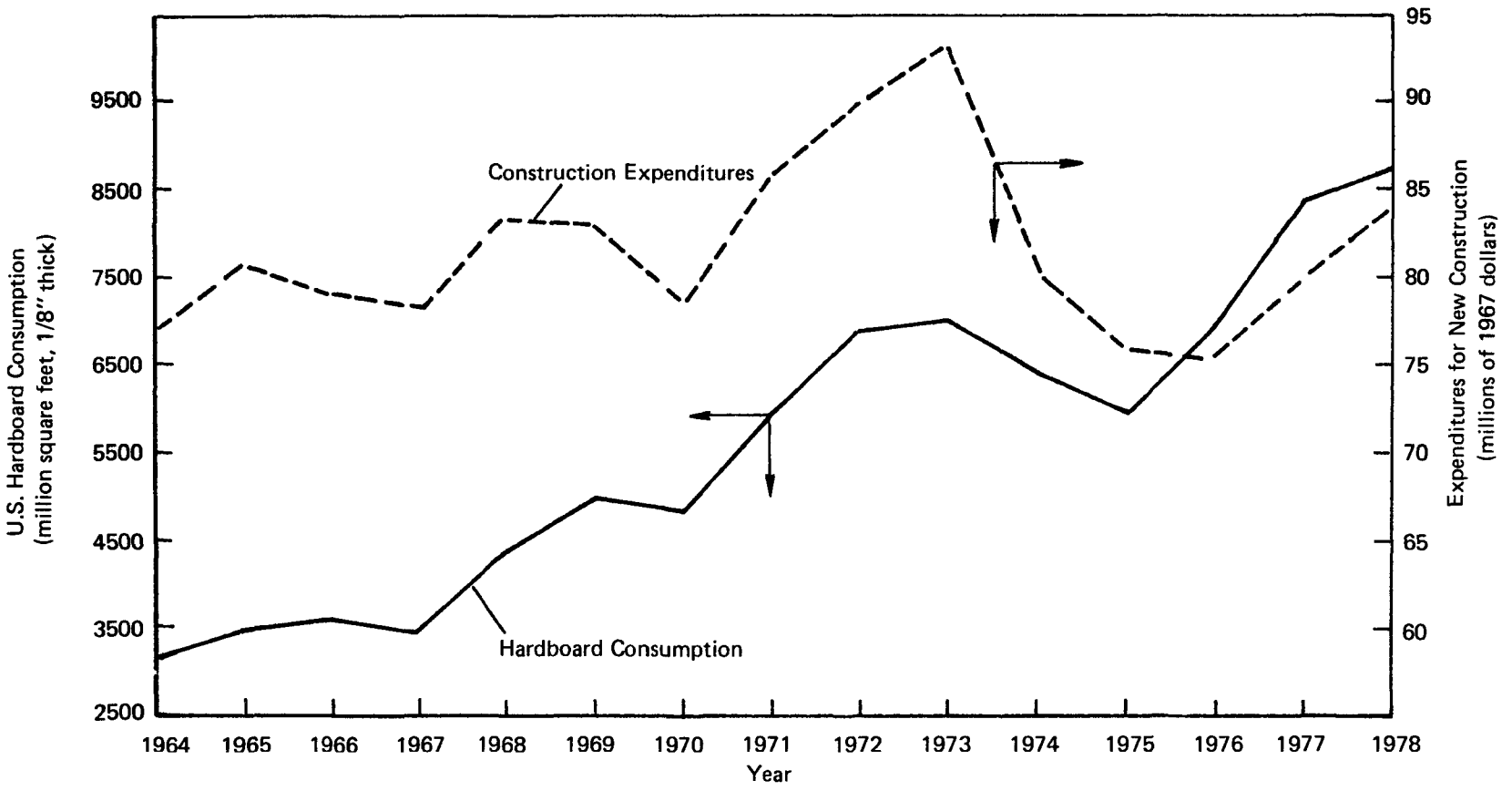
1. Process Technology

Wet process operations use a pulping process that requires large amounts of water and a wet mat forming system similar in some respects to the fourdrinier paper forming process. In wet-wet mills, the wet mat is pressed between a flat hot platen and a rigid screen that will allow steam to escape from the board. The board produced in this manner is called an S1S or screen back board. In wet-dry mills, the mat is dried before pressing so it can be pressed between two flat hot platens, producing a board with a smooth surface on both sides (S2S). In dry process mills, the mat is formed from dry fibers in an air inter-felting process. The dry mat is pressed between two flat hot platens, thus producing an S2S board. One mill uses a dry-wet process in which the mat is dry formed, as described above, then water is added and it is pressed between a flat hot platen and a screen, producing an S1S board. Insulation board capacity may, in certain cases, be converted to produce selected grades of wet process hardboard (and vice versa).

Process developments in wet process hardboard have been limited and slow, although the industry has had major product developments such as exterior siding and deep embossing. As a result of design changes in caul plates used in wet pressing operations, wet-wet mills can produce an S2S hardboard with minimal sanding, allowing them to compete in S2S markets against wet-dry and dry-dry mills.

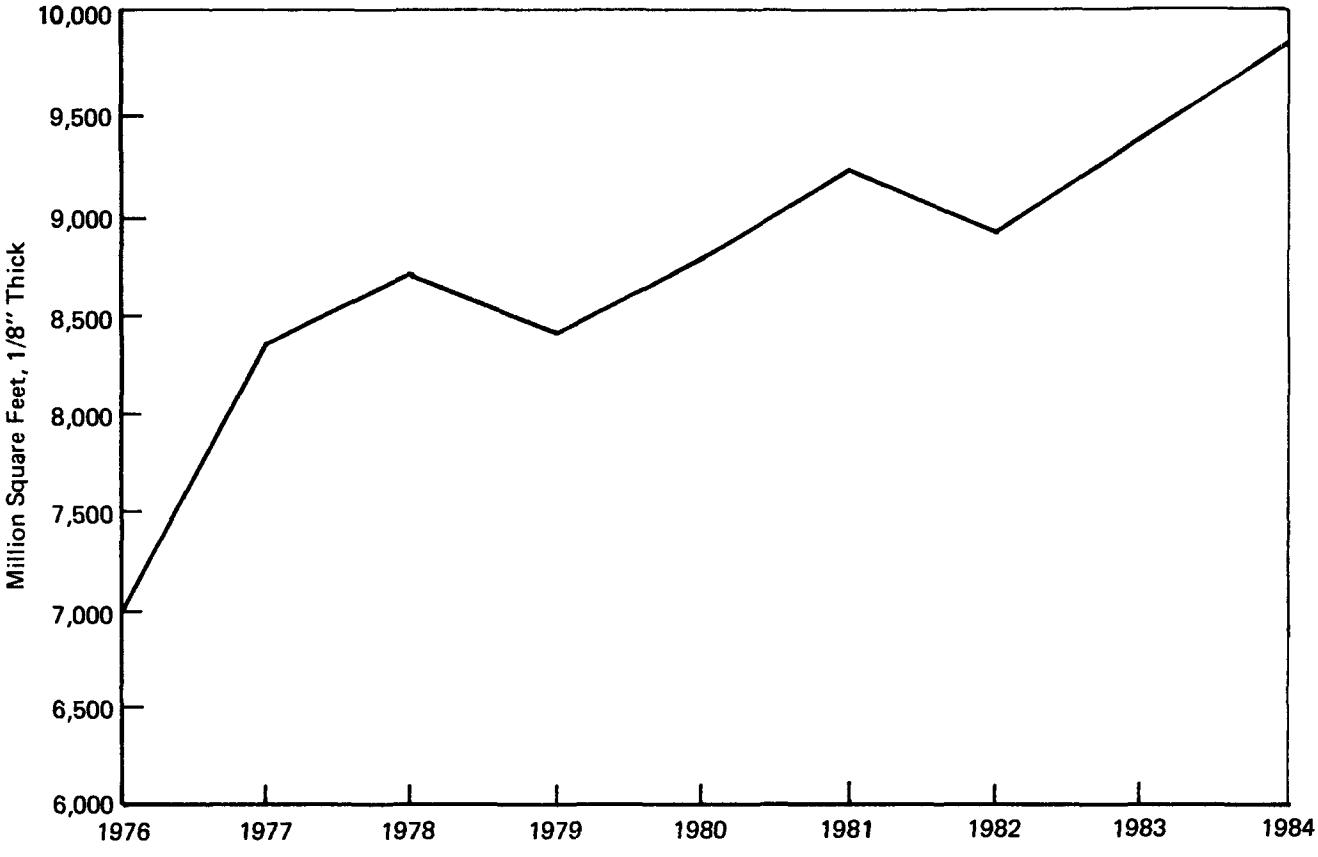
Developments that hold potential for lower costs are important to this industry because of the product substitution possible in most markets; likewise, adverse cost developments are of equal significance. The full impact of energy costs, for example, on pulping processes (e.g., the explosion process) may affect hardboard's cost effectiveness relative to substitute products in the future.

There are no foreseeable technical process developments that will have a major impact on the hardboard industry. The technology of the wet process hardboard industry generally has



Source: U.S. Department of Commerce, American Board Products Association.

FIGURE III–1 HARDBOARD CONSUMPTION AND CONSTRUCTION EXPENDITURES, 1964–1978



Source: Arthur D. Little, Inc., forecasts.

FIGURE III–2 TOTAL HARDBOARD DEMAND, 1976–1984

remained static since the development of dry process mills eliminated many of the water pollution problems facing the industry. Dry process technology is competitive with the wet process mills to the extent that it makes possible the manufacturing of hardboard which usually competes with the products of the wet process mills without incurring water pollution abatement costs. This advantage is partially offset by air pollution control expenditures that will be required for dry process mills. It is, of course, theoretically possible to convert a wet process mill to a dry process mill; however, the capital costs involved would make the operation both uneconomic and uncompetitive; thus, conversion to dry processes is an unlikely response to revised effluent regulations.

2. Size/Age/Location

A typical wet process plant produces 230 million square feet (MMSF-⅛ inch) annually, while individual plant capacities range from 52 to 1850 MMSF (Table III-1). Although the largest plant is also the oldest (Masonite started operations in Laurel, Mississippi, in 1926), the older plants tend to be smaller.

Prior to 1948, only three hardboard plants were in operation in the United States and they all used a wet process (Table III-5). Of the ten plants built in the 1948-1957 period, five were wet process mills. The next decade brought six wet and four dry process mills. Since 1968, two wet process mills have been built (both in 1971) while three dry process mills have started production. Prior to 1978 there were sixteen wet process mills (including seven wet-wet, six wet-dry, and three operations using both processes) and twelve dry process mills in the United States. A thirteenth mill was due to start up late in 1978. Additions to existing mills did not necessarily use the same process; three mills are actually a combination of wet forming and both dry and wet press lines. This gives these mills additional flexibility to meet market demands by producing either S1S or S2S hardboard. Most of the older plants have been continually expanded and modernized so age is not a valid indication of efficiency.

TABLE III-5

DISTRIBUTION OF HARDBOARD PLANTS BY PLANT AGE

	Number of Plants	
Year of Start-Up	Wet*	Dry**
Prior to 1948	3	0
1948-1957	5	5
1968 to 1977	6	4
1968 to present	2	3
Total	16	12

Sources: *EPA Financial 308 Letter. Does not include Jarratt, Va.
**Industry data.

The first two plants were constructed in Mississippi and used roundwood as their fiber source. Later expansion of the industry in the North Central states depended on inexpensive hardwoods, while mills in the Pacific states used wastes from softwood lumber and plywood operations as fiber sources. The fact that hardboard mills are evenly spread throughout these regions is indicative of the wide range of wood species being used in hardboard and the significance of low-cost fiber to the producer. Most of the plants are located on rural sites but several are in urban and suburban areas.

3. Employment

Most plants employ between 100 and 300 workers and staff (Table III-6). Employment figures for each mill depend upon the size and product mix of the facility.

TABLE III-6

EMPLOYMENT IN WET PROCESS HARDBOARD PLANTS

Number of Employees	Number of Plants
0-199	8
200-399	5
400+	3
Total	16

E. CHARACTERISTICS OF NEW CAPACITY

1. Recent Capacity Additions

No new wet hardboard plants have come on-stream since 1971; however, several locations have added substantial capacity. In addition to large capacity expansions in 1972, Masonite completed a 175-MMSF expansion of its wet process plant in Ukiah, California, in 1977. Abitibi also completed small expansions of the Alpena and Roaring River facilities. The 100-MMSF addition to the Weyerhaeuser plant in Doswell, Virginia, was the only dry process expansion. Boise Cascade diverted some of the insulation board capacity at International Falls, Minnesota, to add 100 MMSF to its hardboard capacity. At least five plants added incremental volumes to their siding production capacity.

Announced plans for capacity additions in 1979 include construction of a 66-MMSF, 7/16-inch, wet process hardboard siding mill at Georgia Pacific's insulation board plant in Jarratt, Virginia. Temple Industries has also announced a $21 million addition to its wet process facility to produce hardboard siding. No further information has been made public about these projects or any others.

2. Process Economics of New Capacity

It is extremely unlikely that anyone would build a wet process S2S mill. Capacity addition would most likely take the form of incremental expansion of existing facilities or perhaps the conversion of insulation board capacity. However, process economic models were constructed for Greenfield expansion, conversion of an insulation board plant and incremental expansion (Table III-7).

TABLE III-7

PROCESS ECONOMICS OF NEW WET PROCESS HARDBOARD CAPACITY

	S1S Greenfield Mill	Conversion of Insulation Board Mill	Incremental Expansion
Design Production (MMSF, 1/8")	293	234	117
Capital Investment ($ million)	50	25-28	15-20
Operating Cost ($ million)			
Labor	10.2	9.0	3.7
Wood	4.2	3.4	1.7
Other Materials	4.2	3.4	1.7
Energy	3.6	3.2	1.3
Other Costs	2.0	1.6	0.8
	24.2	20.6	9.2
Operating Cost/MSF, 1/8" ($)	82.59	88.03	78.63
Investment/MSF, 1/8" ($)	170.65	113.70	149.57

Source: Arthur D. Little, Inc., estimates. See Appendix A, Table A-2 for assumptions underlying costs.

The parameters of any expansion or conversion are extremely variable and unique to every case. Thus the capital investment and the operating cost for each of the wet process hardboard expansion methods shown in Table III-7 are not applicable to any specific situation. Incremental operating costs per thousand square feet, 1/8" basis, are lowest for capacity added through incremental expansion, followed by that for a Greenfield mill and insulation board plant conversion. Investment costs per thousand square feet are highest for a Greenfield plant and lowest for an insulation board plant conversion.

F. COMPETITIVE STRUCTURE

1. Market Structure

The five largest firms control 70.5% of the total hardboard production capacity. Masonite Corporation, by far the largest firm in the industry, controls 35.1% of the total hardboard capacity and 41.5% of the wet process hardboard capacity (Table III-8). Wet process mills represent 70.3% of the total U.S. hardboard capacity.

2. Pricing Mechanism

The ability of the industry to pass increases in production costs for tempered hardboard on to the marketplace is of major importance in considering the question of whether or not hardboard producers will be able to continue operations with the burden of additional pollution control costs.

Prices are quoted on a dollars per thousand square feet basis and are usually based on standard units and sizes. Prices are generally f.o.b. mill with full rail freight allowed to the destination. Due to the wide range of end uses, prices, and customer categories, hardboard prices are set at a number of levels, depending on the class of trade of the purchaser. Frequently specific hardboard prices involve a complicated schedule of discounts and extras dependent upon the size of the load, packaging, style of the product, degree of fabrication, quality, etc.

TABLE III-8

HARDBOARD INDUSTRY CAPACITY

Firm	Percent of Total Capacity	Wet Process	
		Percent of Capacity	Percent of Firm's Hardboard Capacity
Masonite	35.1	41.5	83.1
Abitibi	10.2	14.5	100.0
Weyerhaeuser	9.4	3.0	22.4
Boise Cascade	8.5	12.0	89.7
Superwood	7.3	8.8	85.0
U.S. Gypsum	5.7	8.1	100.0
Champion	4.9	1.3	18.6
Temple	2.9	4.2	100.0
Superior Fiber	1.9	2.7	100.0
Evans	1.3	1.9	100.0
Forest Fiber	1.4	2.0	100.0
Total	88.6[1]	100.0	81.7[2]

1. Four other firms are operating only dry process mills.
2. Average

Source: American Board Products Association.

The largest producer does exert some control over product design trends, frequency of price changes, and price leadership. As explained earlier, the industry serves as a very wide range of end uses requiring an estimated 800 different sets of specifications; this makes direct competition between manufacturers selling to the industrial market not only uncommon but unlikely to occur in the future. Hardboard marketing efforts have traditionally been aimed at displacing such entrenched products as lumber and plywood in specific applications using pricing as an incentive; now, hardboard is challenging and being challenged by plastics and metals for various applications. Consequently, a major pricing factor is the possibility of substitution of competitive materials by and for hardboard. Price competition can be a factor in sales to retail yards handling large volumes of hardboard.

3. Price Elasticity of Demand

Price changes in hardboard from 1967 to 1976 (Table III-9) have been far less frequent and quite moderate compared with price changes of lumber, plywood, and other products with which it competes. While the wholesale price index for construction materials in 1976 was 187.7, the wholesale price index for tempered hardboard was only 131.4. Furthermore, the GNP deflator for 1976 was 1.59 of the 1967 level, which shows that hardboard prices have failed to keep pace with general economic conditions. There are several factors that contribute to this situation.

First, costs of production have not increased as rapidly as general inflation, which may have allowed the industry to maintain its accepted level of profitability without increasing prices. This situation will probably not continue given the likely real increases in wood costs and increased competition for fiber. However, the costs of producing substitute materials are likely to increase even faster than hardboard production costs.

TABLE III-9

TEMPERED HARDBOARD PRICE TRENDS, 1963-1978

Year	Price[1]	Percent Increase Over Previous Year	Price[2] Index	All Construction Materials Price Index
1963	61.956	–	103.8	93.6
1964	61.001	1.6	102.2	94.7
1965	60.941	0.1	102.1	95.8
1966	60.822	(.2)	101.9	98.8
1967	59.688	(1.9)	100.0	100.0
1968	58.633	(1.8)	98.3	105.6
1969	59.969	2.3	99.8	111.9
1970	61.001	1.7	102.2	112.5
1971	60.345	(1.1)	101.1	119.5
1972	61.001	1.1	102.2	126.6
1973	62.792	2.9	105.2	138.5
1974	70.432	12.5	118.0	160.9
1975	70.253	0.3	117.0	174.0
1976	78.430	11.6	131.4	187.7
1977	85.175	8.6	142.7	204.9
1978	93.95	10.3	157.4	228.2

1. Manufacturers' price to jobber or wholesaler delivered to destination or f.o.b. mill with freight allowed, $/MSF, 1/8" basis.
2. 1967 = 100

Source: U.S. Department of Labor, Bureau of Labor Statistics, *Wholesale Price Indices.*

Second, the incremental additions in 1976, 1977 and 1978 suggest that the industry may have absorbed the anticipated impact of lower margins per unit by adding shifts. This course of action would result in stabilized rates of return as a consequence of lower per unit margins on greater volumes produced at any individual facility.

Finally, there is a market-price relationship. Hardboard producers may have to keep their prices down to meet competition from substitute products and maintain market shares. Price apparently varies somewhat independently of consumption and in different magnitudes, as shown in the random pattern of price-consumption correlations. Obviously, demand is not totally price inelastic, but for real price increases of 1-2% there is no adverse impact on overall demand.

The ability of hardboard manufacturers to pass on the additional costs of pollution abatement depends on the amounts involved. Any increase in costs will result in higher levels of competition from substitute products and a more cautious approach to the commitment of capital for capacity expansions. Decreases in market share, if they occur, would be slow in industrial applications, because products would have to be redesigned, and quickly for construction applications.

A price scenario for wet process hardboard was developed to gauge the ability of hardboard producers to recover higher costs through higher prices. The demand forecast through 1984 was combined with announced capacity expansion commitments and an Arthur D. Little forecast of additional capacity that might be added in 1982 through 1984 (Table III-10). Potential real price increases were estimated based upon the estimated operating rate of U.S. plants and the volume of imports necessary to satisfy U.S. demand. Current price levels and the high rate of overall inflation indicate that producers will suffer a real price decline in 1979 of 6% and that they will not fully recover until 1981. By 1984, real price increases on the order of 20% are likely, most of that occurring in 1984.

4. Barriers to Entry of New Firms

Compared to other solid wood products mills, hardboard is a capital intensive industry. The most significant barriers to the entry of new firms, however, are the concentration of the market, the magnitude of the sales effort required, and the development of a secure fiber source. A new company would have to develop new markets or "buy" market share from competitiors; given the recognition of the existing producers in the marketplace, it could be a costly and difficult task at best. A new producer has the alternative of selling through the existing producers' distribution systems, as is done in the case of other wood products, but this would be undesirable for both production and marketing reasons.

5. Other Regulatory Factors

A result of government policy restricting the cut of federal timber on the West Coast will be to push prices of lumber and plywood upward, thereby relieving some pressure against hardboard price increases. An easing of government timber policy that would allow a higher level of removals from West Coast forests, which is equally likely, would have the opposite effect.

G. FINANCIAL PROFILE

While wet process hardboard sales (Table III-11) vary directly with production, plant book values will differ for plants of similar size, primarily because of age of plant.

There was no observable difference in the distribution of the pro-forma costs of production for wet process hardboard (Table III-11) between plants that may be required to undertake expenditures for water pollution regulations and plants that will be in compliance. Differences in the distribution of costs arise in part from plant size differences and plant location (local cost) factors.

TABLE III-10

HARDBOARD DEMAND AND PRICE FORECAST

	U.S. Capacity	U.S. Shipments	Operating Rate	Imports	MMF[2] 1/8" Apparent Consumption	% Change In Real Price MSF, 1/8"
1978	8284	7843	95	920	8763	2
1979	8340	7692	92	627	8319	-6
1980	8760	8322	95	478	8800	2
1981	8935	8666	97	533	9200	6
1982	8935	8455	95	445	8900	2
1983	8955	8686	97	694	9380	6
1984	8975	8705	97	1094	9800	10

Source: Arthur D. Little, Inc., estimates.

TABLE III-11

PRO-FORMA INCOME STATEMENT
WET PROCESS HARDBOARD PLANTS

1976 Sales	$16,000,000 (range $6,000,000 -->$120,000,000)	
1976 Capacity	200 Million square feet	
Capacity Base	1/8"	
Pro-Forma Cost of Manufacture	**Median Value**	**Range**
Sales	100%	100%
Cost of Goods Sold		
Labor	20	15-50
Materials	30	19-50
Depreciation	5	2-5
Other Expenses	20	5-28
Total Cost of Goods Sold	75	
Gross Margin	25	15-36
Selling, General & Administrative	11	7-25
Interest		0-4
Profit Before Tax	14	8-24
Profit After Tax	7	1-13
Plant Book Value	10,000,000	900,000 >$40,000,000

Source: Derived from the EPA Financial 308 Letter.

IV. COST OF COMPLIANCE WITH REVISED WATER EFFLUENT REGULATIONS

A. INTRODUCTION

The purpose of this chapter is to describe the current water effluent method of disposal used by insulation board and wet process hardboard plants, and to summarize the cost of compliance developed by the technical contractor. These data were used to estimate the economic impact of the revised water effluent regulations described in Chapter V. Also described are the control options for new sources and their associated costs of compliance.

B. CURRENT EFFLUENT STATUS

Plants producing both insulation board and wet process hardboard are classified according to the predominant product volume and are referred to throughout as "combination" plants.

Of the eleven wet process hardboard plants, most (nine) discharge into navigable water, one discharges into municipal sewers and one recycles its process wastewater (Table IV-1). The insulation board plants are distributed across all categories: two discharge into navigable water, five discharge into municipal sewers, two dispose of their effluent on site (e.g., spray irrigation) and two recycle their process wastewater. Of the five combination plants, three discharge into navigable water, one into a municipal sewer and one has no discharge.

TABLE IV-1

INSULATION BOARD AND WET PROCESS HARDBOARD
CURRENT METHOD OF WATER EFFLUENT DISPOSAL

Current Water Effluent Disposal	Insulation Board Only		Wet Process Hardboard Only *		Combination	
	Number of Plants	% Total	Number of Plants	% Total	Number of Plants	% Total
Navigable Water	2	18	9	66	3	60
Municipal Sewer	5	45	1	17	1	20
No-Discharge	4	37	1	17	1	20
Total	11	100	11	100	5	100

*Counting Abitibi's Alpena, Michigan operation as one plant.

Source: U.S. Environmental Protection Agency

C. POLLUTION CONTROL OPTIONS FOR EXISTING PLANTS

1. Cost Models

Many plants have pollution control equipment in place and their current treatment will be sufficient for several of them to meet revised effluent guidelines. However, seven plants producing wet process hardboard alone may be required to install new equipment to meet revised water effluent regulations and an eighth is currently in the process of installing a new pretreatment system.

Since so few plants in the wet process hardboard sector need to undertake compliance activities, the technical contractor generated costs of compliance for each impacted plant. The cost estimation method was to use one or more of the plants that have higher levels of water effluent treatment in place as models. The cost of installing the model treatment process was then estimated for impacted plants. Table IV-2 depicts the relationship between the pollution control options and model treatment plant. The plant indicated as a "special case" has a pollution control system in the process of construction, which may or may not be similar to the model treatment plants.

TABLE IV-2

MODEL PLANT TREATMENT OPTIONS

Impacted Plant	Model Treatment Plant	Current Discharge Method	Proposed Discharge Method
Wet Process Hardboard			
Option 1 – S1S/S2S	2099		
Option 2 – S1S	2006		
Option 2 – S2S	2010		
Plant 2001		Direct	Direct
Plant 2002		Direct	Direct
Plant 2003		Direct	Direct
Plant 2004		Direct	Direct
Plant 2007		Direct	Direct
Plant 2012		Direct	Direct
Plant 2013	Special Case	Indirect	Pretreatment
Plant 2099		Direct	Direct

Source: Environmental Science and Engineering, Inc.

The wet process hardboard control options represent different degrees of stringency. Option 1, modelled on plant 2099, calls for a screen, first settling basin, an aerated lagoon, and second settling basin. Option 2, for S1S modelled on plant 2006, consists of two consecutive aerated lagoons followed by a settling basin. Option 2, for S2S modelled on plant 2010, consists of a screen, an equalization basin, a primary clarifier, activated sludge removal, a secondary clarifier, an aerated lagoon and a faculative lagoon; in addition, prior to disposal the sludge is processed through an aerobic digestor, a sludge thickener and a vacuum filter.

2. Costs of Compliance

The differences among the control option costs for wet process hardboard plants are significant, apparently because of differences in the size of facilities (Table IV-3). Plant 2013 is in the process of installing a pollution control system. Under the less stringent EPA option, three plants (2002, 2003 and 2004) would be impacted. Under Option 2, four plants would be added to the list of impacted plants whereas plant 2006 would be added to the list under Option 3.

TABLE IV-3

COST OF COMPLIANCE FOR PLANTS
IMPACTED BY REVISED EFFLUENT REGULATIONS
($000)

Option 1	Type of Product	Investment			Operating Costs	Acres of Land
		Total	Land	Other Investment		
Plant 2002	S1S	285	5	280	51	.5
Plant 2003	S2S	7,266	40	7,226	2,219	4.0
Plant 2004	S1S	1,320	105	1,215	179	10.5
Total Option 1		8,871	150	8,721	2,449	
Option 2						
Plant 2001	S1S	6,856	188	6,668	796	18.8
Plant 2002	S1S	1,105	46	1,059	107	4.6
Plant 2003	S2S	7,436	40	7,356	2,300	4.0
Plant 2004	S1S	2,938	300	2,638	274	30.0
Plant 2007	S1S	183	–	183	101	0
Plant 2012	S1S	599	–	599	173	0
Plant 2099	S1S	1,228	30	1,198	107	3.0
Total Option 2		20,345	604	19,741	3,858	

Source: Environmental Science and Engineering, Inc.

D. POLLUTION CONTROL OPTIONS FOR NEW SOURCES

1. Cost Models

A candidate new source performance standard for insulation board and wet process hardboard plants calls for zero discharge. The control technology, is the same for mechanical refining insulation board and thermo-mechanical insulation board (that for S1S wet process hardboard and S2S wet process hardboard is similar), and consists of the following steps:

- Screening;
- Neutralization;
- Nutrient Addition;
- Aerated lagoon (two aerated lagoons for hardboard);
- Faculative lagoon; and
- Spray irrigation.

The characteristics of the model insulation board and hardboard plants are shown in Table IV-4.

2. Costs of Compliance

The costs of compliance for new insulation board and wet process hardboards plants are summarized in Table IV-5.

TABLE IV-4

MODEL PLANTS FOR NEW SOURCE PERFORMANCE STANDARDS INSULATION BOARD AND WET PROCESS HARDBOARD

Plant Type	Design Production		Wastewater Flow	Raw BOD Wasteload	Raw TSS Wasteload
	(tons/day)	(MMSF/yr., 1/8")	(000 gal./day)	(lbs/day)	(lbs/day)
Mechanical Refining					
Insulation Board					
Plant 1	250	264	0.5	7,510	9,170
Plant 2	600	635	1.2	18,000	22,000
Thermo-mechanical Refining					
Insulation Board					
Plant 1	200	212	0.5	22,400	6,410
Plant 2	400	425	1.0	44,800	12,800
S1S					
Wet Process Hardboard					
Plant 1	100	106	0.3	7,710	3,040
Plant 2	300	318	0.8	23,100	9,110
S2S					
Wet Process Hardboard					
Plant 1	250	264	1.5	32,500	7,510

Source: Environmental Science and Engineering, Inc.

TABLE IV-5

COST OF COMPLIANCE
NEW INSULATION BOARD AND
WET PROCESS HARDBOARD MILLS

Plant Type	Total Investment	Operating Cost	Acres of Land Required
Mechanical Refining			
Insulation Board			
Plant 1	2,336	543	270
Plant 2	4,044	964	630
Thermo-mechanical Refining			
Insulation Board			
Plant 1	2,862	951	270
Plant 2	5,491	1,985	631
S1S			
Wet Process Hardboard			
Plant 1	1,953	516	159
Plant 2	2,915	684	437
S2S			
Wet Process Hardboard			
Plant 1	5,075	1,393	792

Source: Environmental Science and Engineering, Inc.

V. ECONOMIC IMPACT OF COMPLIANCE WITH REVISED WATER EFFLUENT REGULATIONS

A. INTRODUCTION

The cost of compliance estimates generated by the technical contractor (Chapter IV) were combined with plant financial profiles and economic characteristics of the industry (Chapter III) to produce an estimate of the economic impact of revised water effluent regulations on the insulation board and wet process hardboard sectors of the timber industry.

Because there are so few plants in the insulation board and wet process hardboard sectors, and only seven wet process hardboard plants must incur costs to comply with revised water effluent regulations, an analysis of economic impact was performed for each affected plant.

The potential economic impacts discussed in this chapter include:

- price increases, and demand shifts;
- financial considerations;
- plant closure;
- capacity expansion;
- market structure;
- employment and community impacts.

B. PRICE INCREASES

1. Level

The price increase required to recover the cost of compliance varies widely among wet process hardboard plants (Table V-1). For the wet process hardboard plants, Option 1 will produce a lower impact upon price than Option 2. Because plant 2013 is currently in the process of installing a pollution control system, its required revenue is the same under all options.

Plants 2002, 2003 and 2004 are required to make expenditures for pollution control under both options. For plant 2002 the required price increases to recover the cost of Option 1 is about one percent of the 1977 aggregate average price of hardboard, while its required price increase to recover costs for Option 2 is equivalent to 4%. For plant 2004 the required price increase to recover costs for Option 2 technology is twice as high as Option 1. For plant 2003, the required price increase is about the same under both options.

The differences in required price increase from plant to plant for a given model treatment can be explained by a combination of in-place treatment, production scale and/or special circumstances.

The relative difference between Option 1 and Option 2 also differs from plant to plant. This reflects the differences in control equipment in place from plant to plant.

TABLE V-1

REVENUE REQUIRED TO RECOVER
THE COST OF COMPLYING WITH REVISED REGULATIONS
FOR HARDBOARD PLANTS

Plant Type/Code	(1) 1976 Revenue ($000)	1976 Price** $/MSF	Recovery of Compliance Cost: Required Δ Revenue $/MSF	Recovery of Compliance Cost: % Δ 1977 Price
Option 1				
Plant 2002	20,000	78	0.80	1
Plant 2003	>30,000	78	9.93	14
Plant 2004	8,400	78	6.60	9
Plant 2013*	20,400	78	6.10	8
Option 2				
Plant 2001	>30,000	78	4.02	5
Plant 2002	20,000	78	2.60	4
Plant 2003	>30,000	78	10.23	14
Plant 2004	8,400	78	13.40	18
Plant 2007	9,600	78	1.75	2
Plant 2012	>30,000	78	0.30	0
Plant 2099	5,500	78	8.30	11

*This plant is in the process of installing a pollution control system, and those specific costs were used in the analysis.
**The average price for wet process hardboard for 1976.

Source: Arthur D. Little, Inc., estimates.

2. Obtainability

In evaluating economic impact, in addition to the long-term price increases that are necessary to recover the cost of compliance with revised water effluent regulations, it is important to determine if and when price increases can be obtained.

The first step in evaluating whether price increases can be obtained was to compare the productive capacity in plants that are required to make expenditures for revised regulations with those that are not. Comparing the capacity of plants impacted by Option 2 with that of plants currently in compliance, one finds that wet process hardboard plants impacted by revised regulations represent 55% of the 1976 *total hardboard* (wet and dry) capacity and 56% of the total 1976 production (Table V-2). The total hardboard segments had an operating rate of 83% in 1976

TABLE V-2

DISTRIBUTION OF HARDBOARD CAPACITY
IMPACTED VS. NON-IMPACTED PLANTS
OPTION 2

	1976 Capacity (1/8" – MMSF)	% of Total	1976 Production 1/8" – MMSF	1976 Production % Total	1976 Capacity Utilization
Wet Process					
Impacted Plants (8)	4,307	55	3,643	56	85
Plants in Compliance (8)[1]	1,004	13	701	11	70
Total Wet Process (16)	5,311	68	4,344	67	82
Dry Process (12)	2,460	32	2,141	33	87
Total Hardboard	7,771	100	6,485	100	83

1. Includes two combination plants.

Source: Derived from Financial 308 Letter and Table III-4.

while the impacted plants operated at 85% of capacity. However, wet process and other hardboard plants have enjoyed higher operating rates from 1976 to 1978 than in the past.

Under Option 1 only four plants are impacted and the impacted plants represent 16% of hardboard capacity.

While current operating rates are important, future growth in demand and capacity expansion will indicate the probable supply/demand balance at the time the plants are required to make the pollution control investments. As previously discussed (Chapter III) hardboard demand will continue to grow at an average rate of 2% a year, while fluctuating with the business cycle for the construction industry. Insulation board, on the other hand, is a product in long-term decline. By 1984, demand for insulation board will be 65% of the 1976 level and, if all plants were in operation, the industry operating rate would be at about 60%. The demand for hardboard will be about 40% higher in 1984 than in 1976 and an 1100-1200 MMSF of additional capacity will be required to meet the demand.

It is not contemplated that any Greenfield plants will be constructed to add to hardboard capacity. The probable method of expansion is incremental increases in capacity at existing plants and conversion of insulation board capacity to hardboard capacity. (Coincidentally, the increased hardboard capacity required by 1984 is about the same in MMSF as the excess insulation board capacity that will exist by then (1,200 MMSF), although only a small proportion of this capacity can practically be converted to hardboard.) The total cost of production and derived selling prices based upon long-run total cost indicate that the price of hardboard must rise to a level substantially higher than the levels indicated in Table V-1 to support new capacity (Section V-F).

Since hardboard is expected to be in tight supply on average over the next five to ten years, and the cost of new capacity cannot be supported by current market prices, then eventually prices can be expected to cover the increased costs of existing hardboard producers.

The increases in hardboard price (measured in 1976 dollars) under Options 1 and 2 will not generally be sufficient to negate its competitive advantage over other products. However, even when demand is price inelastic, some reductions in demand can occur. Under Option 2, while the cost of hardboard will still be lower than that of some substitutes, the required price increases will be large enough so that there could be some decline in product demand. However, these price increases will not reduce demand sufficiently to prevent the addition of new capacity.

C. FINANCIAL CONSIDERATIONS

When an industry can recover cost increases through price increases without impacting demand, the economic impact is less severe than it would otherwise be. However, plants may suffer adverse economic impact if price increases lag cost increases and if companies are unable to finance the compliance investment.

The profitability of wet process hardboard plants impacted by revised regulations was analyzed as if price increases did not occur (Figure V-1). In general, plant profitability will be reduced, but a plant will still cover its cash costs and depreciation, assuming that the 1976 operating results are representative of cost conditions likely to prevail in 1984. However, one plant would incur a loss under these assumptions.

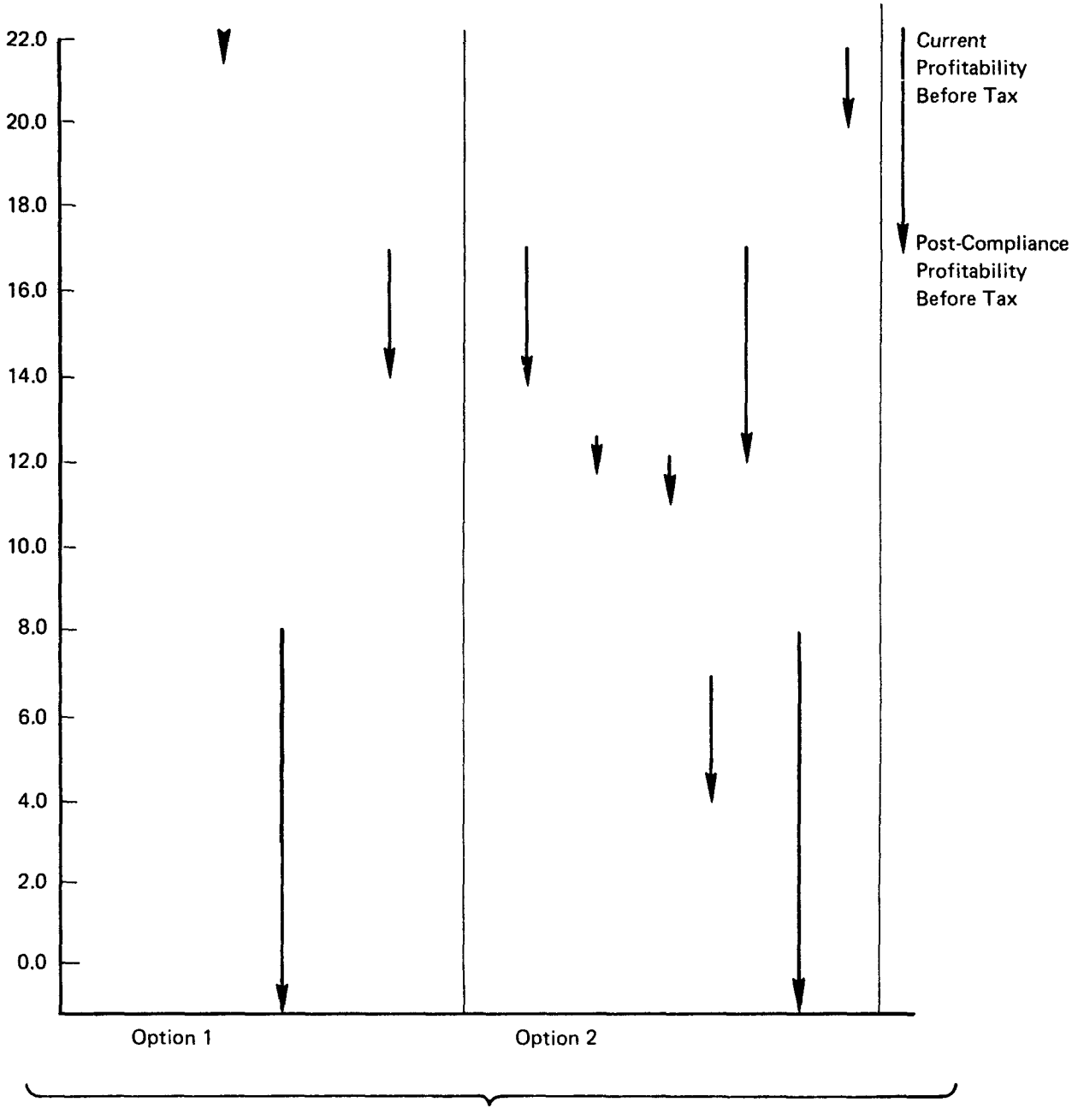
Most of the insulation board and wet process hardboard plants are parts of larger corporations which generate cash flow in excess of the required pollution control investment and which also have some ability to generate external funds. However, a parent company might be reluctant to divert funds from other operations to hardboard plants. For this reason and the fact that a few plants are part of smaller corporations, it is advisable to examine the relationship between plant cash flow and the required compliance investment.

For the impacted plants not now installing a pollution control system, the investment required for revised effluent regulations was divided by cash flow (Figure V-2). For wet process hardboard plants, the investment associated with Option 1 ranges up to 300% of 1976 cash flow, while the investment associated with Option 2 could reach 330% of cash flow.

The impacted wet process hardboard plants will eventually recover the costs of compliance through higher prices which will probably also provide a sufficient rate of return on investment. However, the installation of pollution control equipment will cause a cash drain from other operations.

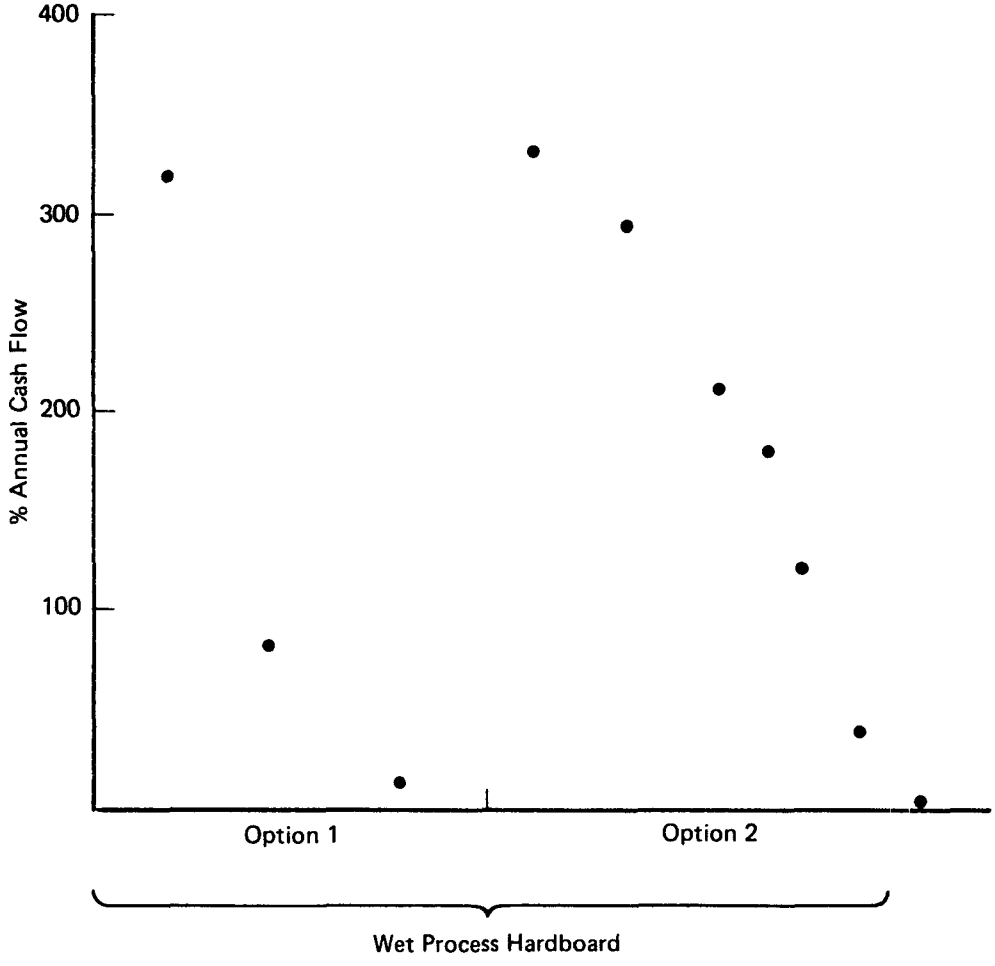
D. PLANT CLOSURE

The evaluation of whether a plant will close down as a result of pollution control regulation (or any other event) is at best an imprecise estimate based upon an external view of plant's situation. Of necessity, the evaluation is based upon financial criteria without knowledge and consideration of a corporation's policies and goals. To illustrate, a corporation may decide to close or sell an apparently profitable plant if the plant's business does not meet its long-term objectives. On the other hand, to retain control over the source of supply, a corporation may elect to invest in and operate a marginal plant which provides a source of equipment or materials for its other operations.



Source: Arthur D. Little, Inc., estimates.

FIGURE V–1 POST-COMPLIANCE PROFITABILITY WITH NO PRICE INCREASE (1976 COST STRUCTURE)



Source: Arthur D. Little, Inc., estimates.

FIGURE V–2 INVESTMENT REQUIRED FOR COMPLIANCE WITH REVISED EFFLUENT REGULATIONS COMPARED WITH PLANT CASH FLOW

Under Options 1 and 2 one plant may close rather than invest in the pollution control equipment. This may occur because profitability in the absence of price increases will be severly reduced and the investment is over 300% of 1976 cash flow. However, these data do not reflect the anticipated real price increases that will occur by 1984 for hardboard which will allow the plant to maintain profitable operations.

E. CAPACITY EXPANSION

The discussion of the hardboard and insulation board industry segments (Chapters II and III) indicated that no Greenfield mills are likely to be built for either of the two product types. Insulation board demand is facing a long-term decline and significant excess capacity by the 1980's; therefore, no new capacity will be built.

Capacity expansion for hardboard will most likely occur through incremental expansion of existing hardboard mills and secondarily from conversion of insulation board capacity. This is primarily attributable to the high cost of new capacity compared with current market prices. While this relationship would be exacerbated by pollution control costs, they are of secondary importance.

Under a total recycle option, the required increment to cover pollution control costs for a new source does not differ from that of a conversion and expansion (Table V-3). However, for a new facility the baseline plant cost translates into a higher, long-term required price-per-ton.

All the expansion methods shown in Table V-3 require a higher product price than the current average market prices, suggesting that capacity increases will lag demand growth enough so that market price will rise to cover the costs of new capacity. The average 1978 market price was $93.95 per MSF; real prices must rise by 25% to support an incremental expansion by the lowest-cost method. This increase is greater than that required by impacted hardboard plants to recover costs of pollution control costs under all of the options studied.

F. MARKET STRUCTURE

The number and size of future insulation board plants will be unaffected by revised regulations because the new source performance standards do not affect economies of scale. The one plant that may close has about 6% of industry capacity and its closure will not affect the number of participants in the industry. Any new capacity probably will be built at existing plants and will not be influenced significantly by revised regulations.

G. EMPLOYMENT AND COMMUNITY IMPACTS

As noted above, one plant may close rather than invest in additional controls. If so approximately 300 jobs would be directly affected. In addition, since this plant is not located near major employment centers, secondary community impacts could occur with decreases in the economic activity in the surrounding area.

TABLE V-3

COST OF NEW HARDBOARD CAPACITY
NEW MILL VERSUS INCREMENTAL EXPANSION
$1978

	Capacity MMSF	Incremental Investment ($000)	Annual Operating Costs ($000)	Long-Run Price ($/MSF)
1. New Plant				
Baseline Plant	293	57,000	24,200	136
Water Effluent Control	–	2,915	684	5
				141
2. Conversion of Insulation Board Plant				
Baseline Conversion Cost	234	27,000	20,440	117
Water Effluent Central (Option 2)[1]	–			2-14
				119-131
3. Incremental Expansion				
Baseline Expansion	117	17,500	8,370	106
Water Effluent Control (Option 2)[1]				2-14
				108-120

1. Based on range for similar size plants.

Source: Arthur D. Little, Inc., estimates.

VI. LIMITATIONS OF ANALYSIS

The economic impact of revised water effluent guidelines upon the wet process hardboard industry may differ fron the analysis in this economic impact assessment, depending upon:

1. EPA regulations which affect waste disposal,
2. Future growth in demand, and
3. Unknown factors related to impacted plants.

Item (1) was beyond the scope of the Technical Contractor's and the Economic Contractor's work. Items (2) and (3) are limitations in every analysis of this type but their influence on the results of a study varies from case to case and thus requires discussion.

A. EPA's REGULATIONS AFFECTING WASTE DISPOSAL

Subtitle C of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976 (RCRA), creates a regulatory framework to control hazardous wastes. Section 3004 addresses standards for owners and operators of hazardous waste treatment, storage and disposal facilities. The regulation impacts the analysis of alternative control options because it specifies the technical and monitoring requirements for each disposal method, as well as restrictions on disposal of waste by method. These, in turn, may limit the application of some of the control options studied, or result in higher costs for an alternative than have been indicated by the technical contractor in this report. Further, insulation board and wet process hardboard preserving plants which dispose of water effluent on-site may be impacted, in that the current method of disposal may no longer be environmentally adequate.

The application of the pollution control options studies in this report will be affected by RCRA regulations. The lagoons associated with enhanced biological treatment will be considered as methods of hazardous waste disposal or storage, and thus plants will be required to monitor groundwater and surface water as well as to install leachate collection and monitoring systems.

A leachate collection and monitoring system is not included in the cost of compliance. Assuming that an aerated lagoon is similar in size to small land-fills (5,000M^3/year), then the incremental compliance cost per plant could be as follows:

Initial Investment:	$129,000
Annual Operating Costs:	$ 42,200

Other monitoring equipment is required for groundwater and surface water testing. The cost of analysis for groundwater and surface water samples would be on the order of $60,000 per year.

Another source of additional cost is related to sludge disposal. Consideration of whether or not the sludge and effluent of wet process hardboard plants were hazardous wastes was beyond the scope of the technical contractor's report,[1] although it was discussed. The costs of sludge disposal are expected to double or triple as a result of Section 3004.[2] Therefore, that component of the technical contractor's operating cost (amounting to about 3% of operating costs) will be two to three times as high, but it will not change the results of the economic impact assessment.

B. FUTURE GROWTH IN DEMAND

If the construction and housing market growth inherent in the forecast of wet process hardboard growth does not materialize, then the impacted plants will have difficulty in recovering costs of compliance. However, the Arthur D. Little forecast is generally regarded as conservative relative to other forecasts and thus this should not present a problem.

C. UNKNOWN FACTORS

The analysis of economic impact was based upon 1976 production and sales data and individual plants may not track industry trends. This could affect the ability of individual plants to increase price.

REFERENCES

1. *Revised Technical Review of Best Available Technology, Best Demonstrated Technology and Pretreatment Technology for the Timber Products Point Source Category,* report to the U.S. Environmental Protection Agency by Environmental Science and Engineering, Project No. 78-052, September 1, 1978.

2. *Integrated Economic Impact Assessment of Hazardous Waste Management Regulations (Regulatory Analysis Supplement),* Preliminary Draft Report prepared for the Office of Solid Waste Programs, U.S. Environmental Protection Agency, October, 1978.

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"The Demand and Price Situation for Forest Products, 1976-1977," Forest Service Miscellaneous Publication 1356, U.S. Department of Agriculture.

Directory of Corporate Affiliates, Dun & Bradstreet, New York, 1978.

Directory of the Forest Products Industry, American Board Products Association, 1976.

Revised Technical Review of Best Available Technology, Best Demonstrated Technology and Pretreatment Technology for the Timber Products Point Source Category, report to the U.S. Environmental Protection Agency, by Environmental Science and Engineering, Project No. 78-052, September 1, 1978.

Survey of Current Business, Bureau of the Census, U.S. Department of Commerce.

Wholesale Price Indexes, Bureau of Labor Statistics, U.S. Department of Labor.

APPENDIX A

SUPPLEMENTARY DATA

TABLE A-1

PRODUCTION OF INSULATING BOARD[1]

(density less than 31 pounds per cu. ft.)

SIC	Product	1976 Short Tons	1976 Thousand sq. ft. 1/2" Basis	1975 Short Tons	1975 Thousand sq. ft. 1/2" Basis	1974 Short Tons	1974 Thousand sq. ft. 1/2" Basis	1973 Short Tons	1973 Thousand sq. ft. 1/2" Basis
2661110	Structural insulating board, total	1,444,889	3,406,733	1,248,811	2,959,795	1,295,216	3,281,821	1,547,351	3,914,076
2661160	Insulating boards for the retail trade or for use directly in building construction, total	1,248,234	2,988,808	1,081,494	2,616,528	1,087,742	2,746,727	1,263,083	3,208,495
	Interior products, total	481,969	1,020,289	421,581	870,246	415,252	1,027,685	502,325	1,249,256
2661111	Building board, 7/16" or thicker, mostly painted or factory finished	169,772	401,786	117,811	287,746	127,643	309,176	164,239	398,032
2661113	Wallboard, under 7/16" thick, except shinglebacker	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
2661115	Sound-deadening board, nominal 1/2" thick, natural finish	23,399	46,405	13,690	37,248	28,194	76,310	36,597	101,306
2661121	Tile, except acoustical	166,395	321,339	206,192	371,092	164,031	403,653	194,892	484,664
2661123	Acoustical tile and lay-in panels, acoustical	95,014	200,422	73,955	153,524	70,668	176,580	71,441	178,621
2661129	Other (including plank, trim, moldings, and other insulating board for retail used directly in interior building construction)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
	Exterior products, total	766,265	1,968,519	659,913	1,746,283	672,490	1,719,042	760,758	1,959,239
2661131	Sheathing board	575,199	1,367,602	483,792	1,172,905	515,937	1,308,254	619,436	1,591,961
2661133	Shinglebacker	19,484	52,054	(D)	(D)	(D)	(D)	24,687	65,293
2661135	Roof insulation board, preformed above deck	171,582	548,863	157,678	523,771	132,530	347,940	114,361	295,848
2661136	Insulating roof deck	(D)	(D)	(D)	(D)	(D)	(D)	2,274	6,137
2661138	Insulating fiberboard formboard								
	Insulating boards for industrial uses (for further manufacture, processing, or assembly), total	193,105	417,925	167,317	343,267	207,476	535,094	284,268	705,581
2661151	Insulating siding base	7,479	18,742	7,760	19,619	(D)	(D)	(D)	(D)
2661153	Trailer board	103,917	175,768	104,646	169,346	114,828	265,155	186,450	422,314
2661155	Backer board for siding made of metal	(D)	(D)	(D)	(D)	48,499	136,700	58,732	164,930
2661157	Insulating board for processing into expansion joint strips	(D)	(D)	16,087	41,939	21,950	75,947	19,716	68,367
2661159	Insulating board for all other industrial uses such as automobile industry, furniture industry, etc.	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)

1. The American Board Products Association does not agree with the Government's product mix data shown in this table.

D: Not disclosed

Source: U.S. Department of Commerce Current Industrial Reports, "Pulp, Paper, and Board" – M26A

TABLE A-1 (Continued)

PRODUCTION OF INSULATING BOARD[1]

(density less than 31 pounds per cu. ft.)

SIC	Product	1972 Short Tons	1972 Thousand sq. ft. 1/2" Basis	1971 Short Tons	1971 Thousand sq. ft. 1/2" Basis	1970 Short Tons	1970 Thousand sq. ft. 1/2" Basis	1969 Short Tons	1969 Thousand sq. ft. 1/2" Basis
2661110	Structural insulating board, total	1,528,534	3,917,742	1,445,835	3,838,953	1,218,531	3,193,714	1,352,314	3,594,675
2661160	Insulating boards for the retail trade or for use directly in building construction, total	1,265,721	3,199,718	1,196,334	3,147,684	1,004,667	2,608,405	1,163,875	3,068,502
	Interior products, total	486,371	1,285,782	470,183	1,251,552	386,830	1,021,376	455,502	1,201,352
2661111	Building board, 7/16" or thicker, mostly painted or factory finished	162,828	397,859	130,909	327,439	112,926	282,996	152,932	367,554
2661113	Wallboard, under 7/16" thick, except shinglebacker	(D)	(D)	23,247	57,829	28,756	70,492	30,040	74,933
2661115	Sound-deadening board, nominal 1/2" thick, natural finish	40,412	113,882	36,399	100,683	28,555	79,980	34,712	95,697
2661121	Tile, except acoustical	196,027	530,440	204,807	554,996	154,448	413,256	158,477	436,685
2661123	Acoustical tile and lay-in panels, acoustical	59,942	171,780	63,579	177,605	50,922	143,173	63,480	181,815
2661129	Other (including plank, trim, moldings, and other insulating board for retail use directly in interior building construction)	(D)	(D)	11,242	33,000	11,223	31,479	15,861	44,668
	Exterior products, total	779,350	1,938,461	726,151	1,896,132	617,837	1,587,029	708,373	1,867,150
2661131	Sheathing board	631,489	1,607,572	559,902	1,438,930	436,306	1,074,829	469,770	1,169,164
2661133	Shinglebacker	23,150	62,479	17,168	46,782	18,004	47,008	31,035	78,204
2661135	Roof insulation board, preformed above deck	122,057	261,482	145,610	401,560	159,943	455,786	202,084	605,629
2661136	Insulating roof deck	2,654	6,928	3,471	8,860	3,584	9,406	5,484	14,153
2661138	Insulating fiberboard formboard								
	Insulating boards for industrial uses (for further manufacture, processing, or assembly), total	262,813	718,024	249,501	691,269	213,864	585,309	188,439	526,173
2661151	Insulating siding base	(D)	(D)	18,160	47,094	14,947	36,396	7,483	21,821
2661153	Trailer board	157,081	418,811	161,906	444,061	117,234	307,194	118,982	342,449
2661155	Backer board for siding made of metal	51,525	150,693						
2661157	Insulating board for processing into expansion joint strips	22,017	61,662	69,435	200,114	81,683	241,719	61,974	161,903
2661159	Insulating board for all other industrial uses such as automobile industry, furniture industry, etc.	(D)	(D)						

1. The American Board Products Association does not agree with the Government's product mix data shown in this table.

D: Not disclosed

Source: U.S. Department of Commerce Current Industrial Reports, "Pulp, Paper, and Board" – M26A

TABLE A-2

DERIVATION OF UNIT COST
WET PROCESS HARDBOARD NEW CAPACITY

LABOR HOURS

1. Greenfield Mill

	Manhours/Ton
Logging	2.72
Manufacture	14.72
Transportation	2.08
	19.52

2. Conversion of Insulation Board to Hardboard
   Increase manhours by 10%: 21.42 manhours/incremental ton

3. Incremental Expansion
   Decrease manhours by 10%: 17.57 manhours/incremental ton

ENERGY REQUIREMENTS

1. Greenfield Mill

	Million Btu's
Gross Manufacturing Requirements	21.551
Energy Generated from Residue	.797
	20.754

2. Conversion of Insulation Board to Hardboard
   Increase Btu's by 10%: 22.829 million Btu's

3. Incremental Expansion
   Decrease Btu's by 10%: 18.679 million Btu's

WOOD REQUIREMENTS

300 tons of chips/day = 107 MBF/day
0.84 MSF/day

APPENDIX B

EPA FINANCIAL 308 SURVEY

TABLE B-1

RESPONSES TO EPA FINANCIAL 308 SURVEY

Questionnaires Mailed to 18 Companies:

19 Wet Process Hardboard Mills
16 Insulation Board Mills

Response Rate: 100%

Applicable Responses Were Received For:

11 Wet Process Hardboard Only Mills*
11 Insulation Board Only Mills
5 Combination Mills

*Counting Abitibi's Alpena, Michigan operation as one mill.

INSTRUCTIONS AND DEFINITIONS RELATING TO INSULATION BOARD

1. This survey must be completed by each manufacturing facility that manufactures insulation board.

2. A questionnaire for *each* insulation board plant has been sent to the corporate address. This may or may not be a plant site. All questions on a survey form refer to *one* particular insulation board plant site *only* and a separate questionnaire must be completed for each. Questionnaires were mailed to corporate offices because much of the information resides there and typically corporate involvement is required for response to materials of this kind.

3. Please submit one completed questionnaire for *each* plant in the enclosed, pre-addressed envelope by November 30, 1977.

4. All questions contained in this survey are intended to obtain information about your manufacturing operations and activities as they pertain to *insulation board manufacture only*. Other plant operations should not be considered in determining your responses unless a question specifically instructs you to do so.

5. A list of definitions of terms used in the survey has been provided to assist you in understanding the questions asked and to insure your interpretation of terms is the same as that of the persons who developed the survey. Please read these definitions prior to completing any questions and refer to them as often as necessary to assure accuracy in the completion of your response. Defined terms appear in *italics* in the questionnaire.

6. All questions should be answered by checking the appropriate box or boxes. Those questions requiring a written response should be answered by printing or typing in the appropriate space.

7. Attempt to answer all questions. Where appropriate, answers should be provided for the most recent fiscal year. If you cannot provide a full response to a question, answer as much of it as you can. If a question is not relevant to your plant operation or the information requested is not obtainable, please provide an explanation. If clarification or supplementation of any response is necessary, please attach a separate sheet. If you do not know the answer to a question, write "don't know" or "DK". If a value is zero, write in zero (0).

8. If you have difficulty understanding or answering any question, please call Stephen Mermelstein, 202-755-6906.

9. Please retain a copy of your completed survey, since it may be necessary to contact you in the future to verify your responses.

10. Definitions appear on the reverse of this page.

DEFINITIONS

Accumulated Depreciation–Total depreciation to date or the difference between original book value and current book value.

Annual Cost of Pollution Control and Other Environmental Regulations–Depreciation charges for pollution control equipment or for plant and equipment modifications required by regulations. Operating costs include the cost of maintenance and operating labor, supplies, fuel, and electricity required to operate the equipment related to the regulation.

Depreciation–Annual book depreciation of assets at this plant. *Do not include any Timberland Depletion in this figure.*

Direct Wages, Salaries and Related–Payroll costs (salaries, wages, unemployment insurance, FICA and other related costs) of direct labor (production employees) engaged in the manufacture of insulation board.

Fixed Assets–Capital assets, plant site land, and equipment are all categories of fixed assets. The book values or value net to depreciation or depletion should be shown. *Do not include any Timberland in this figure.*

Gross Fixed Assets–Original book value of Fixed Assets.

Insulation Board–A generic term for a homogeneous panel made from lignocellulosic fibers (usually wood or cane) characterized by an integral bond produced by inter-felting of the fibers, to which other materials may have been added during manufacture to improve certain properties, but which has not been consolidated under heat and pressure as a separate stage in manufacture, said board having a density of less than 31 lb/ft^3 (specific gravity 0.50) but having a density of more than 10 lb/ft^3 (specific gravity 0.16).

Materials Cost–Logs, wood, chips, chemicals and other supplies used in the production of insulation board.

Navigable Waters–Waters of the United States, including ocean, rivers, streams, etc. (surface water).

NPDES (National Pollutant Discharge Elimination System) Permit–A permit issued by EPA or an approved state program to point sources which discharge to public waters allowing the discharge of wastewater under certain stated conditions.

Operating Margin–Earnings before interest, taxes, general and administrative expense.

OSHA–The Occupational Safety and Health Administration.

Other Income (Expense)–Income (expense) not directly or indirectly associated with wet process hardboard manufacture.

Payback Period–The number of years it takes for an investment to repay itself.

Process Wastewater–Any used water which results from or has had contact with the manufacturing process, including any water for which there is a reasonable possibility of contamination from the insulation board manufacturing process or from raw material-intermediate product-final product, storage, transportation, handling, processing or cleaning. For purposes of this survey, cooling water, sanitary wastewater, store water and boiler blowdown are not considered process wastewater if they have no contact with the process.

Production Workers–Direct and indirect labor associated with and attributable to wood treating at this plant.

Profit After Tax–If this is a single-plant company, the net profit remaining after Federal Income taxes. If a multi-plant company, calculate an approximate profit after tax by using the aggregate corporate tax rate.

Profit Before Tax–Sales less all costs, except Federal Income taxes.

Return on Investment–The average annual increased revenue (or decreased cost) on an original investment, usually calculated by a discounted cash flow method, expressed as a percentage of original investment.

Sales–Sales, f.o.b. plant, net of discounts, and returns. If the plant is a cost center, estimate the approximate market value (f.o.b. plant) of the products produced in the most recent fiscal year.

Selling, General and Administrative Cost–Salaries, wages and related labor costs not directly associated with production activity; state and local taxes; insurance and expenses allocated from parent.

Total Assets–Fixed Assets, inventories, receivables, cash securities, et cetera.

Total Liabilities–Long-term debt, accounts and notes payable, deferred taxes, et cetera.

Unusual Production Costs–Any plant characteristic that causes unusual costs should be described as well as the impact upon operations. For example, if the plant is in a remote location, freight costs to the nearest market may be higher than those of other plants competing in the market.

308 QUESTIONNAIRE
INSULATION BOARD

i. Name of Plant _____

ii. Address of Plant _____
Street

_____
City State Zip

iii. Name of Respondent* _____ Title _____

iv. Address of Respondent _____
Street City State Zip

v. Telephone No. of Respondent _____
Area Code Number

vi. Parent Company _____

vii. Is this plant engaged in the manufacture of insulation board?

Yes ☐ Continue with Questionnaire

No ☐ Do not fill out the questionnaire but return after completing this page, through Question vii.

viii. To assert your claim of confidentiality, please check off the box corresponding to the questions that in the company's opinion require confidential treatment.

1	☐	5	☐	9	☐	13	☐	19	☐
2	☐	6	☐	10	☐	14	☐	20	☐
3	☐	7	☐	11	☐	15	☐	21	☐
4	☐	8	☐	12	☐	18	☐	22	☐

NOTE: Upon receipt by EPA, this page will be separated from the remainder of the questionnaire so that data processing and use is conducted on a coded basis.

For Use by EPA
Code Number _____

*Person to be contacted in case of questions.

308 QUESTIONNAIRE

INSULATION BOARD

Company Code _____

(For EPA Use)

A. GENERAL INFORMATION

1. Is this insulation board (IB) plant a stand-alone operation or part of a multi-plant complex?

   Stand-Alone ☐ Multi-plant Complex ☐

   If part of a multi-plant complex, approximately what percentage of total complex sales revenue was represented by insulation board in the fiscal year ending 1976? _____ %

2. Is this plant at an urban, suburban or rural location? _____

   Urban ☐ Suburban ☐ Rural ☐

3. What year did the plant begin operation? _____

B. SALES AND PRODUCT MIX

4. What were total sales for this insulation board (IB) plant during 1976?

Under $8 Million	$8-12 Million	$13-20 Million	$21-28 Million	Over $28 Million
☐	☐	☐	☐	☐

5. Which of the following product types were produced at this IB plant during 1976?

	Produced At Plant	Approximate Percent of *Sales*					
		< 10	10-30	31-50	51-70	71-90	> 90
Insulation Board							
a. Structural	☐	☐	☐	☐	☐	☐	☐
b. Decorative	☐	☐	☐	☐	☐	☐	☐
c. Other	☐	☐	☐	☐	☐	☐	☐

6. Are any changes (other than normal business fluctuations) planned over the next five years in IB production process or product mix?

   Yes ☐ No ☐ (If no, go to Part C)

   If yes, please describe: _____

   _____

C. PLANT CAPACITY AND PRODUCTION

7. Annual Capacity: The amount of thousands of square feet of insulation board which could have been produced in this plant during 1976 if the IB plant was operated fully 6-2/3 days/week, 24 hours/day, (350 days or 8400 hours/yr.).

Insulation Board (1/2" Basis)

Thousands of Square Feet				
< 100,000	100,000-150,000	150,001-200,000	200,001-250,000	250,001-300,000
☐	☐	☐	☐	☐
300,001-350,000	350,001-400,000	400,001-450,000	450,001-500,000	> 500,000
☐	☐	☐	☐	☐

8. Actual Production in 1976: The amount of thousands of square feet of insulation board which were produced in this IB plant during 1976:

Insulation Board (1/2" basis) _____ thousands of square feet

9. Did this IB plant have any unusual downtime during 1976, e.g., labor strikes, accidents, et cetera?

No ☐ (Go to 10)
Yes ☐

Number of Weeks of Unusual Downtime					
< 1	1-2	3-4	5-6	7-8	> 8
☐	☐	☐	☐	☐	☐

10. Average number of employees during 1976:

	< 25	26-50	51-75	76-100	101-150	> 150
Production Workers	☐	☐	☐	☐	☐	☐
Other Employees	☐	☐	☐	☐	☐	☐

11. a. Typical number of production days per week:

1-4 ☐ 5 ☐ 6 ☐ 7 ☐

b. Please state number of weeks at each shift level (the total should add to 52 weeks)

No. of Weeks

(1) _____ at 0 shifts (shut down or no insulation board production)

(2) _____ at 1 shift

(3) _____ at 2 shifts

(4) _____ at 3 shifts

(5) _____ at 4 shifts

52 weeks Total [(1) + (2) + (3) + (4) + (5)]

D. REVENUES AND EXPENSES

12. Income Statement

Please check the box which most closely approximates your costs as a percentage of sales. (Use an approximate allocation of data are available at the plant level.)

	Approximate Percent of *Sales*					
	< 16	16-20	21-25	26-30	31-35	> 35
a. *Direct Wages, Salaries and Related*	☐	☐	☐	☐	☐	☐
	< 40.0	41-45	46-50	51-55	56-60	> 60
b. *Materials* (logs, wood, other materials, inventory charges)	☐	☐	☐	☐	☐	☐
	< 1	1-2	3-4	4-5	6-7	> 7
c. *Depreciation*	☐	☐	☐	☐	☐	☐
	< 1	1-2	3-4	4-5	6-7	> 7
d. Other Plant Expenses (Including rent, fuel and energy)	☐	☐	☐	☐	☐	☐
	< 10	10.0-20.0	21.0-25.0		25.1-30.0	> 30
e. *Operating Margin*	☐	☐	☐		☐	☐
	< 8	8-10	11-13		> 14	
f. *Selling, General and Administration* (Including allocation from Parent)	☐	☐	☐		☐	
	0	1-2	3-4	5-6	7-8	> 8
g. Interest Expense	☐	☐	☐	☐	☐	☐
h. *Other Income (Expense)*	☐	☐	☐	☐	☐	☐
	< 3	3-9	10-12	13-15	16-17	> 17
i. *Profit Before Tax*	☐	☐	☐	☐	☐	☐
	< 1	2-3	4-5	6-7	8-9	> 9
j. Taxes	☐	☐	☐	☐	☐	☐
	< 2	2-4	5-10	11-15	> 15	
k. *Profit After Tax*	☐	☐	☐	☐	☐	

13. How representative is 1976 profit before tax compared to the 1971-1975 period:

Much Better than Average	☐
Better than Average	☐
About the Same	☐
Worse than Average	☐
Much Worse than Average	☐

14. What Depreciation Method is used?

		Equipment	Buildings
a. Book Basis:	Straight-Line	☐	☐
	Double-declining Balance	☐	☐
	Sum of Year's Digits	☐	☐
	Other: _____ (Please Specify)	☐	☐
b. Tax Basis:	Straight Line	☐	☐
	Double-declining Balance	☐	☐
	Sum of Year's Digits	☐	☐
	Other: _____ (Please Specify)	☐	☐
c. Pollution Control Expenditures:			
	Accelerated Over 5 Years	☐	☐
	Same as Other Equipment	☐	☐

15. Annual Cost of Pollution Control and other Regulations Affecting Insulation Board Production Process and Costs at this IB Plant:

	Don't Know	None	Fiscal Year Ending 1976	Fiscal Year Ending 1977*
a. Direct Costs				
(1) Water Pollution Regulations:				
(a) Annual Operating Costs**	☐	☐	_____	_____
(b) Annual Depreciation Charges**	☐	☐	_____	_____
(c) Obligations to Municipalities	☐	☐	_____	_____
(2) Air Pollution Regulations:				
(a) Annual Operating Costs	☐	☐	_____	_____
(b) Annual Depreciation Charges	☐	☐	_____	_____

*Please estimate the 1977 value if unknown at this time.

**Include the cost associated with shared facilities, including Industrial Waste Recovery Systems.

	Don't Know	None	Fiscal Year Ending 1976	1977*
(3) Solid Waste Disposal (Total, including waste water sludge and wood waste):	☐	☐	_____	_____
(a) Annual Operating Costs	☐	☐	_____	_____
(b) Annual Depreciation Charges	☐	☐	_____	_____
(4) Other Regulations Affecting Production Processes and Production Costs (Please Specify): _____				
(a) Annual Operating Costs	☐	☐	_____	_____
(b) Annual Depreciation Charges	☐	☐	_____	_____
b. Indirect Costs (e.g., environmental research, consultants, litigation)	☐	☐	_____	_____

16. How does this plant discharge of *process waste water*?

a. Discharge into navigable water ☐
b. Discharge into municipal sewer ☐
c. Disposed on plant site ☐
d. Disposed off plant site ☐
e. Process waste is recycled (no discharge) ☐
f. Other ☐ Please specify _____

17a. If you do not discharge *process waste water* into a municipal sewer, do you have the option to connect?

Yes ☐ No ☐ Don't Know ☐

b. If you do have the option to connect to a municipal sewer, what is the initial capital investment cost?

$ _____ Don't Know ☐

c. If you discharge any wood treating *process waste water* into a sewer system, on what basis are your sewer charges made?

Flat annual fee ☐
Gallon of effluent ☐
Other ☐ Please specify _____

*Please estimate the 1977 value if unknown at this time.

d. If you discharge into a municipal sewer, what were your total sewer charges in 1976?

$ _____

e. If you discharge *process waste water* into navigable waters, do you have an *NPDES permit*?

Yes ☐ No ☐ Don't Know ☐

f. Do you own or have available for purchase about one acre of land at or adjacent to this facility that could be used for an effluent treatment system?

Yes ☐ No ☐

If yes, what is the current market value per acre? $ _____

18. *Unusual Production Costs*

Are there any circumstances peculiar to this plant which result in unusual production costs (other than unusual downtime described in Q. 9)?

Yes ☐ No ☐

If Yes, please describe: _____

_____

_____

19. Distribution of Corporate Assets and Liabilities

a. What was the value of the company's *total assets* at the end of the 1976 fiscal year? $ _____

b. What was the value of the company's *total liabilities* and net worth at the end of the 1976 fiscal year (accounts payable, debt due within the year, etc.)? $ _____

c. What was the value of debt maturing in one year? $ _____

d. What was the corporation's debt/equity ratio? _____ :1

20 Value of Assets for this Insulation Board Plant

a. *Gross Fixed Assets*: Original Cost (Book Value) of plant and equipment dedicated to insulation board $ _____

b. Accumulated *depreciation* - _____

c. Net *Fixed Assets (Gross Fixed Assets* less cumulative *depreciation* = Current Book Value) $ _____

d. *Total Assets*: Net *Fixed Assets*, Cash Receivables, inventory, other costs) $ _____

21. Capital Investment Criteria for IB Plant

a. What basis is used to evaluate the IB plant's profitability (*return on investment*)?

☐ *Total Assets* (As above, 20.d) less current liabilities

☐ Book Value of Net *Fixed Assets* (As above, 20.c)

☐ Replacement Cost

☐ Salvage Value

☐ Other (Specify)

b. What is the target internal pre-tax rate of return on capital required for investment in this plant? _____ % At what ROI would you consider closing the plant? _____ %

c. If rate of return criteria are not used, what is the required *payback period* for investment? _____ Years or ☐ Useful Life. At what payback period would you consider closing the plant? _____ Years

22. Capital Investment for IB Plant (including capitalized maintenance)

	(1) Total Investment	(2) Plant Capitalized Maintenance of Major Expansion	(3) Water Pollution Control	(4) Other Environmental Regulation Impacting Production Processes
Planned 1977	_____	_____	_____	_____
Total Actual 1972-76	_____	_____	_____	_____

INSTRUCTIONS AND DEFINITIONS RELATING TO WET PROCESS HARDBOARD

1. This survey must be completed by each manufacturing facility that manufactures hardboard by the wet process.

2. A questionnaire for *each* hardboard plant has been sent to the corporate address. This may or may not be a plant site. All questions on a survey form refer to *one* particular hardboard plant site *only* and a separate questionnaire must be completed for each. Questionnaires were mailed to corporate offices because much of the information resides there and typically corporate involvement is required for response to materials of this kind.

3. Please submit one completed questionnaire for *each* plant in the enclosed, pre-addressed enveloped by November 30, 1977.

4. All questions contained in this survey are intended to obtain information about your manufacturing operations and activities as they pertain to *wet process hardboard manufacture only*. Other plant operations should not be considered in determining your responses unless a question specifically instructs you to do so.

5. A list of definitions of terms used in the survey has been provided to assist you in understanding the questions asked and to insure your interpretation of terms is the same as that of the persons who developed the survey. Please read these definitions prior to completing any questions and refer to them as often as necessary to assure accuracy in the completion of your response. Defined terms appear in *italics* in the questionnaire.

6. All questions should be answered by checking the appropriate box or boxes. Those questions requiring a written response should be answered by printing or typing in the appropriate space.

7. Attempt to answer all questions. Where appropriate, answers should be provided for the most recent fiscal year. If you cannot provide a full response to a question, answer as much of it as you can. If a question is not relevant to your plant operation or the information requested is not obtainable, please provide an explanation. If clarification or supplementation of any response is necessary, please attach a separate sheet. If you do not know the answer to a question, write "don't know" or "DK". If a value is zero, write in zero (0).

8. If you have difficulty understanding or answering any question, please call Stephen Mermelstein, 202-755-6906.

9. Please retain a copy of your completed survey, since it may be necessary to contact you in the future to verify your responses.

10. Definitions appear on the reverse of this page.

DEFINITIONS

Accumulated Depreciation–Total depreciation to date or the difference between original book value and current book value.

Annual Cost of Pollution Control and Other Environmental Regulations–Depreciation charges for pollution control equipment or for plant and equipment modifications required by regulations. Operating costs include the cost of maintenance and operating labor, supplies, fuel, and electricity required to operate the equipment related to the regulation.

Depreciation–Annual book depreciation of assets at this plant. *Do not include any Timberland Depletion in this figure.*

Direct Wages, Salaries and Related–Payroll costs (salaries, wages, unemployment insurance, FICA and other related costs) of direct labor (production employees) engaged in the manufacture of wet process hardboard.

Fixed Assets–Capital assets, plant site land, and equipment are all categories of fixed assets. The book values or value net to depreciation or depletion should be shown. *Do not include any Timberland in this figure.*

Gross Fixed Assets–Original book value of Fixed Assets.

Hardboard–A generic term for a panel manufactured primarily from inter-felted lignocellulosic fibers (usually wood), consolidated under heat and pressure in a hot-press to a density of 31 lb/ft^3 (specific gravity 0.50) or greater, and to which other materials may have been added during manufacture to improve certain properties.

Materials Cost–Logs, wood, chips, chemicals and other supplies used in the production of wet process hardboard.

NPDES (National Pollutant Discharge Elimination System) Permit–A permit issued by EPA or an approved state program to point sources which discharge to public waters allowing the discharge of wastewater under certain stated conditions.

Navigable Waters–Waters of the United States including ocean, rivers, streams, etc. (surface water).

Operating Margin–Earnings before interest, taxes, general and administrative expense.

OSHA–The Occupational Safety and Health Administration.

Other Income (Expense)–Income (expense) not directly or indirectly associated with wet process hardboard manufacture.

Payback Period–The number of years it takes for an investment to repay itself.

Process Wastewater–Any used water which results from or has had contact with the manufacturing process, including any water for which there is a reasonable possibility of contamination from the wet process hardboard manufacturing process or from raw material-intermediate product-final product, storage, transportation, handling, processing or cleaning. For purposes of this survey, cooling water, sanitary wastewater, store water and boiler blowdown are not considered process wastewater if they have no contact with the process.

Production Workers–Direct and indirect labor engaged in and attributable to the production of wet process hardboard at this plant.

Profit After Tax–If this is a single-plant company, the net profit remaining after Federal Income taxes. If a multi-plant company, calculate an approximate profit after tax by using the aggregate corporate tax rate.

Profit Before Tax–Sales less all costs, except Federal Income taxes.

Return on Investment–The average annual revenue (or decreased cost) on an original investment, usually calculated by a discounted cash flow method.

Sales–Sales, f.o.b. plant, net of discounts, and returns. If the plant is a cost center, estimate the approximate market value (f.o.b. plant) of the products produced in the most recent fiscal year expressed as a percent of the original investment.

Selling, General and Administrative Cost–Salaries, wages and related labor costs not directly associated with production activity; state and local taxes; insurance and expenses allocated from parent.

Total Assets–Fixed Assets, inventories, receivables, cash securities, et cetera.

Total Liabilities–Long-term debt, accounts and notes payable, deferred taxes, et cetera.

Unusual Production Costs–Any plant characteristic that causes unusual costs should be described as well as the impact upon operations. For example, if the plant is in a remote location, freight costs to the nearest market may be higher than those of other plants competing in the market.

308 QUESTIONNAIRE
WET PROCESS HARDBOARD

i. Name of Plant _____

ii. Address of Plant _____
Street

_____
City State Zip

iii. Name of Respondent* _____ Title _____

iv. Address of Respondent _____
Street City State Zip

v. Telephone No. of Respondent _____
Area Code Number

vi. Parent Company _____

vii. Is this plant engaged in the manufacture of insulation board?

Yes ☐ Continue with Questionnaire

No ☐ Do not fill out the questionnaire but return after completing this page through Question vii.

viii. To assert your claim of confidentiality, please check off the box corresponding to the questions that in the company's opinion require confidential treatment.

1	☐	5	☐	9	☐	13	☐	19	☐
2	☐	6	☐	10	☐	14	☐	20	☐
3	☐	7	☐	11	☐	15	☐	21	☐
4	☐	8	☐	12	☐	18	☐	22	☐

NOTE: Upon receipt by EPA, this page will be separated from the remainder of the questionnaire so that data processing and use is conducted on a coded basis.

For Use by EPA

Code Number _____

*Person to be contacted in case of questions.

308 QUESTIONNAIRE
WET PROCESS HARDBOARD

Company Code _____
(For EPA Use)

A. GENERAL INFORMATION

1. Is this wet process *hardboard* (WPH) plant a stand-alone operation or part of a multi-plant complex?

   Stand-Alone ☐ Multi-plant Complex ☐

   If part of a complex, approximately what percentage of total *sales* at this complex was from wet process hardboard in the 1976 fiscal year? _____ %

2. Is this plant at an urban, suburban or rural location?

   Urban ☐ Suburban ☐ Rural ☐

3. What year did the plant begin operation? _____

B. SALES AND PRODUCT MIX

4. What were total *sales* (net f.o.b.) for this wet process hardboard (WPH) plant during 1976?

Under $5 Million	$5-10 Million	$11-20 Million	$21-30 Million	More than $30 Million
☐	☐	☐	☐	☐

5. Which of the following product types were produced at this WPH plant during 1976?

S1S Products	Produced At Plant	Approximate Percent of *Sales*					
		< 10	10-30	31-50	51-70	70-90	> 90
a. Siding	☐	☐	☐	☐	☐	☐	☐
b. Panelling	☐	☐	☐	☐	☐	☐	☐
c. Industrial Board	☐	☐	☐	☐	☐	☐	☐
d. Other S1S	☐	☐	☐	☐	☐	☐	☐
S2S Products							
e. Siding	☐	☐	☐	☐	☐	☐	☐
d. Panelling	☐	☐	☐	☐	☐	☐	☐
g. Industrial Board	☐	☐	☐	☐	☐	☐	☐
h. Other S2S	☐	☐	☐	☐	☐	☐	☐

6. Are any changes (other than normal business fluctuations) planned over the next five years in production process or product mix at this WPH plant?

   Yes ☐ No ☐ (If no, go to Part C)

   If yes, please describe _____

   _____

   _____

C. PLANT CAPACITY AND PRODUCTION

7. Annual Capacity: The amount of thousands of square feet of the product which could have been produced in this plant during 1976 if the plant was operated fully 6-2/3 days/week, 24 hours/day (350 days or 8400 hours/yr.).

	Thousands of Square Feet				
	< 100,000	100,000-150,000	150,001-200,000	200,001-250,000	250,001-300,000
Wet Process Hardboard (1/8" Basis)	☐	☐	☐	☐	☐
	300,001-350,000	350,001-400,000	400,001-450,000	450,001-500,000	> 500,000
	☐	☐	☐	☐	☐

8. Actual Production in 1976: The amount of thousands of square feet of the product which were produced in this plant during 1976:

Wet Process Hardboard (1/8" basis) _____ thousands of square feet

9. Did this WPH plant have any unusual downtime during 1976, e.g., labor strikes, accidents, etc?

		Number of Weeks of Unusual Downtime					
		< 1	1-2	3-4	5-6	7-8	> 8
No ☐	(Go to 10)						
Yes ☐		☐	☐	☐	☐	☐	☐

10. Average number of employees during 1976:

	< 25	26-50	51-75	76-100	101-150	> 150
Production Workers	☐	☐	☐	☐	☐	☐
Other Employees	☐	☐	☐	☐	☐	☐

11. a. Typical number of production days per week:

1-4 ☐ 5 ☐ 6 ☐ 7 ☐

b. Please state number of weeks at each shift level (the total should add to 52 weeks):

No. of Weeks

(1) _____ at 0 shifts (shut down or no wet process hardboard production)

(2) _____ at 1 shift

(3) _____ at 2 shifts

(4) _____ at 3 shifts

(5) _____ at 4 shifts

52 Weeks Total [(1) + (2) + (3) + (4) + (5)]

D. REVENUES AND EXPENSES

12. Income Statement

Please check the box which most closely approximates your costs as a percentage of sales. (Use an approximate allocation if data are unavailable at the plant level.)

	This WPH Plant's Cost as an Approximate Percent of *Sales*					
	< 16	17-19	20-23	24-26	27-29	> 29
a. *Direct Wages, Salaries and Related*	☐	☐	☐	☐	☐	☐
	< 20	21-27	28-33	34-40	41-47	> 47
b. *Materials* (logs, wood, other materials plus inventory charges)	☐	☐	☐	☐	☐	☐
	< 1	1-2	3-4	4-5	6-7	> 7
c. *Depreciation*	☐	☐	☐	☐	☐	☐
	< 1	1-2	3-4	4-5	5-6	> 7
d. Other Plant Expenses (Including rent, fuel and energy)	☐	☐	☐	☐	☐	☐
	< 30	31-35	36-40	41-45	46-50	> 50
e. *Operating Margin*	☐	☐	☐	☐	☐	☐
	< 5	6-7	8-10	11-12	13-15	> 15
f. *Selling General and Admin.* (Including Allocation from Parent)	☐	☐	☐	☐	☐	☐
	0	1-2	3-4	5-6	> 6	
g. Interest Expense	☐	☐	☐	☐	☐	
h. *Other Income (expense)*	☐	☐	☐	☐	☐	
	< 10	11-14	15-19	19-24	25-30	
i. *Profit Before Tax*	☐	☐	☐	☐	☐	
	< 4	5-6	7-9	10-12	13-15	
j. Taxes	☐	☐	☐	☐	☐	
	< 4	5-6	7-9	10-12	13-15	
k. *Profit After Tax*	☐	☐	☐	☐	☐	

13. How representative is 1976 profit before tax compared to the 1971-1975 period:

Much Better than Average	☐
Better than Average	☐
About the Same	☐
Worse than Average	☐
Much Worse than Average	☐

14. What depreciation method is used?

		Equipment	Buildings
a. Book Basis:	Straight-Line	☐	☐
	Double-declining Balance	☐	☐
	Sum of Year's Digits	☐	☐
	Other: _____ (Please Specify)	☐	☐
b. Tax Basis:	Straight Line	☐	☐
	Double-declining Balance	☐	☐
	Sum of Year's Digits	☐	☐
	Other: _____ (Please Specify)	☐	☐
c. Pollution Control Expenditures:			
	Accelerated Over 5 Years	☐	☐
	Same as Other Equipment/Bldgs.	☐	☐

15. Annual Cost of Pollution Control and other Regulations Affecting WPH Production Process and Production at this Plant:

	Don't Know	None	Fiscal Year Ending 1976	Fiscal Year Ending 1977*
a. Direct Costs				
(1) Water Pollution Regulations:				
(a) Annual Operating Costs**	☐	☐	_____	_____
(b) Annual Depreciation Charges**	☐	☐	_____	_____
(c) Obligations to municipalities	☐	☐	_____	_____
(2) Air Pollution Regulations:				
(a) Annual Operating Costs	☐	☐	_____	_____
(b) Annual Depreciation Charges	☐	☐	_____	_____

*Please estimate 1977 expenditures if they are not known.

**Include the cost associated with shared facilities, including Industrial Waste Recovery Systems.

	Don't Know	None	Fiscal Year Ending 1976	1977*
(3) Solid Waste Disposal (Total, including waste water sludge and wood waste):	☐	☐	_____	_____
(a) Annual Operating Costs	☐	☐	_____	_____
(b) Annual Depreciation Charges	☐	☐	_____	_____
(4) Other Regulations Affecting Production Processes and Production Costs (Please Specify): _____				
(a) Annual Operating Costs	☐	☐	_____	_____
(b) Annual Depreciation Charges	☐	☐	_____	_____
b. Indirect/Overhead Costs (Environmental research, consulting fees, litigation, etc.)	☐	☐	_____	_____

16. How does this plant dispose of *process waste water*?

a. Discharge into navigable water ☐
b. Discharge into municipal sewer ☐
c. Disposed on plant site ☐
d. Disposed off plant site ☐
e. Process waste water is recycled (no discharge) ☐
f. Other ☐ Please specify _____

17.a If you do not discharge *process waste water* into a municipal sewer, do you have the option to connect?

Yes ☐ No ☐ Don't Know ☐

b. If you do have the option to connect to a municipal sewer, what is the initial capital investment cost?

$ _____ Don't Know ☐

c. If you discharge any *process waste water* into a sewer system, on what basis are your sewer charges made?

Flat annual fee ☐
Gallon of effluent ☐
Other ☐ Please specify _____

*Please estimate the 1977 value if unknown at this time.

d. If you discharge into a municipal sewer, what were your total sewer charges in 1976?

$_____

e. If you discharge *process waste water* into navigable waters, do you have an *NPDES Permit*?

Yes ☐ No ☐ Don't Know ☐

f. Do you own or have available for purchase about one acre of land at or adjacent to this facility that could be used for an effluent treatment system?

Yes ☐ No ☐

If yes, what is the current market value per acre? $ _____

18. *Unusual Production Costs*

Are there any circumstances peculiar to this plant which result in unusual production costs (other than unusual downtime described in Q. 9)?

Yes ☐ No ☐

If Yes, please describe: _____

_____

_____

19. Distribution of Corporate Assets and Liabilities

a. What is the value of the corporation's total accounts receivable? $ _____

b. What is the value of the corporation's total current liabilities (accounts payable, debt due within the year, etc.)? $ _____

c. What is the value of debt maturing in the current fiscal year? $ _____

d. What is the corporate debt/equity ratio? _____:1

20. Value of Assets (Wet Process Hardboard Plant):

a. *Gross Fixed Assets*: Original Cost (Book Value) of plant equipment dedicated to wet process hardboard $ _____

b. Accumulated *depreciation* - _____

c. Net *Fixed Assets (Gross Fixed Assets* less cumulative *depreciation*–Current Book Value) $ _____

d. *Total Assets*: Net *Fixed Assets*, Cash Receivables, inventory, other costs) $ _____

21. Capital Investment Criteria for WPH Plant

a. What basis is used to evaluate the plant's profitability (return on investment)?

☐ Net Assets (Total Assets, as above in 20.d, less Current Liabilities)

☐ Book Value of Net Fixed Assets (as above in 20.c)

☐ Replacement Cost

☐ Salvage Value

☐ Other (Specify) _____

b. What is the target internal pre-tax rate of return on capital required for investment in this plant? _____ % At what ROI would you consider closing the plant? _____ %

c. If rate of return criteria are not used, what is the required *payback period* for investment? _____ Years or ☐ Useful Life

22. Capital Investment for WPH Plant (including capitalized maintenance)

	(1) Total Investment	(2) Plant Capitalized Maintenance of Major Expansion	(3) Water Pollution Control	(4) Other Environmental Regulation Impacting Production Processes
Planned 1977	_____	_____	_____	_____
Total Actual 1972-76	_____	_____	_____	_____