United States
Environmental Protection
Agency

Office of
Water Planning and Standards
Washington, DC 20460

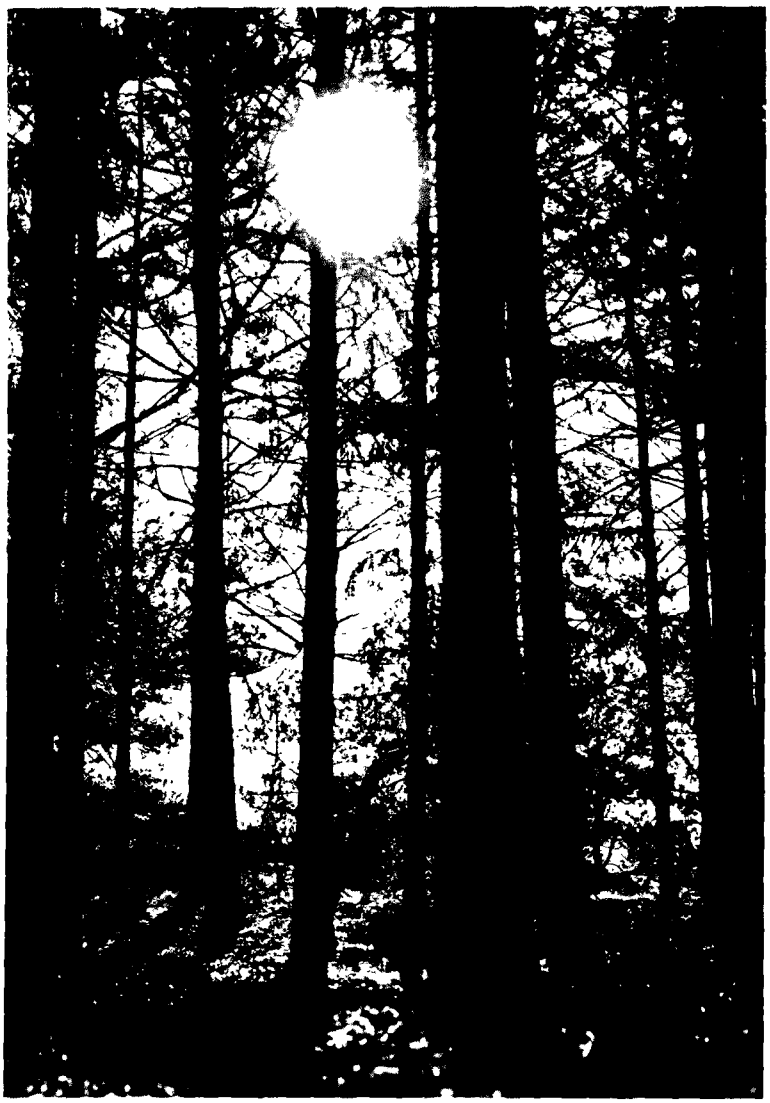
EPA-440/2-79-018

Water

EPA

Economic Impact Analysis of Alternative Pollution Control Technologies

Wood Preserving Subcategories of the Timber Products Industry



This document is available in limited quantities through the U.S. Environmental Protection Agency, Economic Analysis Staff WH-586, 401 M Street, S.W., Washington, D.C. 20460, 202-755-2484.

This document will subsequently be available through the National Technical Information Service, Springfield, Virginia, 22151.

EPA-440/2-79-018

Economic Impact Analysis of Alternative Pollution Control Technologies

Wood Preserving Subcategories of the Timber Products Industry

U.S. Environmental Protection Agency

Office of Water Planning and Standards

September 1979

PREFACE

This document is a contractor's study prepared for the Office of Water Planning and Standards of the Environmental Protection Agency (EPA). The purpose of the study is to analyze the economic impact which could result from the application of effluent standards and limitations issued under Sections 301, 304, 306 and 307 of the Clean Water Act to the timber products industry.

The study supplements the technical study (EPA Development Document) supporting the issuance of these regulations. The Development Document surveys existing and potential waste treatment control methods and technology within particular industrial source categories and supports certain standards and limitations based upon an analysis of the feasibility of these standards in accordance with the requirements of the Clean Water Act. Presented in the Development Document are the investment and operating costs associated with various control and treatment technologies. The attached document supplements this analysis by estimating the broader economic effects which might result from the application of various control methods and technologies. This study investigates the effect in terms of product price increases, effects upon employment and the continued viability of affected plants, effects upon foreign trade and other competitive effects.

The study has been prepared with the supervision and review of the Office of Water Planning and Standards of EPA. This report was submitted in fulfillment of Contract Nos. 68-01-4194 and 68-01-4398 by Arthur D. Little, Inc.

This report is being released and circulated at approximately the same time as publication in the *Federal Register* of a notice of proposed rule making. The study is not an official EPA publication. It will be considered along with the information contained in the Development Document and any comments received by EPA on either document before or during final rule making proceedings necessary to establish final regulations. Prior to final promulgation of regulations, the accompanying study shall have standing in any EPA proceeding or court proceeding only to the extent that it represents the views of the contractor who studied the subject industry. It cannot be cited, referenced, or represented in any respect in any such proceeding as a statement of EPA's views regarding the timber products industry.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Cont)

LIST OF FIGURES

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 wood preserving subcategories of the timber products industry. It characterizes each wood preserving subsegment; summarizes alternative technologies and their related costs of compliance* and analyzes and discusses the anticipated economic impact on those plants that would have to make investments to be in compliance with alternative regulation options. The EPA assisted in the analysis by surveying the wood preserving 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

The wood preserving industry comprises establishments primarily engaged in treating wood, sawed or planed in other establishments, with creosote or other preservatives to prevent decay and to protect against fire and insects. This industry also includes the cutting, treating, and selling of crossties, poles, posts, and pilings.

The wood treating process can employ either pressure or non-pressure systems. Non-pressure processors use open tanks containing the preservatives in which the wood is immersed. Pressure processors can be either "full-cell," commonly used with aqueous solutions, or "empty-cell," used with oil preservatives.

The industry is composed of a large number of small, privately owned plants and a few larger establishments, totaling 302 companies that operated about 415 wood preserving plants in the United States in 1976. Of these companies, 87% are single-plant firms. The largest, Koppers Company, operates 25 plants, whereas the other multi-plant firms operate 10 or fewer. The 10 largest represent approximately 51% of total industry pressure-tank capacity.

Wood preserving companies vary with respect to the degree of vertical integration and ownership. Most of the companies are not integrated back to the ownership of timberland but purchase wood or treat customer-owned wood on a service basis only. Ownership is about 22% through publicly held corporations, 69% privately held and 9% proprietorships.

In general, firms located in the South are treating mostly Southern Pine while those in the West treat mostly Douglas Fir. The industry uses either oil-borne (organic) preservatives for products such as poles, pilings or railroad ties, or waterborne (inorganic) preservatives for plywood and lumber. The majority (80%) of firms treat with organic preservatives.

---

*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.

Wood preserving plants are distributed throughout the United States, but 45% are located in the Southeast. Of plants responding to the EPA Financial 308 Survey, 30% described their plant site as urban, whereas 25% were reported to be suburban and 45%, rural. The industry exhibits a fairly even distribution by annual sales value, with 45% of the facilities having sales between $300,000 and $2.4 million.

The value of shipments by the wood preserving industry rose from $344 million in 1967 to $761 million in 1974, before easing in the succeeding two years. The volume of wood preserved peaked at 286 million cubic feet in 1967; in 1976, the most recent year for which data are available, the total volume was 257 million cubic feet. Future growth will vary by product but is forecast by Arthur D. Little, Inc., to average three percent per year to 1988.

Preserved wood is largely a commodity market modified by transportation costs which give regional advantages to some producers. Sometimes, the availability of a particular wood specie can also be a factor. Demand elasticity in the industry varies somewhat among products but the major factors governing demand are the competition within the industry, the economic climate of user industries and the cost-effectiveness of substitute products.

The industry has experienced significant cost increases for some of the principal raw materials used, especially chemicals and wood. However, producers have been largely able to pass on increased costs in the form of higher selling prices, although margins have eased during the 1970's.

Pro-forma income statements developed for seven sales and service categories of wood preserving plants indicate a range in after-tax profit of 0.5% to 6%. (Plant models were developed for five plants treating owned-wood products and ranging in sales from $200,000 to $7.5 million, and two plants offering a treating service only and having sales of $250,000 and $1 million, respectively.) The return on total capital in 1976 for 314 of the 337 respondents to the EPA Financial 308 Letter ranges from 1.9% to 32%. The ratio of sales to total assets ranges from 2.5 to 5.

C. COSTS OF COMPLIANCE

Costs of compliance were developed for three levels of treatment for each indirect discharge plant:

- Biological treatment;
- Metals removal; and
- Zero discharge.

Six options were examined for indirect dischargers:

- Option 1: Existing interim final standards; i.e., no further regulation;
- Option 2: Biological treatment only for plants using pentachlorophenol;
- Option 3: Metals removal for plants with fugitive metals;
- Option 4: Zero discharge only for plants using pentachlorophenol or plants with fugitive metals;

- Option 5: Zero discharge for plants using pentachlorophenol; and
- Option 6: Zero discharge for all indirect dischargers.

The total investment required for all indirect dischargers is highest under Option 6, at $6.1 million, and lowest for Option 3, at $1.6 million (Table I-1).

The cost of compliance was also calculated using a set size-cutoff criterion. The effect of using the size cutoff is to cut in half the number of impacted plants and the total industry cost of compliance.

There is only one direct discharging plant; and for that plant, two levels of treatment technology were developed:

- Additional biological treatment with activated carbon adsorption; and
- No discharge, through spray evaporation.

D. ECONOMIC IMPACT

A small portion (10%) of the wood preserving subcategory will be affected by the alternatives that were considered.

The EPA is proposing Option 5 without a size cutoff as the Pretreatment Standard for Existing Sources for both Boulton and steaming indirect dischargers. A total of 21 steaming plants and 6 Boulton plants will be impacted by Option 5. Revenue required to recover cost ranges from 2% to 33% (Table I-2) for impacted steaming plants and 2% to 49% (Table I-3) for Boulton plants. Under Options 2 and 3, required price increases would have been lower while under Options 4 and 6 the required price increase to recover cost would have been about the same.

There will be no general price increase as a consequence of the alternatives studied. Individual plants may be able to recover their cost if local market conditions permit. Therefore, the profitability of impacted plants will decline.

The investment required under each option studied is generally larger than average annual cash flow for indirect dischargers (Table I-2). An estimated 25% of annual cash flow could be made available for pollution control investment; thus most plants will require external financing.

Under Option 5, there could be from two to seven plant closures in the steaming category and one to three in the Boulton category. The employment losses associated with plant closures are expected to range from 103 to 383 in the steaming category and from 15 to 56 in the Boulton category. Under Options 2 and 3, in the steaming category, plant closures and employment would have been lower while under Options 4 and 6 both would be higher. In the Boulton category, the plant closures and employment losses are the same under Options 3, 4 and 6 as for Option 5.

TABLE I-1

TOTAL COST OF COMPLIANCE WOOD PRESERVING INDUSTRY

A. INDIRECT STEAMING PLANTS

	With No Size Cutoff			With Size Cutoff		
		Cost ($ Millions)			Cost ($ Millions)	
	Impacted Plants	Investment	Annual Operating Cost	Impacted Plants	Investment	Annual Operating Cost
Option 1	0	–	–	0	–	–
Option 2	19	1.8	0.4	13	1.3	0.3
Option 3	8	1.0	0.2	2	0.2	0.0
Option 4	25	4.0	0.5	12	1.8	0.2
Option 5	21	3.3	0.4	12	1.8	0.2
Option 6	31	5.0	0.5	15	2.3	0.3

B. INDIRECT BOULTON PLANTS

Option 1	0	–	–	–	–	–
Option 2	6	0.8	0.2	5	0.6	0.2
Option 3	6	0.6	0.2	5	0.6	0.2
Option 4	7	0.8	0.2	3	0.5	0.1
Option 5	6	0.6	0.2	2	0.3	0.1
Option 6	11	1.2	0.4	6	0.9	0.3

TABLE I-2

SUMMARY OF ECONOMIC IMPACT STEAMING INDIRECT DISCHARGERS

	Option 2		Option 3		Option 4		Option 5		Option 6	
	Without Cutoff	With Cutoff	Without Cutoff	With Cutoff	Without Cutoff	With Cutoff	Without Cutoff	With Cutoff	Without Cutoff	With Cutoff
Number of Plants Impacted*	19	13	8	2	25	12	21	12	31	15
% of Total Plants	5%	3%	2%	0%	6%	3%	5%	3%	7%	4%
Revenue Increase (%) to Recover Compliance Costs	0-14	0-12	2-14	2	2-33	2-33	2-33	2-33	2-33	2-33
Compliance Investment as a Percent of Cash Flow	9-130	9-97	20-200	20	14-240	14-200	14-210	14-130	14-589	14-211
Number of Plant Closures										
Moderate Probability	3	–	2	–	6	2	5	2	8	1
High Probability	–	–	2	–	5	–	2	–	6	2
Total	3	–	4	–	11	2	7	2	14	3
Unemployment from Plant Closures										
Moderate Probability	130	–	54	–	280	199	280	199	295	199
High Probability	–	–	77	–	199	–	103	–	253	27
Total	130	–	131	–	479	199	383	199	548	226
%of Total Employment	2%	–	2%	–	6%	3%	5%	3%	7%	3%

*Plants required to make expenditures to comply.

TABLE I-3

SUMMARY OF ECONOMIC IMPACT BOULTON INDIRECT DISCHARGERS

	Option 2		Option 3		Option 4		Option 5		Option 6	
	Without Cutoff	With Cutoff	Without Cutoff	With Cutoff	Without Cutoff	With Cutoff	Without Cutoff	With Cutoff	Without Cutoff	With Cutoff
Number of Plants Impacted	6	5	6	5	7	3	6	2	11	6
% of Total Plants	1	1	1	1	2	1	1	0	3	1
Revenue Increase (%) to Recover Compliance Costs	4-49	4-6	2-11	3-4	2-49	2-4	2-49	2-4	2-49	2-4
Compliance Investment as a Percent of Cash Flow	42-600	42-68	29-134	29-68	42-600	44-55	42-60	55%	37-600	37-55
Number of Plant Closures										
Moderate Probability	2	–	1	–	1	–	1	–	1	–
High Probability	–	–	2	–	2	–	2	–	2	–
Total	2	–	3	–	3	–	3	–	3	–
Unemployment from Plant Closures										
Moderate Probability	41	–	41	–	41	–	41	–	41	–
High Probability	–	–	15	–	15	–	15	–	15	–
Total	41	–	56	–	56	–	56	–	56	–
% of Total Employment	1	–	1	–	1	–	1	–	1	–

II. INDUSTRY CHARACTERIZATION

A. INDUSTRY DEFINITION

As defined in Standard Industrial Classification (SIC) 2491, the wood preserving industry "comprises establishments primarily engaged in treating wood, sawed or planed in other establishments, with creosote or other preservatives to prevent decay and to protect against fire and insects. This industry also includes the cutting, treating, and selling of crossties, poles, posts, and piling."

B TYPES OF FIRMS

The wood preserving industry is composed of a large number of small, privately owned plants and a few larger establishments. Larger establishments are generally either:

- Owned by companies whose major source of income is not wood preserving: e.g., Koppers, Kerr-McGee Chemical Corp., Southern Wood Piedmont Co., and International Paper Company; or
- Owned by companies which are primarily wood preservers; e.g., J. H. Baxter & Co., Wyckoff Co.

Each of these firms operates at numerous locations. There were approximately 302 companies and 415 wood preserving plants in the country in 1976. The Environmental Protection Agency Financial 308 Letter* was answered by 337 plants.

1. Size of Firm

The wood preserving companies vary considerably in both sales and number of wood preserving operations. Of 302 wood preserving companies, 263 (87%) are single-plant firms, 39 (13%) are multi-plant firms. Koppers Company operates 25 plants; the other multi-plant firms operate 10 or fewer plants.

Available information shows that total annual sales of these companies, including sales from other operations, range from less than $200,000 to over $1 billion.

The wood preserving industry has a large number of small firms. However, on the basis of pressure tank capacity, the 10 largest firms represent approximately 51% of the total industry. While actual production may not be directly correlated with pressure tank capacity because capacity utilization may vary and different products and different species of wood require varying treating times, pressure tank capacity is an indicator of production capacity. In 1976, Koppers Co., Inc., represented 20% of total industry capacity, while the four largest firms represented 37% of total capacity (Table II-1).

2. Integration

Wood preserving companies also vary with respect to vertical integration. Some plants are part of lumber operations or associated with a company sawmill. In such cases, the wood treating operation may be an additional service for lumber customers. In other cases, such as Koppers

*Survey conducted by EPA under Section 308 of the Federal Water Pollution Control Act, as amended, referred to throughout as the "EPA Financial 308 Letter." A response summary and the tabulated data are contained in Appendix D. The number of responses to individual questions often are fewer than 337.

TABLE II-1

PRESSURE CYLINDER CAPACITY OF THE TEN LARGEST WOOD PRESERVING FIRMS, 1976

Company	Total Pressure Tank Capacity (thousand cubic feet)	Percent of Total Industry Capacity
Koppers Co., Inc.	415	20
Kerr-McGee Chemical Co.	127	6
Southern Wood Piedmont Co.	123	6
J. H. Baxter	108	5
Wyckoff Co.	73	3
Atlantic Creosoting Co., Inc.	57	3
International Paper Company	51	2
McCormick & Baxter Creosoting Co.	50	2
Crown Zellerbach Treated Wood Products	45	2
Cascade Pole Co.	34	2
All others	1,023	49
Total Industry	2,106	100

Source: Arthur D. Little, Inc., estimates based upon Ernst and Ernst *Wood Preservation Statistics – 1976.*

Company, Weyerhaeuser, and International Paper, where the company is involved in wood products and/or chemicals, the treatment of wood for customers is a natural expansion of its existing resources. In a few cases, railroads and utility companies own wood treatment facilities, which serve as captive suppliers of poles, ties, crossarms, etc., and seldom sell to others. The Atchison, Topeka & Sante Fe Railway Company, Burlington Northern, Southern California Edison Company, Texas Electric Cooperatives, Inc., and Utah Power & Light are some of these.

Most of the companies, however, are not integrated back to wood; i.e., they do not own their own timberland, and they purchase wood. A number of plants treat wood for customers on a service basis only, while other plants treat wood for customers on a service basis and also treat purchased wood.

3. Ownership Characteristics

Both privately and publicly held companies are represented in this industry segment. In general, the smaller, single-plant companies are privately held and the largest companies are publicly held.

There are basically two different patterns of ownership and management in the industry. In the first category are plants owned by publicly held corporations which may or may not do wood preserving as the primary activity. These plants are managed by individuals with little or no equity in the corporation. Plants following the second pattern are owner-managed and may be proprietorships or privately held corporations. They may even have been owned by the same family for several generations.

The ownership and management patterns in an industry are important for an assessment of how the industry will be impacted by pollution control costs. Profitability requirements are very different between an owner-manager and a corporation which more critically views the return on investment from one of many plants. The former may accept an increase in abatement costs as a neccessity for staying in business, while the latter may decide that the increased cost is not justified by the expected returns. On the other hand, a closely held company may have difficulty obtaining capital investment funds and thus be unable to continue to operate.

Among these plants primarily treating with organic preservatives, 25% are owned by publicly held corporations. Among the plants primarily treating with inorganic preservatives, only 10% of the plants are owned by publicly held corporations (Table II-2). Publicly held corporations owned only 22% of the total number of plants responding to the EPA financial 308 survey; but according to the 1972 Bureau of Census statistics, publicly held corporations accounted for 73% of the total value added of the wood preserving industry.

TABLE II-2

WOOD PRESERVING PLANTS
FORM OF BUSINESS ORGANIZATION, 1976

Primary Organic Preservatives	#	%
Proprietorship	23	10
Co-op	1	0
Privately Held Corporation	158	65
Publicly Held Corporation	59	25
	241	100
Primary Inorganic Preservatives		
Proprietorship	5	8
Co-op	–	–
Privately Held Corporation	54	82
Publicly Held Corporation	7	10
	66	100
Total		
Proprietorship	31	9
Co-op	1	0
Privately Held Corporation	230	69
Publicly Held Corporation	72	22
Number of Respondents to Question	334	100

Source: Derived from EPA 308 Financial Letter

C. PRODUCT DESCRIPTION

1. Type of Products

The development of the wood preserving industry in the United States has been based on the need for prolonging life in wooden structural products. Historically, railroads ties, utility poles, and pilings treated with creosote have been the major products of the industry. In recent years, lumber and plywood treated for fire retardancy, insect resistance, and rot resistance have experienced rapid growth.

The industry's products as listed in SIC 2491[8] include:

- Bridges and trestles of wood, treated
- Creosoting of wood
- Crossties, treated
- Flooring, wood block, treated
- Mine props, treated
- Millwork, treated
- Piles, foundation and marine construction, treated
- Piling of wood, treated
- Poles, cutting and preserving
- Poles and pole crossarms, treated
- Structural lumber and timber, treated
- Vehicle lumber, treated
- Wood products, creosoted

The industry can be categorized according to size, product, technology, or location. Generally speaking, the firms that are located in the South are treating mostly Southern Pine, and those in the West are treating mostly Douglas Fir. The industry uses oil-borne (organic) or waterborne (inorganic) preservatives. The products treated with oil, such as poles, piling, and railroad ties, have a distinct odor and "oiliness," which makes them unsuitable for use where odor is objectionable. The waterborne preservatives are used for preserving plywood and lumber, especially when treating for fire retardancy.

Competition in the wood preserving industry is normally very keen and usually based on price. Many suppliers only exist to serve regional markets, and some regions are served by only one or two suppliers. There is some limited competition from other materials, such as steel, concrete, and aluminum (Table II-3). In addition to price differentials, there are advantages and disadvantages to each type of material. Generally the type of use dictates the type of material required. For example, treated wood piles must be used in acidic soil (such as in a sanitary landfill) because acidic conditions corrode steel and concrete. Of particular interest is the possibility of more vigorous competition from concrete railroad ties; concrete ties are being used in several parts of the United States and this use is growing.

2. Market Size

From 1955 to 1976, the volume of wood treated with preservatives fluctuated from a low of 213.9 million cubic feet in 1962 to a peak production of 286.4 million cubic feet in 1967 (Table II-4). Production was 257.2 million cubic feet in 1976, the most recent year for which data are available. The industry's historical peak production level, 356.6 million cubic feet, was in 1947, indicating that the long-term trend is down.

TABLE II-3

PRESERVED WOOD PRODUCTS AND THEIR POTENTIAL SUBSTITUTES

Preserved Wood Product	Potential Substitute[1]
Piling	In-place concrete Driven concrete Steel piling Hollow I beams
Marine piling	In-place concrete Driven concrete Interlocking iron sheets
2 x 4's, etc.	Metal studs I-Beams Prestressed walls
Plywood	Concrete Cinder block Sheetrock Particleboard
Fire-retardant lumber, plywood, etc.	Asbestos Gypsum Metal sheets
Poles	Metal poles Prestressed concrete
Railroad ties	Concrete ties

1. Not all substitutes have been proven to be reliable. The potential for substitution is limited because material selection is often dictated by specific uses.

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

TABLE II-4

WOOD TREATED WITH PRESERVATIVES, 1955-1976

(millions of cubic feet)

Product	Crossarms	Crossties	Fence Posts	Lumber & Timbers	Piling	Poles	Switch Ties	Miscellaneous	Total
1955	4.3	85.9	16.2	39.4	13.9	74.8	7.3	3.8	248.4
1956	4.7	83.2	12.8	41.0	16.8	85.8	8.1	3.6	257.9
1957	4.6	101.5	13.4	41.9	16.3	84.0	8.1	4.8	274.5
1958	3.4	73.9	14.9	38.4	16.2	73.8	6.7	5.6	232.8
1959	3.6	52.1	15.7	39.9	14.7	78.3	4.5	5.7	214.5
1960	3.7	57.2	13.5	39.5	16.1	75.1	4.9	6.0	216.1
1961	3.6	55.8	15.0	38.8	14.3	76.4	4.7	6.6	215.4
1962	3.5	42.9	17.1	42.6	17.8	78.7	4.3	6.9	213.9
1963	3.4	47.4	18.2	43.5	15.9	77.0	5.3	6.7	217.4
1964	3.6	55.7	18.6	47.3	16.5	80.6	6.8	8.0	237.0
1965	4.9	63.7	18.4	50.3	17.8	83.9	7.5	9.2	255.7
1966	5.5	70.4	19.7	60.4	21.1	87.1	7.8	8.6	280.6
1967	4.6	80.4	21.0	62.2	16.6	84.3	8.3	8.9	286.4
1968	3.3	78.5	16.5	62.6	17.4	76.2	7.9	9.4	271.9
1969	3.2	71.3	15.7	59.6	14.7	74.4	6.4	8.2	253.5
1970	3.5	79.4	15.1	55.7	15.1	76.8	7.9	6.9	260.3
1971	3.1	87.0	16.7	59.9	13.7	74.4	6.2	7.7	268.6
1972	2.4	85.9	18.2	64.0	14.3	74.5	6.0	7.2	272.6
1973	2.6	67.6	15.2	68.9	13.0	75.4	5.0	6.9	254.4
1974	2.4	75.9	17.3	77.8	13.3	73.8	6.5	8.5	274.7
1975	1.4	93.1	15.3	61.5	9.4	49.1	8.0	6.4	244.1
1976	4.6	95.3	13.8	67.1	8.5	53.1	5.7	9.0	257.2

Note:

1. Data for 1966-1971 are not comparable with previous years because they include wood treated with fire-retardant chemicals under each category rather than under MISCELLANEOUS.
2. WOOD BLOCKS: Data for 1957-1969 are included in MISCELLANEOUS.
3. MISCELLANEOUS: Includes all wood products treated with fire-retardant chemicals in 1955-1965. In 1965, 2.8 million cubic feet of wood were treated with fire retardants.

Source: Ernst and Ernst, *Wood Preservation Statistics – 1976.*

The value of shipments rose from $344.2 million in 1967 to $761 million in 1974, the peak year (Table II-5). Both 1975 ($647.7 million) and 1976 ($704 million) were below this peak level. Typically, about 85% of the value of shipments is from owned wood, with the remainder contract work.

TABLE II-5

VALUE OF SHIPMENTS FOR THE WOOD PRESERVING INDUSTRY, 1958-1976

($ million)

Year	Value of Shipments	Capital Expenditures
1958	203.0	3.7
1959	218.1	(D)
1960	225.1	3.7
1961	220.1	4.1
1962	230.0	4.9
1963	247.3	5.5
1964	270.9	5.8
1965	279.6	11.4
1966	326.0	10.4
1967	344.2	10.7
1968	375.1	9.3
1969	386.1	13.2
1970	387.8	8.4
1971	416.9	10.4
1972	475.8	14.8
1973	557.4	11.6
1974	761.2	28.1
1975	647.7	27.5
1976	704.3	22.3

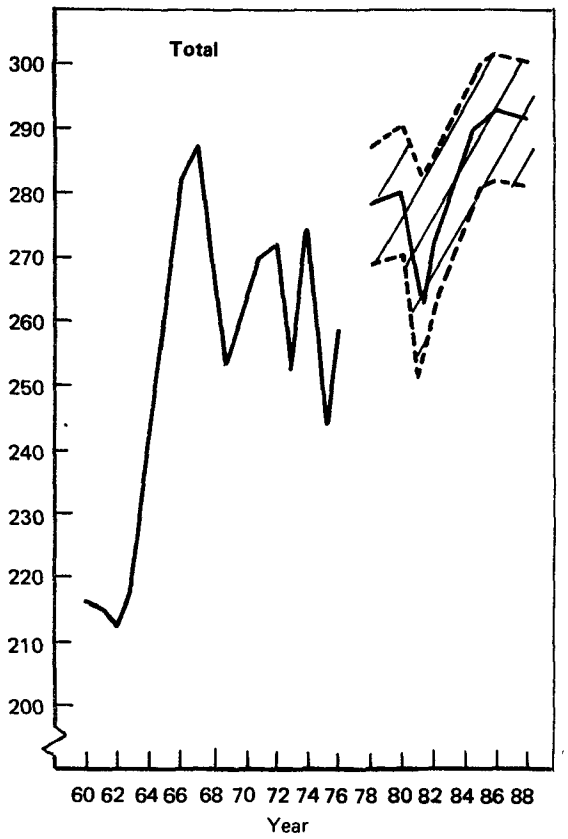
Source: U.S. Department of Commerce, Bureau of the Census, *Annual Survey of Manufacturers*

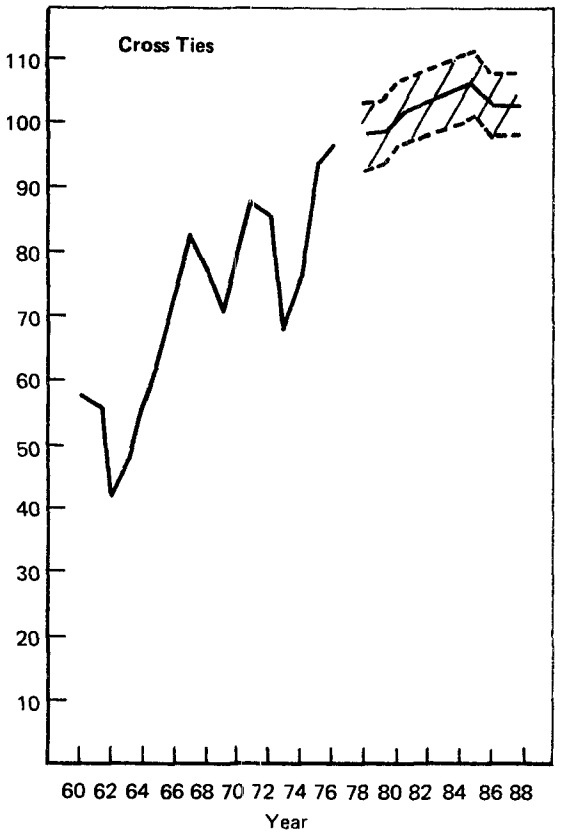
3. Future Demand Growth

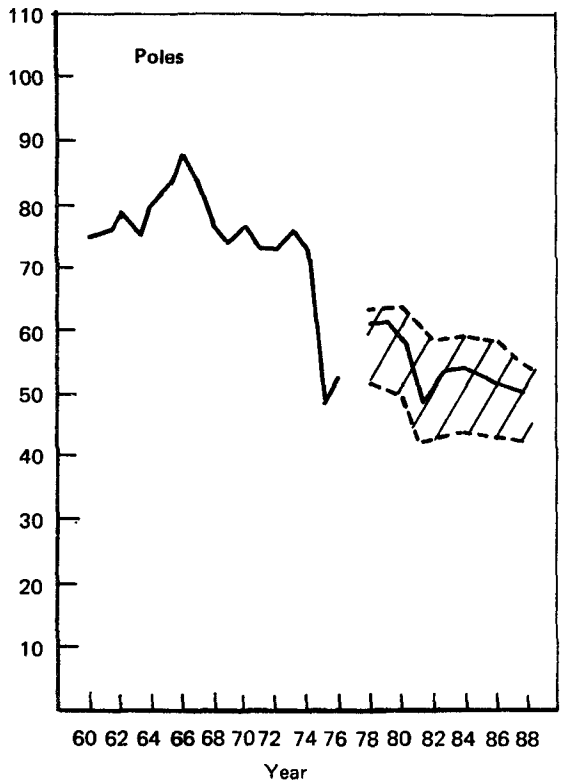
During the early sixties, the demand for preserved wood products increased dramatically compared with levels existing in the fifties (Table II-1). Since then there have been wide swings in total annual production but discernible trends for individual product categories.

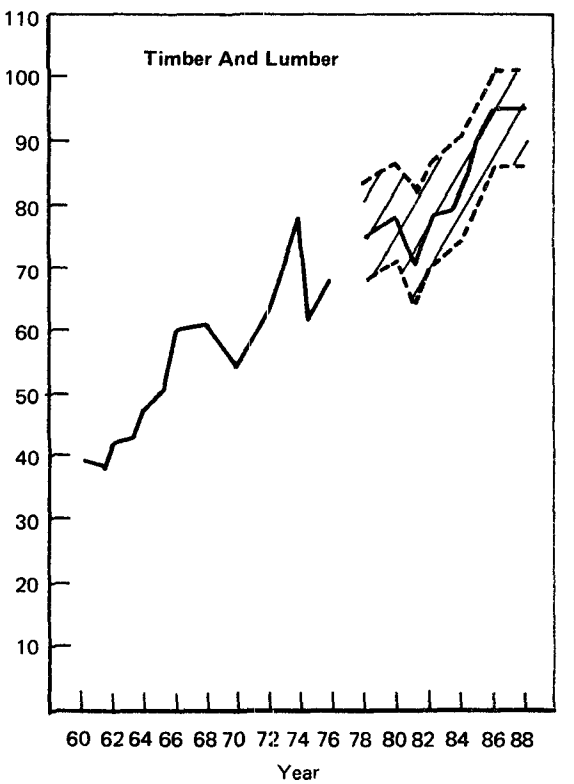
The annual production volumes of ties, poles and timbers also exhibit wide swings but there are definite trends in each of the major categories shown in Figure II-1. In addition, Arthur D. Little, Inc. and others have concluded that these trends are likely to continue over the next 10 years.

The forecast values from 1978 through 1988 were derived by analyzing the production trend from 1963 to 1976 for each product category as well as the annual fluctuations. The growth rate (or decline) underlying the trend was compared to with the forecast growth rates of other studies to









Source: Historic Data – Ernst & Ernst data cited in *The Analysis of Existing Wood Preserving Techniques and Possible Substitutes,* June 1977.
Forecast – Arthur D. Little, Inc., estimates.

FIGURE II–1 SALES TRENDS FOR PRESERVED WOOD PRODUCTS 1960–1988 (Thousand Cubic Feet)

check for reasonableness and to establish a range. As a group, all the other preserved wood products exhibited no upward or downward trend and were assumed to remain stable at about 42,000 cubic feet per year. The forecast for total preserved wood products is the sum of the individual product forecasts.

This analysis was performed to identify product areas when the demand might be declining and thus provide a basis for assessing the willingness and unwillingness of impacted plants to make an investment in pollution control expenditures. Product growth areas were also examined to gauge the extent to which they would take up the slack in the production of declining products and also to evaluate the potential for any price increase.

On balance, the future outlook for preserved wood products appears good, with the decline in pole demand being offset by the increase in demand for ties and timbers. The pole demand will decline because of slowdowns in growth of utilities and because the size of new transmission lines will require steel. Also, the demand for poles in new urban areas is being affected by the requirement to place utility distribution lines underground. The demand for railroad ties is a result of the rebuilding of roadbeds, which will produce an upward trend over the next 10 years, which will level off as the railroad industry shifts from rebuilding to maintenance. The growth in demand for timbers and lumber is in part a consequence of FHA requirements for preserved wood in home construction. While the average annual growth in timbers from 1963 to 1974 was 5.4%, a future real growth rate of 3% is forecasted to reflect the expected construction of single-family units in the 1978 to 1988 period.

D. CHARACTERISTICS OF THE EXISTING INDUSTRY PLANTS

1. Process Technology

Wood preserving is a two-stage process; first, the wood is preconditioned to reduce its moisture content; and, second, the wood is treated with preservatives.

Any one of several methods can be used to precondition, including: seasoning in large, open yards; kiln drying; pressure steaming in a retort, followed by vacuum drying; heating in a preservative bath under reduced pressures (Boulton Process); or vapor drying. Pressure treatment is the most common form of processing. As widely recognized, this form of treatment provides a superior product to that resulting from the brush or dip application of preservative.

Wood treating can be either a pressure or non-pressure process. In the non-pressure processes, the wood is immersed in open tanks containing the preservatives. The pressure processes can be either "full-cell" or "empty cell." In the "full-cell" process, a vacuum is created in the retort and the preservative is added and forced into the wood under pressure. The "full-cell" process is commonly used with aqueous solutions. In the "empty-cell" process, preservative is added to the retort and forced into the wood under pressure; then the retort is evacuated.

The typical pressure treatment facility includes three major processing areas:

- A treating cylinder, or pressure vessel, with the necessary pumps, tanks, and control equipment;
- A boiler plant to heat the solution and to pressurize the cylinder;

- A seasoning and storage yard, including the cylinder loading track and ancillary transportation facilities;
- Support equipment, such as hoists and lifts for handling timber; finishing equipment, for incising, boring, blocking, framing and shaving materials; and kilns, or other processing facilities, for artificial seasoning of selected products.

The treating cylinders are the most important component of a wood treatment plant. These steel cylinders (retorts), typically used in pressure treatment, are from 4 to 10 feet in diameter and up to 175 feet in length. As an indication of the "charge" size held by a treating cylinder, the average charge for a 6-foot by 36-foot cylinder, typical for a facility in the Northeast, can be 6,000 board feet (500 cubic feet) of lumber.

Wood preserving plants can also be categorized on the basis of the types of preservatives used, as follows:

- plants treating with organic materials, such as pentachlorophenol, oil, and creosote solutions;
- plants treating with waterborne inorganic salts, principally zinc, copper, arsenic, and chromium; and
- plants treating with both organic and inorganic preservatives.

Of the plants identified by the 1976 AWPA *Wood Preservation Statistics*, 49% treat with organics, 27% treat with inorganics, and 24% treat with both types of preservatives.

2. Product Diversification Within Plants

Although the industry treats a wide range of wood products, individual plants usually concentrate on a limited range of products. Plants using inorganic (waterborne) preservatives treat mostly dimension lumber, posts, and poles for insect and rot resistance and fire retardancy; (oil-borne) plants using organic preservatives treat primarily poles, posts, pilings, and railroad ties, and a few other products such as cross arms and bridge timber. Poles and ties are the major production items of organic plants; inorganic plants have a greater variety of treated wood products, but their volume may be smaller.

3. Size of Plants

There are no published data on individual plant capacities or production, because capacity varies with the type of wood treated, the type of treatment and the type of conditioning. For example, Douglas Fir requires a considerably larger residence time than species found in other parts of the country. Although the numbers of cylinders and types of processes are known, there is not necessarily a correlation between these and either plant capacity or production. Some industry members reported that a typical 80-ft. cylinder, operating with an organic process, has an output of 30,000 to 45,000 board feet per day (based on 15,000 board feet per charge, 2 or 3 charges per day). Daily inorganic production may be somewhat higher because of shorter treatment times. Reported annual operating rates (time used for treating as a percent of total time available for treatment, not including loading and unloading time) for the industry range from 40% to 70%.

Taking 1976 annual sales value as an indicator of size, the plants are very uniformly distributed among the value of sales size categories shown in Table II-6. The median plant size lies in the $0.7 to $1.2 million annual sales range. Six of the 319 plants responding to the EPA Financial 308 Letter had sales of over $11.5 million, whereas 25 plants had sales of less than $70 thousand.

TABLE II-6

DISTRIBUTION BY ANNUAL SALES VALUE

1976 Sales ($000)	Plants Built Since 1970		Plants Built 1970 or Earlier		Total	
	#	%	#	%	#	%
0 - 70	8	16	17	6	25	8
71 - 155	4	8	21	8	25	8
156 - 300	10	20	19	7	29	9
301 - 700	8	16	40	15	48	15
701 - 1200	5	10	45	17	50	16
1201 - 2400	5	10	37	14	42	14
2401 - 3200	5	10	21	8	26	8
Over 3200	5	10	69	25	74	23
Total Responding	50	100	269	100	319	100

Source: Derived by Arthur D. Little, Inc., from EPA Financial 308 Letter.

4. Location

Although there are no statistics available on the geographical distribution of consumption, both production and consumption follow the distribution pattern of facilities (Figure II-2). Most of the plants (45%) are in the Southeast region. Of the plants responding to the EPA Financial 308 survey, 30% described their plant site as urban, whereas 25% were suburban and 45% rural.

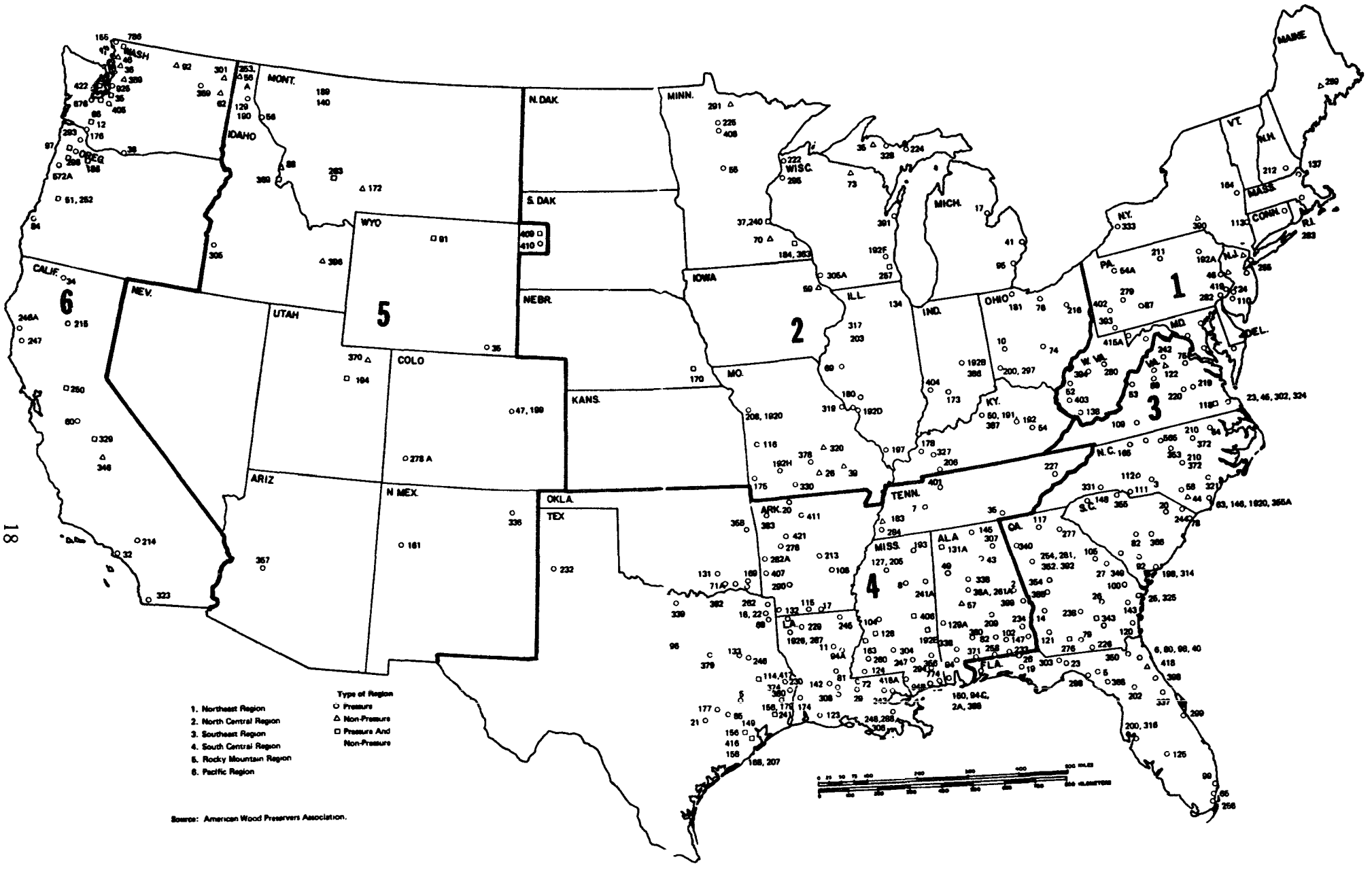
5. Employment

The median sized plant employs 10 to 19 production workers (Table II-7). Two plants employ more than 125 workers, while 22% of all plants employ fewer than 3 workers. The Bureau of the Census estimated the total employment of the wood preserving industry to be 9,700 in 1976. Because of the increased use of materials handling equipment, employment has decreased from the peak of 12,800 in 1968.

E. CHARACTERISTICS OF NEW PLANTS

1. Plants Constructed Since 1971

Of the 332 plants responding to the question in the EPA 308 Letter, 56 plants began operation in the 1971-1977 period (Table II-8). Table II-6 showed the size distribution of 50 of these new plants based on the value of their 1976 sales. The average new plant is smaller than the older plants, possibly suggesting that facilities typically expand over their production life. Comparing the plant size distribution of the new plants to the size distribution of all plants



Source: American Wood Preservers Association.

FIGURE II–2 WOOD PRESERVING PLANTS IN THE UNITED STATES, 1974

TABLE II-7

NUMBER OF PRODUCTION EMPLOYEES PER PLANT, 1976

Number of Production Employees per Plant	Number of Plants	Percentage of Plants
1 – 3	73	22
4 – 6	39	12
7 – 9	26	8
10 – 19	56	17
20 – 34	55	17
35 – 48	27	8
49 – 75	36	11
76 – 99	8	2
100 – 125	6	2
Over 125	2	1
Subtotal	328	100
No Response	9	
Total	337	

Source: Derived by Arthur D. Little, Inc., from Environmental Protection Agency Financial 308 Letter.

TABLE II-8

DISTRIBUTION OF WOOD PRESERVING PLANTS BY YEAR OF INITIAL OPERATION

Year of Initial Operation	Number of Plants	Percentage of Plants
Before 1930	58	17
1931 – 1940	13	4
1941 – 1950	46	14
1951 – 1960	83	25
1961 – 1970	76	3
1971 – 1977	56	17
Subtotal	332	100
No Response	5	
Total	337	

Source: Derived by Arthur D. Little, Inc., from Environmental Protection Agency Financial 308 Letter.

(Table II-6), one can see that the median new plants are smaller than all the older plants. The median annual sales of the new plants is $0.3 to $0.7 million, whereas the median annual sales of older plants is $0.7 to $1.2 million.

The median age of the 332 plants responding to the EPA Financial 308 survey is approximately 20 years; 55 plants were built before 1930 and 56 plants began operation between 1971 and 1977, i.e., an average of 7 per year (Table II-8). Most of the responding plants were built in the 1950's and 1960's.

The profitability of the two groups is roughly comparable (Table II-9). The older plants and the new plants have a median profitability after tax of 2% of sales value.

TABLE II-9

PROFITABILITY OF NEW PLANTS VERSUS OLDER PLANTS, 1976

1976 Profit After Tax as Percentage of Sales Value	New Plants[1]		Older Plants[1]	
	Number	Percentage	Number	Percentage
Under 1	16	37	56	25
1 – 2	6	14	58	25
3 – 4	7	16	47	21
5 – 7	7	16	38	17
Over 7	7	16	26	11
Subtotal	43	100	227	100
No Response	7		60	
Total	50		287	

1. New plants are those beginning operation between 1971 and 1977, while older plants began operation before 1971.

Source: Derived by Arthur D. Little, Inc., from Environmental Protection Agency Financial 308 Letter.

When industry capacity utilization is low, or demand growth is slow, a competitor has difficulty entering the industry. As the industry has become more automated and hence more capital intensive in recent years, the capital cost for entry, in real terms is significantly higher now than it was five or ten years ago.

2. Capital and Operating Costs for New Plants

Capital and operating costs were developed for model new source plants proposed by the technical contractor. Two plants sizes were selected, with each assumed to be producing one of four preserved wood products. The plant sizes are as follows:

1. Two cylinders, each seven-foot diameter by 130 feet long.
2. Five cylinders, each seven-foot diameter by 130 feet long.

The product, location and process relationships are as follows:

Case	Product	Location	Process
A	**Railroad Ties**	**South Central**	**Boultonizing**
B	**Southern Pine poles**	**South Central**	**Steaming**
C	**Douglas Fir poles**	**West Coast**	**Boultonizing**
D	**Southern Pine lumber**	**South Central**	**Inorganic**

The total installed cost for the 5-cylinder facility is about $6.5 million, compared to $3.3 million for the two-cylinder plant (Table II-10), added to Table II-11. Of the respondents to the 308 Financial Survey, only 7 (2%) indicated that they had net fixed assets over $2 million.

The two-cylinder plant has 25 operating, 7 maintenance and 13 supervisory and office employees, at an average annual cost of $15,000 per employee (Table II-11). The five-cylinder plant is assumed to have 50 operating, 14 maintenance and 20 supervisory and office personnel, reflecting scale economies over the two-cylinder plant. Taxes and insurance are estimated at 4% of the capital cost. While maintenance and other consumable supplies, such as packaging, vary with the operating volume of each plant, these variations are too small to affect overall operating costs and have been assumed to be a constant percentage of sales.

The following additional assumptions were made:

- One-product operation was assumed, although most facilities have variable and constantly changing product mixes, depending on specific and local market conditions.
- Capital requirements for the West Coast facility are estimated to be 10% greater than for the Southern plants.
- Land requirements are 50 acres and 75 acres, respectively, for the two plants.
- Raw wood and preservative costs are as specified in accepted, published industry references.
- 40% of the cylinder volume is used for each charge, plants operating three shifts a day and 300 days per year.
- While cycle time depends on wood specie, moisture content, type of process employed and degree of preservation required, the following, perhaps conservative, cycle times were used:
  - — Railroad ties (Boultonized) — 30 hours
  - — Southern Pine poles (steamed) — 16 hours
  - — Douglas Fir poles, green (Boultonized) — 40 hours
  - — Southern Pine lumber(CCA) — 16 hours

F. COMPETITIVE STRUCTURE OF THE INDUSTRY

1. Market Structure

Although the industry is composed of many small firms, the four largest firms had 37% of the total market in 1976, and the eight largest firms had 47% of the total market (Table II-12). The size of the firms vary considerably. The top company has about 20% of the market, the next

TABLE II-10

ESTIMATED FIXED CAPITAL REQUIREMENTS FOR THE MANUFACTURE OF PRESERVED WOOD (ORGANIC TREATMENT) ($000)

Location: South, new facility or replacement value[1]
Cylinder Size: 7-foot diameter, 130 feet long, 5000 cubic feet in volume

	Bare Cost of Equipment Per Cylinder	Installed[2] Cost of a Two Cylinder Plant	Installed[2] Cost of a Five Cylinder Plant
Site Preparation[3]		200	300
Yard Equipment[4]	400	800	1,600
Pressure Cylinder	250	700	1,700
Storage Tanks and Pumps	100	250	400
Utilities:			
Boiler and Compressor[5]	125	400	750
Dry Kilns	100	250	400
Primary Oil-Water Separation[6]	NA	40	57
Subtotal	975	2,640	5,207
Engineering, Construction and Contingency at 25%		660	1,302
Total Fixed Capital[7]		3,300	6,509

1. Add 10% for West Coast construction cost differential.
2. Installation includes piping, instrumentation, electrical, structures, foundations, erection labor, and allocated portion of shops and offices.
3. Site preparation costs estimated at $4,000 per acre.
4. Yard Equipment includes track and trams for cylinder loading, trimming and framing equipment, and mobile equipment. Processing is based on receipt of rough sawn wood, and specifically excludes debarking and rough sawing.
5. A wastewood-fired boiler is assumed.
6. For the primary oil-water separation system, 50% of the cost is included in the cost of the plant, as indicated on pages 8-60 through 8-63 of the August 29, 1973, ES&E report.
7. Does not include cost of land acquisition, because land costs vary considerably from site to site.

Source: Arthur D. Little, Inc., estimates based on industry interviews.

TABLE II-11

ESTIMATED ANNUAL OPERATING COSTS FOR THE MANUFACTURE OF PRESERVED WOOD[1]

($000)

	Operating Conditions[2]							
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2
Wood	2,064	5,160	5,400	13,500	2,448	6,120	6,480	16,200
Preservatives	672	1,680	378	945	230	576	594	1,485
Total Raw Materials	2,736	6,840	5,778	14,445	2,678	6,696	7,074	17,685
Labor	596	1,073	596	1,073	596	1,073	596	1,073
Supplies[3]	132	326	132	326	132	326	132	326
Fuel and Power[3]	132	326	132	326	132	326	132	326
Taxes and Insurance	132	260	132	260	145	286	132	260
Total Operating Cost	3,728	8,925	6,770	16,530	3,683	8,789	8,066	19,770

1. See Appendix A for supplemental data.
2. **Operating Conditions:**
   Case A — Railroad ties, Boultonized, South Central location, 30 hours per charge
   Case B — Southern pine poles, steamed, South Central location, 16 hours per charge
   Case C — Douglas fir poles, Boultonized, West Coast location, 40 hours per charge
   Case D — Southern pine lumber, CCA treated, South Central location, 16 hours per charge

   Case 1 — 2 cylinders, each 7-foot diameter, 130 feet long, 5,000 cubic feet
   Case 2 — 5 cylinders, each 7-foot diameter, 130 feet long, 5,000 cubic feet
3. Includes 50% of the operating cost of oil-water separation.

Source: Arthur D. Little, Inc., estimates based on industry interviews.

TABLE II-12

CONCENTRATION RATIOS IN THE WOOD PRESERVING INDUSTRY, 1963-1976

Year	Percent of Value of Shipments Accounted for by 4 Largest Companies	8 Largest Companies	20 Largest Companies	50 Largest Companies
1963	34	44	64	84
1967	35	44	63	84
1970	34	NA	NA	NA
1972	35	44	60	78
1976	37	47	NA	NA

Source: 1963-1972: U.S. Bureau of Census, *Annual Survey of Manufacturers,*
1976: Arthur D. Little, Inc. estimates.

three companies have 5% to 6% each, and the next four about 2% each. The remainder of the top 20 have market shares of 1% each and the next 30 have shares averaging about 0.6%. The level of concentration has not changed significantly since 1963, indicating a stable market structure.

Preserved wood is largely a commodity market modified by transportation costs which give regional advantages to some producers. While there is some interregional competition in the industry, the cost of inbound and outbound transportation results in predominantly regional markets. For some applications, a particular wood specie is preferred and wood may be shipped over longer distances in these cases; more often, a suitable wood specie may be found locally.

2. Pricing Mechanism

Pricing mechanisms appear to be quite varied. For some products (mostly lumber), wholesalers and commission firms conduct continuous pricing and bidding between the preserving plants and the final customers via the telephone. Some of the preserved lumber is sold from price lists. On the other hand, most poles, piling, and railroad ties are sold directly to the customer through formal bids for specific projects. Purchase decisions are made on the basis of price, availability, and delivery of future production, since most preservers only keep small inventories and make the products only on order.

3. Price Elasticity of Demand

Demand elasticity varies somewhat according to the product. The major factors governing demand are competition within the industry and the economic climate of user industries. Demand for those products with high demand growth potential (such as dimensionalized lumber) wil probably not be affected by an increase in prices. Those products which are threatened by lower demand growth potential (such as utility poles) have higher price elasticity and will be less likely to pass along cost increases as increases in price.

For the immediate future, the demand for railroad ties is expected to continue to grow strongly because of tightened federal railroad safety regulations and the Northeast Railroad Reorganization Act. However, concrete ties are now being used for some of the replacements.

Inorganically treated products (using inorganic salts), although a small portion of all treated products, have recently had rapid growth, even up to 20% per annum, and are expected to continue at a growth rate higher than GNP as the construction market improves and demand for dimension lumber and plywood increases. The market for utility poles is not expected to grow strongly, as previously discussed. Currently, it is mostly a replacement market, and threatens to be diminished in the future by the requirement for underground wiring. Although there are economic and technical difficulties with underground wiring, if these are worked out they may replace wooden poles for some applications. Other products, such as construction and marine pilings, face some pressure from substitute products. In summary, it appears that although some products will have high growth rates, production for the whole industry will continue to have little long-term growth. This situation will make it difficult for producers to increase prices.

G. PRICE AND COST HISTORY

In the 1970-1978 period, the costs of wood preservative chemicals have shown the greatest increase, followed by those of wood (lumber, piles, and ties), and finally labor (Figure II-3A). All of these costs have increased at a rate greater than that of general inflation (Figure II-3B).

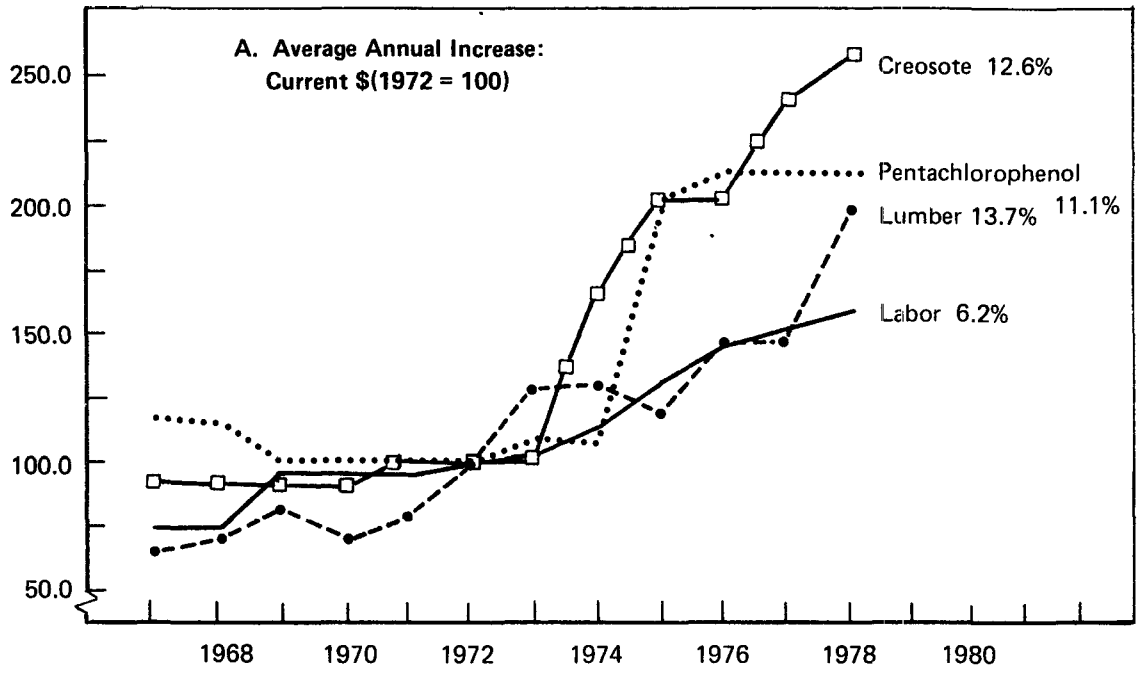
The cost of labor in the wood preserving industry has been increasing steadily; the average payroll per worker was more than 60% higher in 1978 than in 1970, an annual increase of 6.2%. However, since 1970, labor as a percent of value added and per dollar of shipments has declined (Table II-13). In fact, employment in the industry as a whole has declined, from 12,000 in 1970 to 9,700 in 1976, and the percentage of the workforce classified as production workers has also declined, from 84% to 79% for the same period, mainly because of the greater use of materials handling equipment to reduce labor costs.

Naturally, the most significant raw material cost is that for wood, which represents from 40% to 75% of the selling price of the preserved wood product. The selling prices of untreated ties and piles (Figure II-3A) and lumber (Figure II-4) have increased, respectively, 12.4%, 8.8%, and 13.7% annually in the 1970-1978 period, or faster than the rate of overall inflation. The higher rate of increase for ties versus piles is attributable in part to favorable demand levels for railroad ties. The proportion of wood cost to total sales dollars has remained roughly constant over the 1970-1978 period and, except for the 1974-1975 recession, the combined cost of all raw materials has been a stable proportion of the sales dollar (Table II-13).

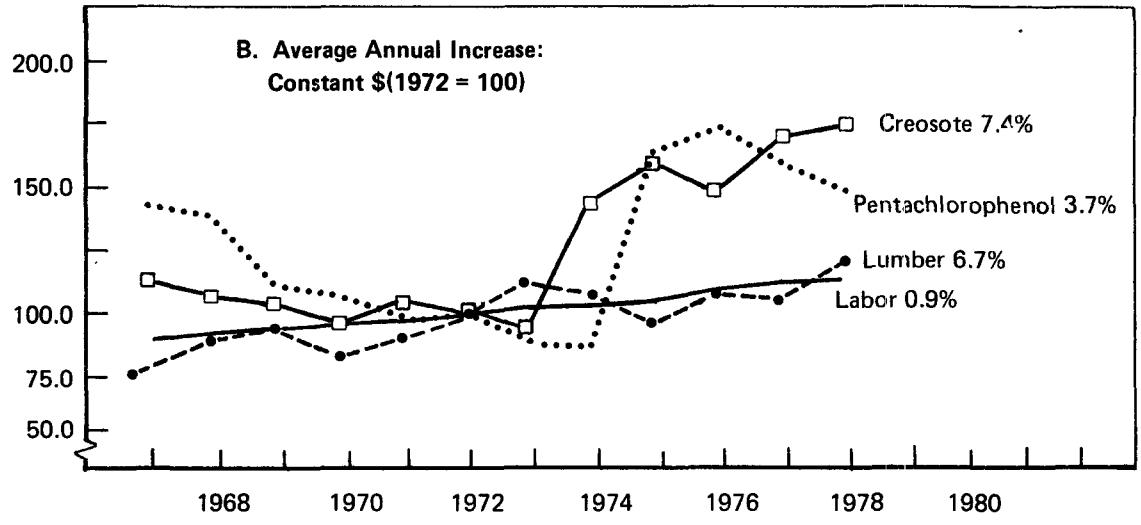
Thus, producers have been able to pass on increased costs of wood in the form of increased selling prices, as indicated by selling prices having closely tracked wood costs (Figure II-4).

After years of relatively constant prices, the prices of major chemical preservatives, pentachlorophenol and, particularly, creosote oil have increased dramatically since 1973. The price increases for these chemical preservatives over the 1970-78 period, averaging 11.1% and 12.6% per year, respectively, are greater than those of the final products. This indicates their increased importance as an input cost, although they still make up a smaller portion of the total than either wood or labor.

The previous discussion of potential industry growth suggests that future demand will be weaker, and the industry will have a more difficult time in passing along increased costs in the form of price increases. However, the pollution abatement cost is predominantly fixed rather than variable. A change in fixed cost represents a change in long-run average total cost; therefore, assuming the historic supply/demand balance, it is likely that the cost per unit of production for a



1972 Values: creosote, 27¢/gallon; pentachlorophenol 18¢/pound; labor $3.31/hour



Sources: (chemicals) *Chemical Marketing Reporter*
(wages) *Employment and Earnings,* US Department of Labor, Bureau of Labor Statistics
(lumber) *Wholesale Prices and Price Indexes,* US Department of Labor, Bureau of Labor Statistics
(GNP deflator) *Economic Indicators,* Council of Economic Advisors.

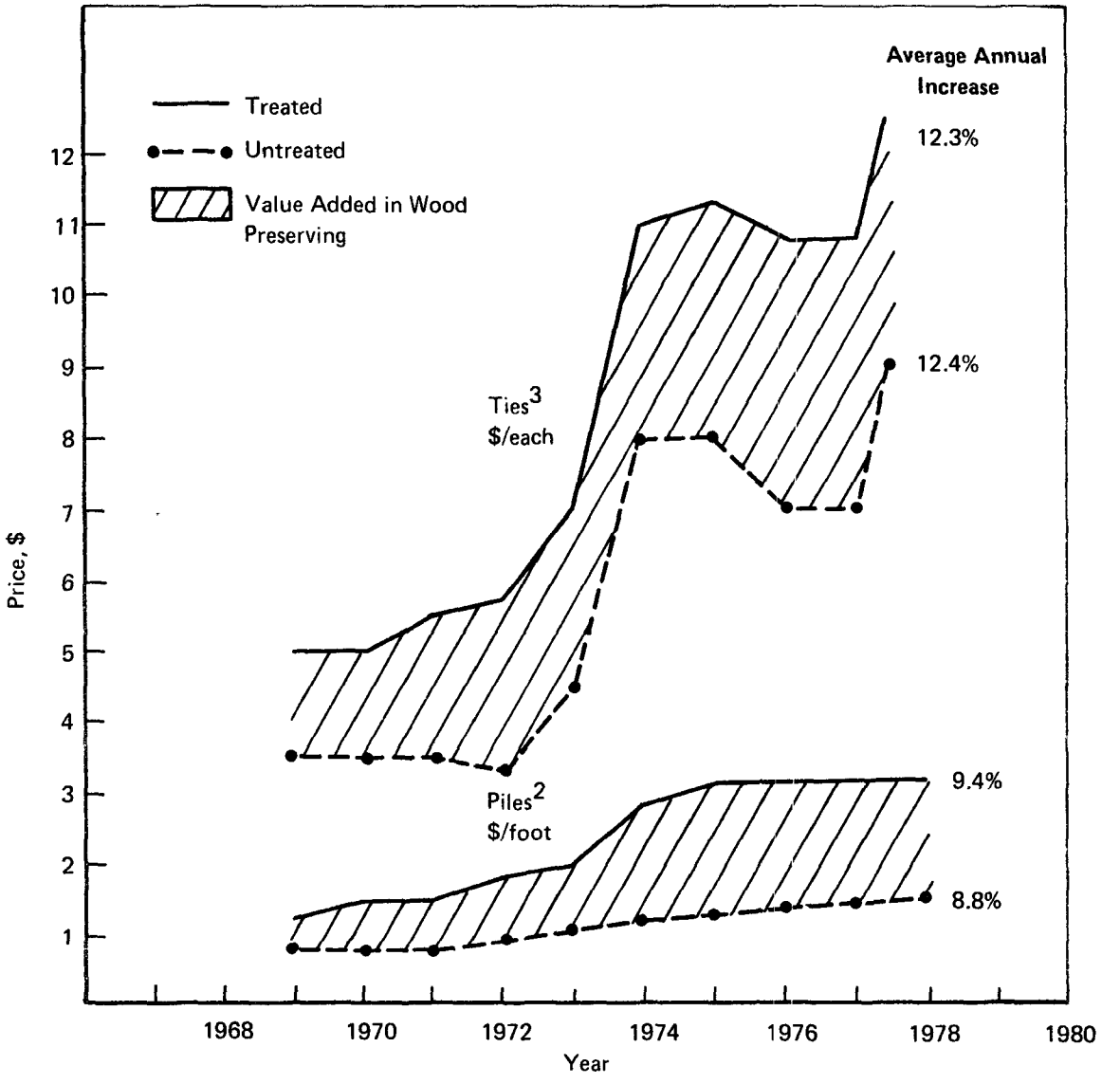
FIGURE II–3 WOOD PRESERVING INDUSTRY PRICE INDICES OF RAW MATERIALS, 1970–1978

TABLE II-13

SELECTED OPERATING RATIOS FOR
THE WOOD PRESERVING INDUSTRY: 1964 to 1976

Year	Cost of Materials Per Dollars of Shipments (dollars)	Cost of Materials & Payrolls Per Dollar Shipments (dollars)	Value Added Per Employee (dollars)	Payrolls as Percent of Value Added
1964	0.63	0.81	8,788	49
1965	0.64	0.81	9,050	48
1966	0.63	0.80	10,479	45
1967	0.62	0.80	11,103	46
1968	0.61	0.79	11,540	45
1969	0.64	0.81	11,818	47
1970	0.63	0.81	12,017	51
1971	0.64	0.82	13,800	48
1972	0.64	0.80	15,557	42
1973	0.67	0.80	18,446	40
1974	0.63	0.75	30,783	29
1975	0.64	0.78	24,548	38
1976	0.68	0.81	23,608	41

Source: U.S. Department of Commerce, Bureau of the Census, *Census of Manufactures,* 1973, 1974, 1975, 1976; and Arthur D. Little, Inc., estimates.



[1]List prices are given because they provide a comparable basis for analysis over an extended period of time. The majority of contracts specify prices which provide substantial discounts from list prices.

[2]Piles: Points: 12" – 3 ft. from butt 7 in.; Length: 40 to 50 ft., truck lots, New York

[3]Ties: 6" x 8" x 8'6", Chicago, Red Oak, Carload lots

Source: *Engineering News Record.*

FIGURE II–4 LIST PRICES OF SELECTED PRESERVED WOOD PRODUCTS,[1] 1969–1978

larger, more efficient plant will set the maximum amount of price increase. Since the effluent abatement cost per unit of production will be greater for smaller plants, smaller plants may not recover the entire cost increase through higher prices. Market factors will determine whether this cost increase may be passed along through price increases or will be absorbed by reducing profits.

H. FINANCIAL PROFILES

1. Income and Asset Analysis

In assessing the economic impact of an EPA regulation upon a specific industry, the impacted industry is examined on a stand-alone basis with out regard to the other businesses associated with it or to resources available to the parent companies of industry plants. For this reason, it is important to have an accurate picture of the revenues and expenses associated with the plant operations in the impacted industry as well as the assets used by the plants. The source of financial profile data is the Environmental Protection Agency Financial 308 Letter.

Pro-forma income statements were developed for seven sales and service categories of wood preserving plants (Table II-14). Sales level categories were selected to represent the distribution of plant sales, profit and loss, and cash flow (Table II-15). Some of these categories could even be grouped together, if one were interested in the pro-forma distribution of expenses alone. However, pro-forma income statements were developed for five categories of plants treating owned-wood products (TOWP) and two categories of plants providing a treating service only (TSO). The number of plants providing TSO represents 13% of the total respondents to the EPA Financial 308; therefore, two sales categories were sufficient to represent this group for an economic impact assessment.

Some cost elements vary with the size of plant and service offered. Wood cost as a percent of sales increases as sales increase for plants treating owned-wood products. The reasons for this could be that the larger plants usually derive a greater portion of their sales from items such as ties and poles whereas smaller plants usually treat more specialty lumber and timbers; ties and poles are more of a commodity product and thus price would be lower relative to cost of goods sold. Another reason would be that plants with higher sales volume have a larger base over which to spread fixed cost (note that the general and administrative expense is a lower percentage of sales for large plants) and thus can afford to have a higher ratio of wood cost to sales. As would be expected, plants primarily engaged in providing treating service only have low wood costs as a percent of sales.

Margin on sale increases with sales for plants treating owned-wood products while the reverse is true for plants providing a treating service only. However, sales turnover (Sales/Net Assets) decreases with sales (Table II-15). Thus, with the exception of the smallest sales category, the net effect is that return on total capital (Margin x Turnover) is higher for smaller plants than for larger plants.

Plants engaged in treating service only have substantially higher rates of return on total capital (Table II-15) than plants treating owned-wood products. This could be artificial if TSO plants have older, more fully depreciated equipment and associated lower book values than comparably sized plants treating owned-wood products.

The distribution of assets at wood preserving plants (in contrast to parent companies) was analyzed to determine working capital requirements associated with compliance investment. The

TABLE II-14

PRO-FORMA INCOME STATEMENTS OF WOOD PRESERVING PLANTS BY SALES CATEGORY ($000)

	Plants Treating Owned-Wood Products (TOWP)					Treating Service Only (TSO)	
	200	700	1,800	3,500	7,500	250	1,000
Sales	100	100	100	100	100	100	100
Cost Goods Sold							
Wood	44	44	55	50	55	8	24
Payroll	19	17	13	12	19	20	19
Other Expenses	18	17	15	20	12	39	34
Depreciation	4	2	2	2	2	5	2
Total Cost Goods Sold	85	80	85	84	88	72	21
Gross Margin	15	20	15	16	12	28	21
Selling General & Administration	11	12	11	9	5	14	15
Interest Expense	3	2	1	1	1	2	1
Profit Before Tax	1	6	3	6	6	12	6
Profit After Tax	0.5	3	2	3	3	6	4
Number of 308 Letter Respondents	50	81	40	50	50	6	37
Percent of Total Respondents[1]	15%	25%	12%	15%	15%	2%	11%

1. 13 plants (4%) had sales evenly split between TSO and TOWP.

Source: Derived by Arthur D. Little, Inc., from EPA Financial 308 Letter.

TABLE II-15

WOOD PRESERVING PLANTS
ASSET TURNOVER BY SALES/SERVICE CATEGORY, 1976

Sales/Service Category ($000)	Total Plants[1]	Turnover Ratio: Sales/ Total Assets	Turnover Ratio: Sales/ Net Assets[2]	Turnover Ratio: Sales Fixed Assets	1976 Return on Total Capital (%)[3]
TOWP					
200	50	2.5	3.8	5.0	1.9
700	81	3.0	4.7	8.0	11.1
1,800	40	3.0	4.3	10.0	8.6
3,500	50	2.5	3.1	10.0	9.3
7,500	50	2.5	3.1	8.0	9.3
TSO					
250	6	3.0	4.0	5.0	24.0
1,000	37	5.0	8.0	10.0	32.0

1. Based on 327 responses; 13 plants were equally split between TSO and TOWP.
2. Total assets less current liabilities.
3. Profit After-Tax (Table II-14) = Margin
   Sales/Net Assets = Turnover; Net Assets = Total Assets – Current Liability
   Rate-of-Return on Total Capital = Margin x Turnover

Source: Derived by Arthur D. Little, Inc., from Environmental Protection Agency Financial 308 Letter.

distribution of assets varies with size of plant (Table II-16). For plants engaged in treating owned-wood products, fixed assets as a percentage of total assets generally decline as sales level increases. While the reverse is true for TSO plants (Table II-16), the variability and small total number of plants are such that the two plant sizes are not statistically different in the percentage of assets in plant and equipment.

The "other current asset" category includes inventory items. As expected, plants treating owned-wood products, except the smallest plants, have a higher percentage of assets in this item than plants engaged in treating service only. For both plant categories, accounts receivable decrease as a percent of total assets as sales increase.

In recent years, more than 85% of the industry's capital expenditures have been on new machinery and equipment to reduce labor costs (column 3 of Table II-17). This investment has reduced total employment and raised the level of industry productivity (shown as a real increase in value added per employee in 1967 dollars in column 7) by about 25% in the 1967-76 period. However, a number of firms have not made the expenditures to reduce labor costs; their comparatively less favorable cost structure will make the financing of major capital expenditures for pollution control especially difficult.

TABLE II-16

WOOD PRESERVING PLANTS
DISTRIBUTION OF ASSETS
BY SALES AND SERVICE COMPANY, 1976

	Plants Treating Owned-Wood Products (TOWP)					Treating Service Only (TSO)	
Sales Category ($000)	**200**	**700**	**1,800**	**3,500**	**7,500**	**250**	**1,000**
Accounts Receivable	35.0%	35.0%	30.0%	20.0%	20.0%	35.0%	26.0%
Other Current Assets	20.0	30.0	40.0	55.0	50.0	25.0	24.0
Total Current Assets	55.0	65.0	70.0	75.0	70.0	60.0	50.0
Fixed Assets	45.0	35.0	30.0	25.0	30.0	40.0	50.0
Total Assets	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Average Value of Total Assets ($000)	270	320	617	1,805	3,710	1.3	751
Number of Plants in Sample[1]	50	81	40	50	50	6	37

1. Based on 327 responses; 13 plants were equally split between TSO and TOWP.

Source: Derived by Arthur D. Little, Inc., from Environmental Protection Agency Financial 308 Letter.

TABLE II-17

CAPITAL EXPENDITURES AND PRODUCTIVITY IN WOOD PRESERVING INDUSTRY, 1967-1976

Year	(1) Total New Expenditures (millions of current dollars)	(2) New Structures and Additions to Plants (millions of current dollars)	(3) New Machinery and Equipment (millions of current dollars)	(4) Total Employment (000s)	(5) Production Workers of % of Total Employment (percent)	(6) Value Added Per Man Hrs. of Production Workers (current $)	(7) Value Added Per Man Hrs. of Production Worker (1967 $)
1967	10.7	1.4	9.3	12.2	84	6.25	6.25
1968	9.3	1.4*	7.9*	12.6	84	6.58	6.03
1969	13.2	NA	NA	12.1	83	6.78	5.77
1970	8.4	1.4	7.0	12.0	81	7.14	5.78
1971	10.4	.5	9.9	11.3	82	7.94	5.94
1972	14.8	2.2	12.6	11.3	81	9.35	6.35
1973	11.6	2.0	9.6	10.1	83	10.41	6.34
1974	28.1	3.9	24.2	10.6	81	17.63	9.94
1975	27.5	4.9	22.6	9.3	80	14.54	7.57
1976	22.3	2.4*	19.9	9.7	79	14.87	7.74

*Indicates the standard error is greater than 15%.

NA — Means not available.

Source: U.S. Department of Commerce, Bureau of the Census, *Annual Survey of Manufacturers,* 1967-1976.

2. Investment Criteria

As part of the Environmental Protection Agency Financial 308 Letter, wood preserving plants were asked to provide their criteria for investment in wood preserving plant and equipment. This information is used in the economic impact assessment to estimate the price increase required to recover the cost of pollution control investment. A total of 119 (35%) of the plants indicated an investment criterion; 22% provided target internal rate-of-return values, and 6% provided payback criteria.

Plants providing rates-of-return criteria represented a cross section of the wood preserving plants responding. There were too few responses to the question to subcategorize the rate-of-return by plant characteristics. However, the distribution of respondents to the question were similar to that of the total sample with respect to sales level, current discharge status and type of preserved wood product. The distribution of target rates of return was taken as representative of the total industry.

The average and median pre-tax rates of return are in the 20-24% category (Table II-18). Using midpoints of the categories, the weighted average after tax rate-of-return is about 12%, assuming a 48% tax rate. The impact was assessed (Chapter IV) using the weighted average value and the sensitivity was analyzed (Chapter V) to determine the impact of different rates-of-return on the results.

TABLE II-18

TARGET RATE OF RETURN FOR INVESTMENTS MADE BY WOOD PRESERVING INDUSTRY

Pre-Tax Rate of Return (%)	#	% of Respondents
0-4	0	0
5-9	2	4
10-14	7	13
15-19	11	21
20-24	8	15
25-29	12	25
30-40	8	15
40 or more	4	7
	52	100

Distribution of Sample	# Respondents	% of Total
Plants Using Rate-of-Return Criteria	75	22
Plants Using Payback Criteria	21	6
Plants Using Other Methods	23	7
Not Answering Question	218	65
	337	100

Source: Environmental Protection Agency Financial 308 Letter.

III. COST OF COMPLIANCE

A. INTRODUCTION

The costs of compliance for a number of alternative BAT regulations have been developed by the EPA Technical Contractor, Environmental Science and Engineering, Inc.[6] The purpose of this Chapter is to summarize the costs of compliance associated with each option, review the current status of the industry, and describe the investment and operating costs that will be incurred under each alternative.

B. CURRENT EFFLUENT STATUS

One wood preserving plant discharges into navigable waters, i.e., it is a direct continuous discharger, while 42 discharge into municipal systems, i.e., indirect discharge. Inorganic plants are required to be at no discharge; all remaining organic plants do not discharge. The plants that will be required to make expenditures represent a minority of the industry. In total, the 43 potentially impacted plants represent about 10% of the 415 plants in the industry.

The one direct discharge plant is a steaming plant. An additional 31 plants in the organic category and 11 Boulton plants discharge into municipal systems.

The costs of compliance developed by the EPA technical contractor were based upon a separate EPA Technical 308 Letter as well as on plant visits and sampling data. The technical contractor developed cost of compliance data for each plant separately, including two plants that did not provide economic data. Current effluent status was verified by the technical contractor through follow-up phone calls.

C. CONTROL OPTIONS

Six options were examined for indirect dischargers:

- Option 1: Existing interim final pretreatment standards; i.e., no further regulation;
- Option 2: Biological treatment only for plants using pentachlorophenol;
- Option 3: Metals removal for plants with fugitive metals;
- Option 4: Zero discharge only for plants using pentachlorophenol or fugitive metals;
- Option 5: Zero discharge for plants using pentachlorophenol; and
- Option 6: Zero discharge for all indirect dischargers.

Treatment technology as developed by the technical contractor differed by wood preserving process; and for indirect dischargers, two treatment subcategories were used:

- Boulton Process; and
- Steaming Process.

Two levels of treatment technology are applicable to the one direct discharge steaming plant:

- Additional biological treatment with activated carbon adsorption; and
- No discharge through spray evaporation.

The costs of effluent monitoring were generated by the EPA and not the technical contractor. These costs will add $5,000 to $10,000 per year to operating costs.

D. COSTS OF COMPLIANCE FOR EXISTING INDUSTRY

Tables III-1 and III-2 contain the investment and operating costs associated with additional cost of the options, or levels of control, respectively, for the Boulton and steaming plants. The land investment has been broken out separately because it permits comparison of the relative amount of land required for each of these control options. On the basis of the Technical Contractor's work and the results of the Financial 308 Survey, a cost of $5000 per acre was taken for land; thus the number of acres required for each can readily be determined. Land investment was separated from other investment in the economic impact assessment because land is not a depreciable asset and, therefore, must be treated separately. As the tables show, the compliance costs vary considerably from plant to plant, depending upon the volume of water effluent.

For indirect discharge steaming plants the cost of compliance, in terms of both investment and monitoring, increases with the stringency of the pollution control requirement. In contrast, for most Boulton plants, the cost of no discharge can be lower than the cost of metals removal or biological treatment. (The obvious exceptions to this are the two Boulton plants which would incur zero cost except under a no-discharge option.)

Table III-3 shows the total costs of compliance that will be incurred by the direct and indirect dischargers in the wood preserving industry. Since "no discharge" is generally less expensive for Boulton plants than heavy metals removal, the six Boulton plants would presumably install the cooling tower evaporation control equipment under Option 3. Table III-3 illustrates the total cost of compliance assuming that plants will install no discharge control equipment where biological treatment or metals removal are more expensive.

The lowest cost alternative for indirect discharges is Option 3, where total investment is $1.7 million and the fewest number of plants (11) are affected. Under Option 6, which represents no discharge for all indirect dischargers, the cost of compliance is $6.1 million.

The EPA also considered the use of production cut-off levels (Table III-4) to trigger compliance for indirect dischargers. Applying the cutoffs under each alternative produces substantially lower compliance costs and fewer impacted plants (Table III-5). Under each alternative the investment cost, operating costs and number of impacted plants are about half the levels with no size-cutoff criterion.

E. COST OF COMPLIANCE FOR NEW SOURCES

Costs of compliance for new sources were generated by the technical contractor for organic plants using the Boulton process and organic steaming methods. Under BPT guidelines, new wood preserving plants using inorganic processes are required to have zero discharge; therefore, they were not analyzed.

TABLE III-1

WOOD PRESERVING STEAMING INDIRECT DISCHARGERS
COST OF COMPLIANCE UNDER ALTERNATIVE TECHNOLOGIES
($)

	Biological Treatment			Metals Removal			Spray Evaporation			
	Investment		Operating	Investment		Operating	Investment		Operating	Type of
Plant	Land	Other	Costs	Land	Other	Costs	Land	Other	Costs	Preservative[1]
1	800	54,200	17,300	-----	Not Applicable	-----	1,250	98,750	15,900	P
2	1,250	80,950	20,500	-----	Not Applicable	-----	2,850	146,550	17,000	P
3	650	45,450	16,000	-	83,300	11,800	750	77,650	15,400	C,M
4	3,900	236,300	34,000	-----	Not Applicable	-----	10,400	312,400	22,000	C
5	900	64,200	18,500	-	101,900	14,600	1,800	117,300	16,300	P,M
6	1,100	69,200	19,200	-----	Not Applicable	-----	2,250	131,250	16,600	P
7	1,050	68,150	19,000	-----	Not Applicable	-----	2,100	126,400	16,500	P
8	1,750	108,450	23,400	-----	Not Applicable	-----	4,750	183,350	17,900	C
9	2,050	126,450	25,200	-----	Not Applicable	-----	6,150	203,750	18,400	P
10	-	68,500	25,500	-----	Not Applicable	-----	-	88,600	15,600	P
11	2,650	161,950	28,600	-	146,700	27,900	7,500	243,900	19,400	M
12	2,600	160,500	28,300	-	145,500	27,600	7,350	249,050	21,300	P,M
13	650	48,650	16,300	-----	Not Applicable	-----	850	82,450	15,500	C
14	1,250	79,550	20,200	-	111,100	16,600	2,800	145,100	18,000	M
15	1,300	82,100	20,600	-----	Not Applicable	-----	2,950	149,550	17,100	P
16	1,150	73,950	19,600	-----	Not Applicable	-----	2,400	143,200	18,200	P
17	3,400	207,500	42,300	-	158,700	31,500	9,300	287,300	32,500	M
18	2,450	149,550	27,400	-----	Not Applicable	-----	8,250	231,550	19,100	C
19	1,900	117,500	34,200	-----	Not Applicable	-----	5,100	203,300	30,000	P
20	1,850	116,150	23,700	-----	Not Applicable	-----	5,000	193,000	18,100	P
21	-	42,600	4,700	-----	Not Applicable	-----	-	106,100	3,400	P
22	-----	Not Applicable	-----	2,250	130,550	16,600	1,100	71,000	19,200	P,M
23	950	45,950	25,200	-----	Not Applicable	-----	750	78,350	15,300	P
24	650	45,450	16,000	-----	Not Applicable	-----	-	66,800	1,500	P
25	-	79,100	29,400	-----	Not Applicable	-----	-	116,400	16,200	P
26	-----	Not Applicable	-----	-----	Not Applicable	-----	1,900	188,800	19,800	P
27	5,400	315,300	51,700	-----	Not Applicable	-----	5,400	392,600	34,900	P
28	-----	Not Applicable	-----	-----	Not Applicable	-----	-	112,200	18,000	C
29	2,400	146,300	27,100	-	142,800	26,500	6,700	227,000	19,000	P,M
30	650	45,450	16,000	-----	Not Applicable	-----	750	78,300	15,400	P
31	950	45,950	25,200	-----	Not Applicable	-----	750	78,350	15,300	C

1 P = pentachlorophenol, C = creosote, M = heavy metal salts

Source: Environmental Science & Engineering, Inc

TABLE III-2

WOOD PRESERVING BOULTON INDIRECT DISCHARGERS
COST OF COMPLIANCE UNDER ALTERNATIVE TECHNOLOGIES

($)

Plant	Biological Treatment			Metals Removal			Cooling Tower Evaporation			Type of Preservative[1]
	Investment		Operating	Investment		Operating	Investment		Operating	
	Land	Other	Costs	Land	Other	Costs	Land	Other	Costs	
32	1,250	81,050	23,900	-----	Not Applicable	-----	–	62,100	25,700	P
33	900	60,300	17,100	–	50,600	23,500	750	98,850	15,000	P,M
34	1,650	102,350	23,300	-----	Not Applicable	-----	–	71,900	28,400	C
35	1,650	102,350	23,300	1,250	125,750	23,200	–	71,900	28,400	P,M
36	2,750	171,150	29,000	1,250	147,150	30,100	–	92,000	33,800	P,M
37	-----	Not Applicable	-----	-----	Not Applicable	-----	–	110,400	42,300	C
38	4,000	234,000	34,700	–	103,500	38,400	1,250	166,950	35,600	P,M
39	-----	Not Applicable	-----	-----	Not Applicable	-----	–	103,500	38,900	C
40	2,150	132,350	25,700	1,250	137,750	26,700	–	132,350	25,700	P,M
41	20,000	956,000	93,100	-----	Not Applicable	-----	–	178,200	89,200	C
42	6,500	345,500	44,500	–	118,500	46,000	1,250	182,850	43,100	C,M

1. P = pentachlorophenol; C = creosote; M = heavy metals.

Source: Environmental Science & Engineering Inc. adjusted to reflect cost of land at $5.000 per acre.

TABLE III-3

TOTAL COST OF COMPLIANCE WOOD PRESERVING INDUSTRY
INSTALLING LEAST-COST TECHNOLOGY

($000's)

Indirect Dischargers	No. of Plants	Investment			Annual Operating Cost
		Total	Land	Other Investments	
Option 1					
Steaming	–	–	–	–	–
Boulton	–	–	–	–	–
Option 2					
Steaming	19	1,828.0	26.0	1,802.0	441.7
Boulton	6	773.5	5.0	768.5	196.8
	25	2,601.5	31.0	2,570.5	638.5
Option 3					
Steaming	8	957.2	1.0	955.4	179.3
Boulton	6	575.6	1.3	574.3	196.8
	14	1,532.8	2.3	1,529.7	376.1
Option 4					
Steaming	25	4,006.2	76.2	3,930.0	451.0
Boulton	7	810.2	3.2	807.0	207.3
	32	4,816.4	79.4	4,737.0	658.3
Option 5					
Steaming	21	3,231.9	55.8	3,176.1	365.7
Boulton	6	626.1	2.0	624.1	164.2
	27	3,858.0	57.8	3,800.2	529.9
Option 6					
Steaming	31	5,006.5	101.2	4,930.3	546.4
Boulton	11	1,274.2	3.2	1,271.0	405.8
	42	6,280.7	104.4	6,201.3	952.2
Direct Dischargers					
Biological Treatment with Carbon Adsorption	1	69.0	–	69.0	23.0
Discharge/Spray Evaporation	1	177.0	–	177.0	15.0

Source: Data supplied by EPA and Environmental Science and Engineering, Inc., revised by Arthur D. Little, Inc., to reflect land cost of $5000 an acre.

TABLE III-4

WOOD PRESERVING INDUSTRY PRODUCTION SIZE CUTOFFS
INDIRECT DISCHARGERS

STEAMING

Alternative	Plants Impacted Without Cutoff	Cutoff (000 Cu. Ft.)	Plants Impacted With Cutoff
Option 1	0	Not Applicable	0
Option 2	19	900	13
Option 3	8	1,200	2
Option 4	25	1,200	12
Option 5	21	1,200	12
Option 6	31	1,200	15

BOULTON

Option 1	0	Not Applicable	0
Option 2	6	700	5
Option 3	6	700	5
Option 4	7	1,100	3
Option 5	6	1,100	2
Option 6	11	1,100	6

TABLE III-5

TOTAL COST OF COMPLIANCE WOOD PRESERVING INDUSTRY
INSTALLING LEAST-COST TECHNOLOGY
(WITH SIZE CUTOFF)
($000's)

Indirect Dischargers	No. of Plants	Investment			Annual Operating Cost
		Total	Land	Other Investments	
Option 1					
Steaming	–	–	–	–	–
Boulton	–	–	–	–	–
Option 2					
Steaming	13	1,324.1	19.3	1,304.8	318.9
Boulton	5	636.5	3.8	632.7	164.4
	18	1,960.6	23.1	1,937.5	483.3
Option 3					
Steaming	2	214.9	1.1	213.8	45.7
Boulton	5	636.5	3.8	632.7	164.4
	7	851.4	4.9	846.5	210.1
Option 4					
Steaming	12	1,836.3	26.7	1,809.6	205.3
Boulton	3	484.6	2.5	482.2	104.4
	15	2,320.9	29.2	2,291.8	309.7
Option 5					
Steaming	12	1,836.3	26.7	1,809.6	205.3
Boulton	2	300.5	1.2	299.3	61.3
	14	2,136.8	27.9	2,108.9	266.6
Option 6					
Steaming	15	2,268.1	35.7	2,232.4	260.8
Boulton	6	879.8	2.5	877.3	274.8
	21	3,147.9	38.2	3,109.7	535.6
Direct Dischargers					
Biological Treatment with Carbon Adsorption	1	69.0	–	69.0	23.0
No Discharge/Spray Evaporation	1	177.0	–	177.0	15.0

Source: Data supplied by Environmental Science and Engineering, Inc., revised by Arthur D. Little, Inc., to reflect land cost of $5000 an acre.

The treatment technology for new Boulton plants consists of:[6]

- Primary gravity oil-water separation;
- Flocculation followed by rapid sand filtration; and
- Evaporation in cooling tower, with provisions for additional heat input through a heat exchanger.

The treatment technology for a new steaming plant consists of:

- Primary gravity oil-water separation;
- Flocculation followed by rapid sand filtration; and
- Containment and spray evaporation.

Cost-of-compliance estimates were based upon the plant types and sizes shown in Table III-6. Two sizes of Boulton plant are shown (one with two 130' x 7' cylinders, and one with five cylinders), each treating Douglas fir poles, which require a long residence time in a retort. Costs were also developed for two sizes of organic steaming plants treating southern pine poles. Boulton plants treating southern oak railroad ties would have production rate and wastewater flows similar to those for the organic steaming plants, but the treatment technology shown for the Boulton plant.

TABLE III-6

MODEL PLANTS FOR NEW SOURCE PERFORMANCE STANDARDS

Plant Type	Design Production		Wastewater Flow (Gal./Day)
	Cubic Feet/ Day	Product Type	
Boulton Process			
Plant A	3,200	Douglas Fir Poles	4,000
Plant B	8,000	"	10,000
Organic Steaming Plants			
Plant C	6,000	Southern Pine Poles	2,500
Plant D	15,000	"	7,000

Source: Environmental Science and Engineering, Inc.

The cost of compliance with the new source treatment technology is shown in Table III-7 for each model plant. The compliance investment and operating costs reflect only one half of the cost of primary oil-water separation; the remainder has been included in the new plant baseline data described in Chapter II and included in Chapter IV. The total cost of primary oil-water separation is also shown in Table III-7; these costs differ by size of plant but not by treatment method.

TABLE III-7

COST OF COMPLIANCE
NEW WOOD PRESERVING PLANTS

Model Plant Type	Total Investment	Operating Cost	Acres of Land Required
Boulton Plant A[1]	$161,030	$66,260	0.50
Boulton Plant B[1]	223,310	99,260	0.75
Organic Plant C[1]	267,640	73,640	0.90
Organic Plant D[1]	427,500	105,300	1.95
Total Requirement Primary Oil-Water Separation			
2-Cylinder Plant	80,000	8,000	–
5-Cylinder Plant	113,500	9,500	–

1. Half the investment and operating cost of primary oil/water separation has been excluded.

Source: Environmental Science and Engineering, Inc., letter dated August 11, 1978, adjusted to reflect land cost of $5000 an acre.

IV. ECONOMIC IMPACT ASSESSMENT

This chapter discusses the results of the economic impact assessment of the costs of complying with the BAT options studied. It also contains a description of plants that will be required to install or modify equipment (thus incurring higher costs of operation) to comply with the studied control options, and compares these plants with those that currently have self-contained or no discharge.

A. ECONOMIC CHARACTERISTICS OF IMPACTED PLANTS

As described in Chapter III, only 10% of the plants in the wood preserving industry will be impacted by the BAT alternatives studied because the remaining 90% of the industry is currently not discharging a liquid waste into navigable water or into a municipal system. The impacted plants were compared with the balance of the industry in several areas important to determining the impact of the alternatives on the industry:

- Sales
- Process
- Profitability
- Product Mix
- Location

With the exception of plant sales, size, and location, impacted plants are not significantly different from non-impacted plants. In general, plants impacted by BAT requirements are larger than non-impacted plants.

Most of the impacted plants (75%) are in urban areas while most of the no discharge plants (77%) are in suburban or rural areas (Table IV-1). The impacted plants located in urban areas cited a lack of available adjacent land for an effluent treatment system (17 of 40 impacted respondents). Hence, land availability does not appear to be a problem in suburban or rural locations.

B. ECONOMIC IMPACT ON EXISTING INDUSTRY

The economic impacts of the compliance costs for each studied alternative were analyzed with respect to:

- Price
- Demand reduction/shifts
- Financial effects
- Plant closures and market structure

The sensitivity of these economic impacts to the assumptions that were made is discussed in Chapter V, Limitations of Analysis.

1. Price Impacts

The potential long-run price impacts resulting from the control alternatives that were studied were addressed by estimating the "long-run price increases" — i.e., those necessary to

TABLE IV-1

LAND AVAILABILITY FOR PLANTS

	DISCHARGING PLANTS								NO DISCHARGE PLANTS	
	Land Availability									
	Available		Unavailable		No Answer		Total			
Type of Location	#	%	#	%	#	%	#	%	#	%
Urban	9	30	17	57	4	13	30	100	68	23
Suburban	5	83	0	0	1	17	6	100	79	27
Rural	2	63	0	0	1	33	3	100	150	50
No Answer	–	–	–	–	1	–	1	–	–	–
Total	16	40	17	43	7	18	40	100	297	100
% of Total Sample (337 Respondents)		5		5		2		12		88

Note: This table includes three plants as "DISCHARGING PLANTS" which the EPA has learned are "NO DISCHARGE" plants.

Source: EPA Financial 308 Letter.

recover all costs associated with a control option, including a normal rate-of-return on investment, associated with the costs for each control alternative. The rate-of-return on investment that was used was the average value for the plants responding to the rate-of-return criteria question posed in the EPA Financial 308 Letter. (See Chapter II.)

An estimate was made of the revenue required for plants to recover the total cost of compliance (Figure IV-1). Since the costs of compliance were developed by plant, the required revenue for each option is shown as a percentage of sales by sales level. The relative increase in revenue required to recover compliance costs varies with size of plant.

The revenue required to recover compliance costs can be viewed as the average price increase across all products required by a plant in a given sales category. Obviously, small plants have a higher revenue requirement because compliance costs for a given option are disproportionately higher for small plants than for large plants.

Because only 10% of the plants in the industry will be impacted by the regulation, the price increases expected from the regulation are likely to range from 0% to the same percentage as that for the larger plants. The wood preserving industry is competitive and while the *industry* demand curve for most preserved wood products is relatively inelastic, the demand curve facing individual firms is quite elastic. However, the following factors and circumstances may enable these plants to obtain price increases to recover cost:

- The impacted plants are generally larger than the industry average;
- They may be in isolated geographic markets;
- The general price level inflation in the U.S. (6-8% per year) may facilitate at least partial cost recovery.

During the 1970's, the prices of preserved wood products have outpaced general price inflation. Given "customary," inflation-related price increases of 6-8%, impacted wood preservers may be able to recover an additional 1-2% of increased cost associated with pollution control. Also, larger plants are often associated with multi-plant companies which have some market power and may be able to obtain a price increase to recover a portion of the cost of compliance.* Finally, plants in locations where there are few or no competing firms may be able to raise prices, limited primarily by the cost of transporting products from the nearest plant that is not impacted.

Note that the analysis of plant closures viewed each plant as a stand-alone operation, unable to recover the cost of compliance through price increases.

2. Production Shifts

Growth rates in the demand for preserved wood products will affect the ability of impacted plants to obtain price increases. Plants predominantly producing poles will be unlikely to obtain higher prices for this product in the face of a declining industry demand. Shifting from poles to other products may enable a plant to produce a product with higher added value to maintain current production levels. However, tight capacity is not forseen for any preserved wood product and thus the ability of impacted plants to increase real prices will be inhibited.

* Although there are occasions when multi-plant companies do not have market power at a specific location, economic theory and actual experience indicate that such market power generally exists.

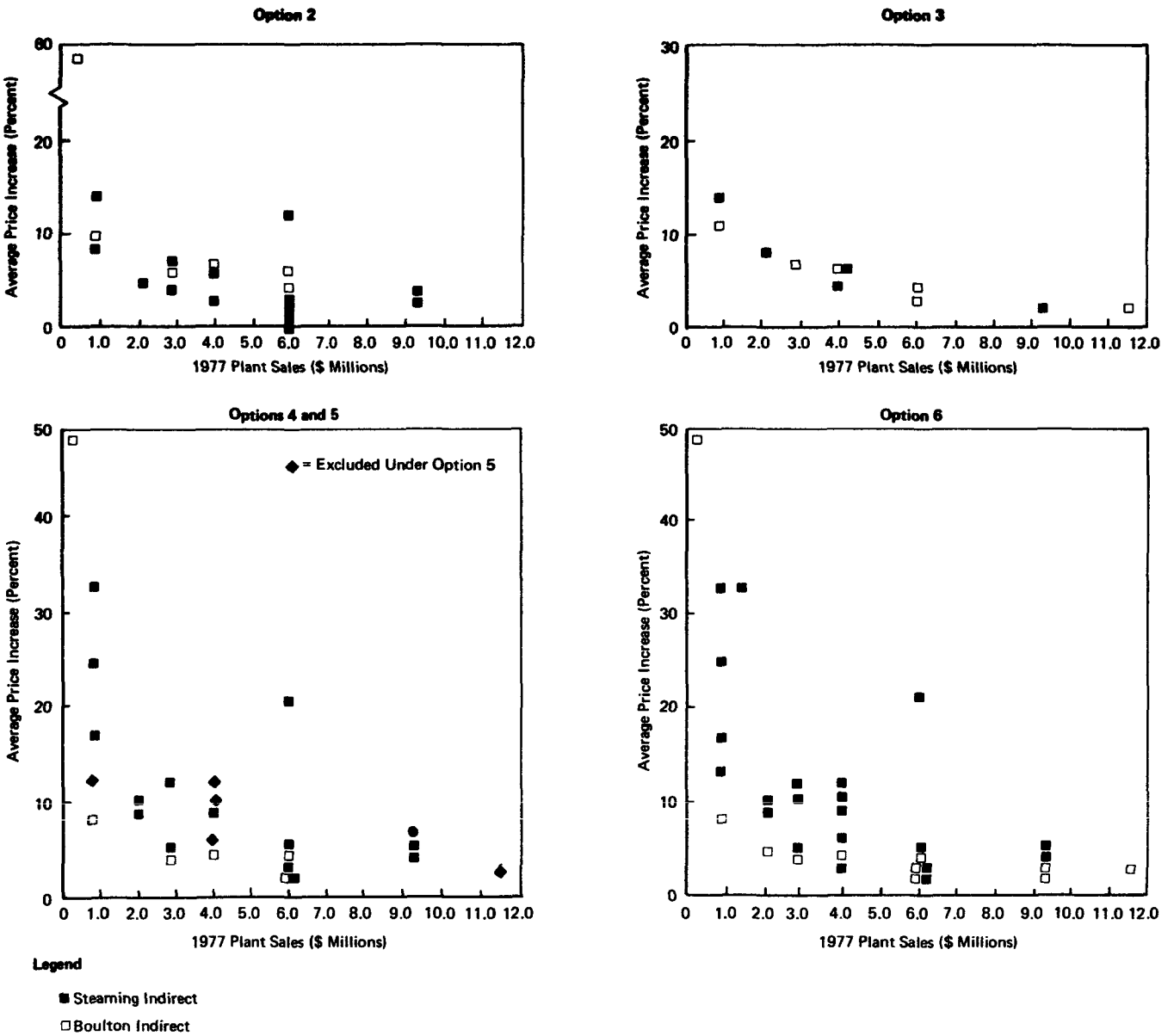


FIGURE IV-1 PRICE INCREASES REQUIRED TO RECOVER COSTS OF COMPLIANCE

While the selection of preserved wood versus steel or concrete materials is predominantly based upon structural requirements, for railroad ties this situation could change. If concrete ties prove to be technically feasible — and economically producible — a portion of the market expansion forecast for ties could be captured by concrete substitutes, especially if the life-cycle costs become more competitive. While this may not be a factor until the mid-1980's, that would coincide with the deadline for BAT compliance and would further prevent the impacted plants from recovering costs of compliance through price increases.

3. Financial Impact

It is unlikely that the impacted plants as a group will be able to recover the costs of complying with BAT regulations through higher prices. If they elect to install the pollution control equipment, profitability is likely to decline. Table IV-2 shows the impact of increased operating costs and investment upon profitability in the absence of price increases. The analysis considered the impact on operating costs due to out-of-pocket expenditures; i.e., while potential interest payments on debt are included as a cost, the total cost of capital is not included in the figures. Also, the lowest-cost means of achieving compliance was used i.e., if Option 4 is less expensive than Option 3 for a plant, it is assumed the plant will install Option 4.

TABLE IV-2

INDIRECT DISCHARGER WOOD PRESERVING PLANTS
PERCENTAGE DECLINE IN PROFITABILITY* AFTER COMPLIANCE WITHOUT PRICE INCREASES

Plant Sales ($000):	200	700	1800	3500	7500
		*Percent Decline in Profitability**			
Option 2					
Steaming	–	20-86	8-155	6-46	2-45
Boulton	260	347	–	16-42	13-68
Option 3					
Steaming	–	79	6	36-113	4
Boulton	–	400	–	16-45	13-68
Option 4					
Steaming	–	21-100	8-174	6-208	3-50
Boulton	260	400	–	16-45	13-68
Option 5					
Steaming	–	21-87	8-174	3-208	3-50
Boulton	260	400	–	16-45	13-68
Option 6					
Steaming	–	21-87	8-174	3-208	3-50
Boulton	260	400	89	16-45	13-68

*Change in Profit/Precompliance Profit: the absolute value of the changes in profit divided by precompliance profit. A value greater than 100% means plant is operating at a loss.

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

Because the costs of compliance for small plants are relatively higher, small firms will suffer the greatest decline in profitability as a result of compliance. The small plants with lowest sales volume would be in a negative profit situation under all of the control options studied. Plants in the other sales categories would suffer a decline in profitability and most impacted plants would still be profitable under each alternative.

Any price increases the impacted plants are able to obtain would mitigate the reduction in profitability for small and medium-sized plants. However, as discussed above, price increases that do occur (barring a tight market) will reflect the cost structure of the larger plants. Even with price increases, many plants with less than $1.8 million in sales are likely to become unprofitable if they make the compliance expenditures.

Reduction in profitability is not the only financial impact of the regulation. If one were to assume that all impacted plants could recover the pollution control expenditures through price increases, it is still likely that a number of impacted plants would be unable to finance the required investment.

For small plants with sales under $1 million, the investment required for all options studied exceeds annual plant cash flow for all but one plant (Figure IV-2). Even for larger plants, the studied alternatives often require investment exceeding a single year's cash flow. Considering the fact that a portion of the plant's cash flow must be used for expenditures other than those associated with BAT regulations, impacted plants will not generate sufficient cash flow to self-finance compliance with these regulations. The impacted plants generate an annual cash flow equivalent to approximately 4% of sales.* About 3% of sales is reinvested to maintain industry assets leaving about 1% of sales for dividends, retained earnings, and other purposes. To have available the equivalent of one year's cash to invest in pollution control, wood preservers would be required to accumulate four years' cash flow in excess of maintenance investment requirements. Therefore, if BAT regulations are required in 1984, any plant with a pollution control investment requirement in excess of one year's cash flow will probably have to obtain external financing between 1979 and 1983 to fund pollution control expenditures.

Assuming that a plant is viable — i.e., prices will eventually increase to cover the BAT investment expenditures — a plant will have to seek financing from a parent company or the financial community. However, the wood preserving industry is dominated by privately held corporations, and only 22% of all plants are publicly held (Table IV-3). Inasmuch as many of the privately held corporations and proprietorships are one-plant corporations, effectively the plant and corporate cash flows are one and the same. Also, the ownership pattern of the plants that will be impacted by BAT regulations is only slightly more favorable than that of the industry overall, with 22 (55%) of the discharging plants organized as proprietorships or privately held corporations.

More likely, the privately held corporations will require external financing to a greater extent than the publicly held corporations. In either case, the financial community or parent corporations is less likely to be willing to make investments in financially nonviable plants. On the basis of the financial criteria, only the larger impacted plants would be able to make the investment required to satisfy BAT requirements.

4. Plant Closures

The impacted wood preserving plants (especially the small ones) will be unable fully to recover costs through price increases. Further, a number of plants will have cash flow shortfalls relative to pollution control investment requirements. Thus plant shutdowns in the wood preserving industry are likely to occur.

* Based upon responses to the EPA Financial 308 Letter. See Chapter II.

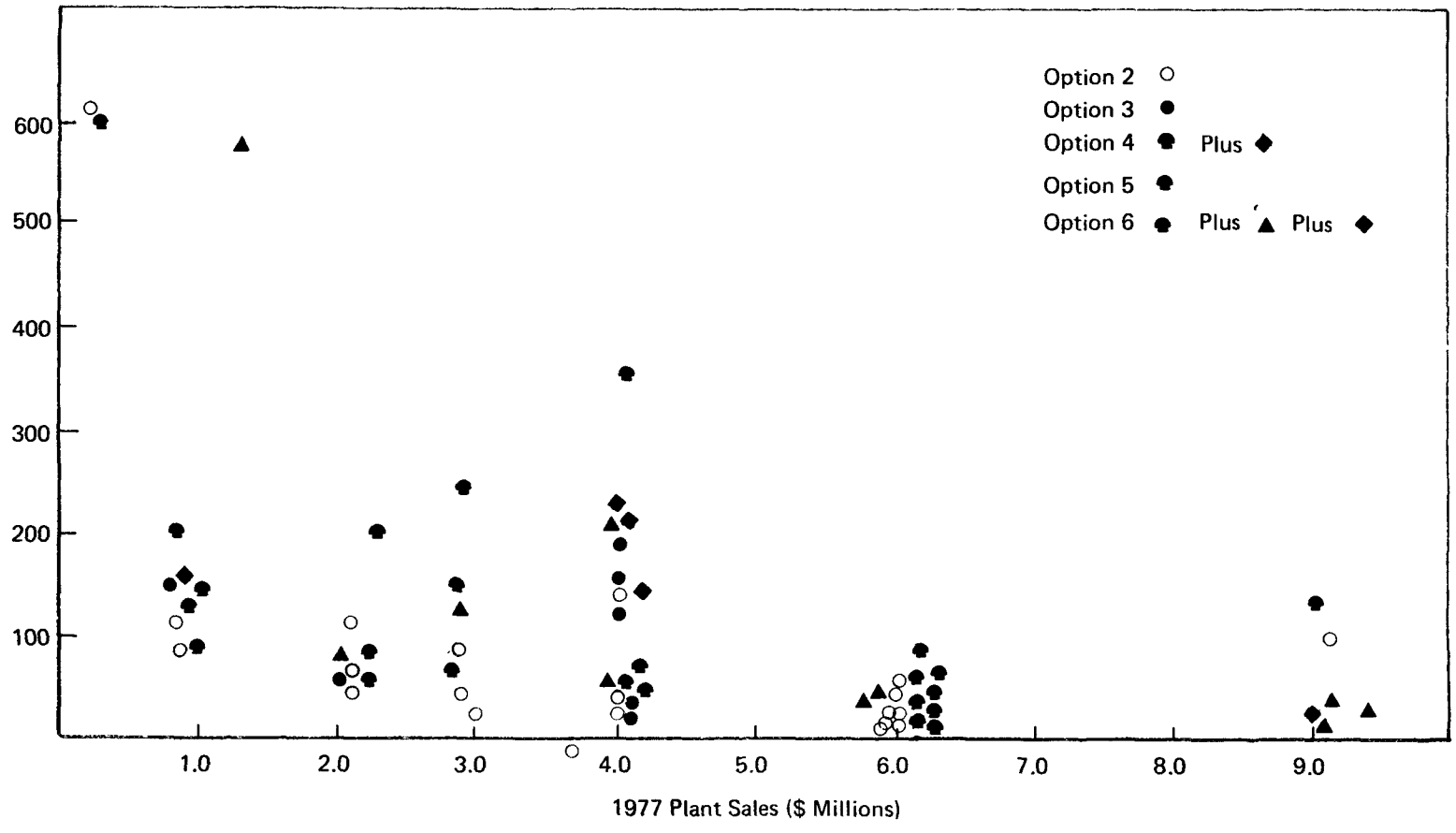


FIGURE IV–2 INVESTMENT REQUIRED FOR BAT ALTERNATIVES AS A PERCENTAGE OF CASH FLOW

TABLE IV-3

FORM OF BUSINESS ORGANIZATION BY DISCHARGE STATUS

Form of Business Organization	Discharging Plants		Zero Discharge*		Total Plants	
	Number	Percent	Number	Percent	Number	Percent
Proprietorship	1	2	31	11	32	9
Co-op						
Privately Held Corporation	21	53	209	71	230	69
Publicly Held Corporation	18	45	54	18	72	22
Total**	40	100	294	100	334	100

*Plants currently at, or currently required to be at, zero discharge.
**Total respondents to question.

The evaluation of whether a plant would shut down rather than make the investment required to comply with pollution control regulations is imprecise. First, the evaluation is external to the corporate environment and based on no knowledge or consideration of corporate goals and objectives. Second, the evaluation is based on financial criteria and, while they are in turn based upon industry data and a distribution of wood preserving plant rate-of-return criteria, they may not reflect the actual parameters that would be used in the individual decision-making process, especially since few plants provided information on financial decision criteria.

With those caveats in mind, the analysis indicates a number of closure candidates (Table IV-4), based on by the following characteristics:

- Low Sales,
- Low Profitability, and/or
- Negative Cash Flow.

The profitability and cash flow of each discharging plant was derived from the EPA Financial 308 Letter. The change in operating cost and relationship of investment required to cash flow was examined under each control option. The plants were assumed to install the least costly treatment technology that would achieve compliance; for example, Option 6 (no discharge) costs were used if less costly than Options 2 or 3.

If a plant could finance the pollution control investment from cash flow and maintain a positive profit margin in the absence of price increases, then the plant was judged likely to remain open. A plant was designated as a high probability of closure where required investment was on the order of 200% of annual cash flow and/or post-compliance profit margins would be negative. Plants judged to have a moderate probability of closure were those for which investment would be 100% to 200% of annual cash flow but which would still have a positive profit after tax.

Since compliance costs are disproportionately high for smaller plants, plants with low sales volumes are more highly impacted. Under the control options studied, up to 8 plants with sales

TABLE IV-4

WOOD PRESERVING INDUSTRY POTENTIAL PLANT CLOSURES
UNDER BAT ALTERNATIVES

Alternative	Without Size Cutoff			With Size Cutoff		
	High Probability	Moderate Probability	Total	High Probability	Moderate Probability	Total
Option 2						
Steaming-Indirect	–	3	3	–	–	–
Boulton-Indirect	–	2	2	–	–	–
Total	–	5	5	–	–	–
Option 3						
Steaming-Indirect	2	2	4	–	–	–
Boulton-Indirect	1	2	3	–	–	–
Total	3	4	7	–	–	–
Option 4						
Steaming-Indirect	6	5	11	–	2	2
Boulton-Indirect	1	2	3	–	–	–
Total	7	7	14	–	2	2
Option 5						
Steaming-Indirect	2	5	7	–	2	2
Boulton-Indirect	1	2	3	–	–	–
Total	3	7	10	–	2	2
Option 6						
Steaming-Indirect	8	6	14	1	2	3
Boulton-Indirect	1	2	3	–	–	–
Total	9	8	17	1	2	3

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

under $3.5 million would be unlikely to make the investment in control equipment for financial reasons — i.e., the plant is likely to incur operating losses as a result of compliance costs or be unable to finance the investment. Under Option 2, three steaming plants and two Boulton plants could close (Table IV-4). The number of potential closures increases with the stringency and scope of the regulatory alternative and under Option 6 up to 14 steaming plants and 3 Boulton plants face closure. If the EPA were to apply a size cutoff, the number of potential closures falls off radically, with plant closures foreseen only under Options 4, 5, and 6.

5. Employment Effects

The potential employment losses attributable to plants with a high probability of closure increases under each of the options and reaches a maximum of 3.5% of the industry production workers under Option 6 (Table IV-5). The employment losses associated with moderate probability plant closure are about the same under Options 4 and 5 at about 4% of the workforce.

TABLE IV-5

WOOD PRESERVING INDUSTRY
EMPLOYMENT LOSSES FROM PLANT CLOSURES

Alternative	Without Size Cutoff			With Size Cutoff		
	High Probability	Moderate Probability	Total	High Probability	Moderate Probability	Total
Option 2						
Steaming-Indirect	–	130	130	–	–	–
Boulton-Indirect	–	41	41	–	–	–
Total	–	171	171	–	–	–
% Employees*		2.2%	2.2%			
Option 3						
Steaming-Indirect	77	54	131	–	–	–
Boulton-Indirect	15	41	56	–	–	–
Total	92	95	187	–	–	–
% Employees*	1.2%	1.2%	2.4%			
Option 4						
Steaming-Indirect	199	280	470	–	199	199
Boulton-Indirect	15	41	56	–	–	–
Total	214	321	535	–	199	199
% Employees*	2.8%	4.2%	5.7%		2.6%	2.6%
Option 5						
Steaming Indirect	103	280	383	–	199	199
Boulton-Indirect	15	41	56	–	–	–
Total	118	321	439	–	199	199
% Employees*	1.5%	4.2%	5.7%		2.6%	2.6%
Option 6						
Steaming-Indirect	253	295	548	27	199	226
Boulton-Indirect	15	41	56	–	–	–
Total	268	336	604	27	199	226
% Employees*	3.5%	4.4%	7.8%	0.3%	2.6%	2.9%

*Based upon 7,700 production workers in 1976, Department of Commerce, Bureau of Census, *Annual Survey of Manufacturers: General Statistics.* Plant production employment data from EPA Financial 308 Letter.

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

C. ECONOMIC IMPACT UPON NEW SOURCES AND CAPACITY EXPANSIONS

1. Potential for New Plants

The wood treating industry is not capital intensive compared with the average manufacturing industry; the sales turnover ratios for plants in 1976 was found to range from 3.0 to 10.0 or more,* whereas the ratio of sales to assets for most process industries is on the order of 1.0 to 2.5.** There is considerable excess capacity among existing plants, based upon maximum operating capacities, but transportation and other factors make it likely that new capacity will be built in growing regions (e.g., the South) before excess capacity is fully utilized in others.

* Financial 308 Letter.

** Based on data from FTC-SEC, *Quarterly Financial Reports.*

Although most new capacity may take the form of incremental expansion (e.g., the addition of a new retort at an existing site), some 17% (or 56 of 337) of the respondents to the Financial 308 Letter indicated that their wood treating plants have begun operation since 1970.

2. Impact Upon New Plants

A number of new wood preserving plant models were developed to evaluate the impact of new source performance standards. (See Chapter II.) Process economic models were developed for four different plant types:

- Boulton plants treating Douglas fir poles in the Northwest;
- Organic steaming plants treating Southern Pine poles;
- Boulton plants treating oak railroad ties in the South; and
- Inorganic plants treating Southern Pine lumber.

Two plant sizes were created for each type: one with two cylinders and one with five (See Chapter II). As mentioned in Chapter III, existing standards for new inorganic plants will have no incremental costs of compliance from BAT revisions. Further, costs of compliance for Boulton plants treating oak railroad ties were not generated by the technical contractor.

Table IV-6 depicts the baseline revenues on each model plant as well as the incremental revenue required to recover costs of compliance (where available). The model plants are larger than the average existing plant, with production and revenue levels at the upper end of the spectrum. The revenue required to recover costs for compliance in the long run is similar to that for existing plants for Option 6, the no discharge option, in the higher sales categories shown in Figure IV-1. The cost of pollution control equipment per se would not appear to hinder the addition of new capacity.

If the existing industry BAT requirements are defined as additional biological treatment or current pre-treatment standards, then incremental expansion may be favored as a means of capacity expansion, especially given the incremental land requirements of a no-discharge new source standard.

TABLE IV-6

IMPACT OF BAT REQUIREMENTS UPON LONG-RUN REVENUE
REQUIRED TO SUPPORT NEW SOURCES

Case	Plant Type/Product	Annual Production (000 Cubic ft.)	Baseline Revenues ($000)	Revenue Required for BAT Compliance Costs	
				($000)	% Baseline
A	Boulton/Douglas Fir Poles	720	7,860	154	2
B	Boulton/Douglas Fir Poles	1,800	19,300	226	1
C	Steaming/Southern Pine Poles	1,800	11,300	198	2
D	Steaming/Southern Pine Poles	4,500	28,100	298	1
E	Boulton/Oak R.R. Ties	960	6,500	Not Available	
F	Boulton/Oak R.R. Ties	2,400	16,000	Not Available	
G	Inorganic/Southern Pine Lumber	1,800	13,500	Not Available	
H	Inorganic/Southern Pine Lumber	4,500	33,300	Not Available	

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

V. LIMITATIONS OF ANALYSIS

The economic impact of BAT regulations may differ from the analysis in this economic impact assessment depending upon the following:

(1) EPA regulations which affect waste disposal;
(2) Return-on-investment criteria;
(3) Cost variation from plant to plant;
(4) Future growth in demand; and/or
(5) Local conditions of impacted plants.

Item (1) was beyond the scope of the technical contractor's or the economic contractor's work. Items (2) through (5) 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 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 indicated by the technical contractor in this report. Further, wood preserving plants which dispose on-site (28%) may be impacted, in that the current method of disposal may no longer be environmentally adequate.

The application of both no-discharge and discharge options studied in this report will be affected by RCRA regulations. The lagoons associated with enhanced biological treatment and the impoundment associated with spray evaporation will both 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 the two aerated lagoon cells combined, or an impoundment, are analogous in size to small landfills (5,000M^3/year), then the incremental compliance cost per plant could be as follows:

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

Another source of additional cost is monitoring requirements. The cost of analysis for soil and water samples could be on the order of $60,000 per year.

Consideration of whether or not the sludge and effluent of wood preserving plants were hazardous wastes was beyond the scope of the technical contractor's report, although it was discussed in the draft report. For off-site disposers, the costs of disposal are expected to double or

triple as a result of Section 3004. 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. RETURN ON INVESTMENT CRITERIA

The use of a higher or lower target rate of return than the median value (12%) produces noticeably higher or lower required revenue to cover cost of compliance (Table V-1). Comparing the revenue increase requirement for the low and high ROR scenarios for the sampled plants, the table shows that the change in revenue requirement for a discount rate change from 12% to 5% ranges from 22% to 40% for the sample plants. There is a greater change in the revenue requirements from a change in the discount rate of 12% to 20%, and it ranges from 33% to 51%.

TABLE V-1

CHANGE IN REVENUE REQUIRED BY DISCOUNT RATE

	Discount Rate				
	12%	5%		20%	
	$000	$000	% Change	$000	% Change
Revenue Required	5	3	- 40	7	40
	39	30	- 23	52	33
	75	52	- 31	113	51
	89	59	- 22	121	36
	108	78	- 28	156	44
	173	118	- 32	258	49
	178	130	- 27	255	43
	434	300	- 31	643	48

There is relatively little variation in the revenue requirement as a percent of sales due to ROR target (Figure V-1). The requirement seems to be higher for both the smallest plants and the very large plants, but even these plants require additional revenue of less than 10% of sales. The bulk of the increases in revenue to maintain target ROR are within the 1-5% range; on the average, the ROR scenarios differ by 1 percentage point. Therefore, the economic impact assessment is basically insensitive to the return on investment criteria employed.

C. COST VARIATIONS FROM PLANT TO PLANT

Because of plant-specific conditions, the technical contractor indicated that the cost estimates for an individual plant could vary between 75% and 150% of the costs for the control options presented in Chapter III. The cost differences could arise as a result of such factors as usable treatment in place, land availability, and/or cost of controls. The cost of compliance is based upon land cost per acre, which will vary considerably depending upon the plant location. Those plants with lower costs will be less severely impacted by the alternatives studied. In addition to the understatement of compliance cost caused by EPA regulations on hazardous waste, there could be plant-specific conditions (e.g., terrain) which contribute to higher costs. Plants with higher costs will be more severely impacted by the regulation.

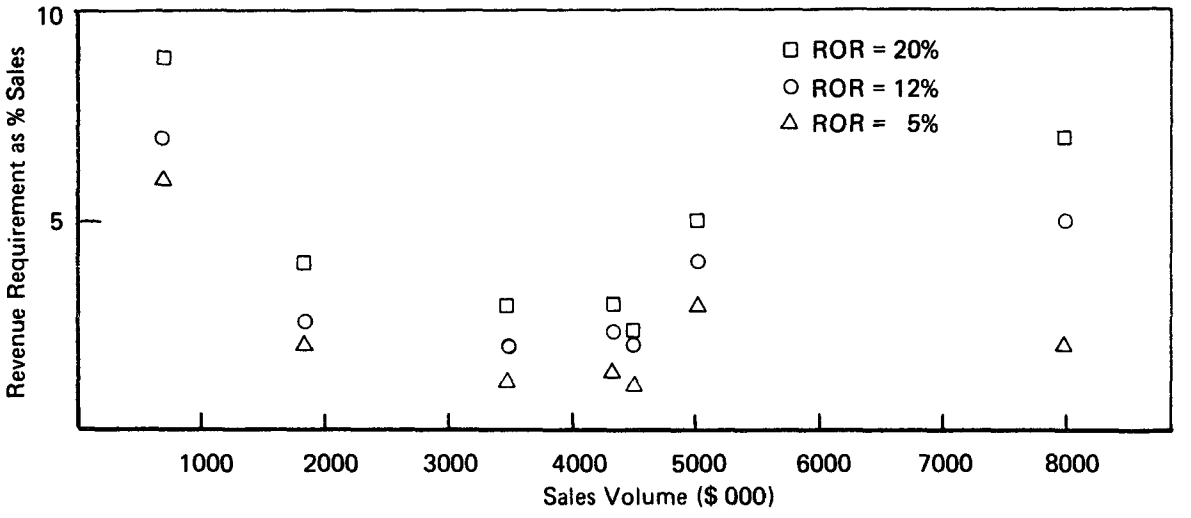


FIGURE V–1 REVENUE REQUIREMENT AS A PERCENTAGE OF SALES BY ROR FOR SAMPLE PLANTS

D. FUTURE GROWTH IN DEMAND

If the forecast growth for railroad ties and timbers does not materialize or if the rate of decline in poles is greater than forecast, the number of potential closure candidates will increase. If, on the other hand, demand growth is greater by virtue of a strong housing market growth and accelerated repair of railroads, then the number of plant closures will be fewer than indicated because the supply/demand balance is such that high-cost plants (including plants impacted by the regulation) determine price and therefore can recover costs of pollution control investment.

E. LOCAL CONDITIONS OF IMPACTED PLANTS

The analysis of plant closures is subject to the limitations of any plant closure analysis (Chapter IV). In addition, local market conditions of some impacted plants will determine to a significant extent whether a plant will shut down rather than comply with a regulation. For example, if an impacted plant were in a market area where there were virtually no competing firms, it might be able to increase its price and recover the cost of installing control equipment, limited by the cost of transportation of the closest competing firm. This would also be the case if all the plants in an area were required to make equivalent expenditures to comply with pollution control requirements. Local conditions could produce a worse impact than described in Chapter IV if, for example, most of the firms in the area are not impacted, in which case the impacted plant would have very little chance of recovering the costs of pollution control.

REFERENCES

1. *Annual Survey of Manufactures*, U.S. Department of Commerce, various years.

2. *Trend Impact Analysis Study of the Wood Preserving Market*, Dow Marketing Research Reports, February 1976.

3. Ibid, p. 21-22.

4. Ibid, p. 36.

5. Personal communications with members of the AWPA.

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

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

8. *Census of Manufactures*, U.S. Department of Commerce, 1972.

BIBLIOGRAPHY

The Analysis of Existing Wood Preserving Techniques and Possible Substitutes, Contract No. 68-01-4310, by The MITRE Corporation, for the U.S. Environmental Protection Agency, June 1977.

Annual Survey of Manufactures, Bureau of the Census, U.S. Department of Commerce, various years.

Census of Manufactures, Bureau of the Census, U.S. Department of Commerce, 1967 and 1972.

Chemical Marketing Reporter, Schnell Publishing Co., Inc., New York, various issues.

Economic Indicators, Council of Economic Advisors,

Engineering News Record, McGraw Hill, Inc., New York, various issues.

Employment and Earnings, Bureau of Labor Statistics, U.S. Department of Labor, various issues.

Integrated Economic Impact Assessment of Hazardous Waste Management Regulations, Preliminary Draft Report for the Office of Solid Waste, U.S. Environmental Protection Agency, October 1978.

Quarterly Financial Reports, Federal Trade Commission, Securities and Exchange Commission, various issues.

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 & Engineering, Project No. 78-052, September 1, 1978.

Trend Impact Analysis Study of the Wood Preserving Market, J. L. Natonski, February 1976.

Wholesale Prices and Price Indexes, Bureau of Labor Statistics, various issues.

Wood Preserving Statistics, Ernst & Ernst, 1976.

APPENDIX A

INDUSTRY CHARACTERIZATION

APPENDIX A

INDUSTRY CHARACTERIZATION

1. PRODUCT DIVERSIFICATION

It is primarily the largest companies in the industry which produce a wide range of products. Most firms in the industry operate only one plant. In these cases, the plant produces organically treated products or inorganically treated products, although some single plant firms produce both. Furthermore, smaller firms tend to specialize on particular preserved wood products. For example, a firm may produce only preserved railroad ties or posts or pilings or dimensional lumber. For many of the smaller firms, wood preserving is a service offered by a company in the lumber and wood products business.

2. IMPORTS AND EXPORTS

Import and export statistics do not distinguish preserved wood products from other wood products. However, piling, utility poles, and railway crossties are likely to be preserved when imported or exported. In recent years, imports, primarily from Canada, have been in the range of $10 million to $15 million per year (Table A-1). Exports, primarily to wood-poor regions such as the Middle East and Japan, have totaled $20 million to $35 million in recent years (Table A-2). About 10% to 15% of the U.S. production of utility poles is exported. With this exception, imports and exports do not constitute a sizeable portion of any other preserved wood markets.

TABLE A-1

U.S. IMPORTS OF PRESERVED WOOD PRODUCTS[1], 1970-1977

Year	Timber, Poles, Piling, Posts, and Other Wood in the Rough	Railroad Ties		Total
	Value[2] ($000)	Quantity (MBF)	Value[2] ($000)	Value[2] ($000)
1970	7,733	8,418	717	8,450
1971	8,633	3,363	385	9,018
1972	9,369	7,924	757	10,126
1973	8,654	11,308	1,505	10,159
1974	15,069	13,916	2,566	17,635
1975	9,868	12,475	2,625	12,493
1976	10,615	8,164	2,314	12,929
1977	10,011	7,367	1,370	11,381

1. U.S. import statistics do not distinguish preserved wood products from other wood products, but the products shown are predominantly preserved wood products.
2. Values shown are f.a.s. (free alongside ship) values.

Source: U.S. Department of Commerce, Bureau of the Census, *U.S. Imports – Schedule A, Commodity by Country,* FT 135.

TABLE A-2

U.S. EXPORTS OF PRESERVED WOOD PRODUCTS[1], 1970-1977

Year	Piling		Utility Line Poles		Railway Crossties & Mine Ties-Softwood		Railway Crossties & Mine Ties-Hardwood		Total
	Quantity (LFT)	Value[2] ($000)	Quantity (Number)	Value[2] ($000)	Quantity (MBF)	Value[2] ($000)	Quantity (MBF)	Value[2] ($000)	Value[2] ($000)
1970	5,055,702	1,935	160,526	5,526	4,052	353	11,626	2,065	9,879
1971	3,119,931	1,646	71,717	2,385	4,343	509	7,486	1,320	5,860
1972	2,231,276	1,355	102,869	3,935	6,027	1,131	11,568	1,937	8,358
1973	3,210,603	1,931	151,661	6,631	4,209	631	4,979	858	10,051
1974	7,802,427	5,730	169,602	12,163	33,113	3,900	21,617	3,977	25,770
1975	4,104,573	4,090	202,012	15,872	28,224	3,196	47,319	9,636	32,794
1976	2,599,684	2,251	298,439	16,350	15,903	1,859	15,003	3,242	23,702
1977	3,096,484	3,124	250,936	16,708	9,355	1,015	9,855	2,423	23,270

1. U.S. export statistics do not separate preserved wood products from other wood products, but the products shown are predominantly preserved wood products.
2. Values shown are f.a.s. (free alongside ship) values at U.S. port.

Source: U.S. Department of Commerce, Bureau of the Census, *U.S. Exports – Schedule B, Commodity by Country,* FT 410.

APPENDIX B

PRO-FORMA NEW SOURCE MODELS

TABLE B-1

PLANT A-1

ESTIMATED OPERATING COSTS FOR THE MANUFACTURE OF PRESERVED WOOD – ORGANIC TREATMENT

Cylinder Size: 2 cylinders, each 7' diameter x 130' long, 5000 cubic feet
Capital Cost: $3,300,000 (1978)
Location: South Central
Production: 2000 cubic feet per charge; 30 hours per charge (Boultonizing)
3 shifts per day, 300 days per year
Product: 960,000 cubic feet per year of Railroad Ties

Item	Units	Unit Cost ($)	Units Per Cubic Foot	Dollars Per Cubic Foot	Thousand Dollars Per Year
Raw Materials:					
Wood	Cubic feet	2.15	1.0	2.15	2,064
Creosote	Gallons	0.70	1.0	0.70	672
Total Raw Materials				2.85	2,736
Processing:					
Labor, Operating	Man hours	6.00		0.324	311
Labor, Maintenance	Man hours	6.50		0.090	86
Maintenance Supplies				0.090	86
Consumable Supplies				0.046	46
Fuel and Power				0.135	132
Plant Overhead	50% of Labor			0.207	199
Taxes and Insurance	4% of Capital			0.137	132
Total Processing				1.329	992
Total Cost, F.O.B. Plant				4.179	3,728

Source: Arthur D. Little, Inc., estimates based on industry interviews.

TABLE B-2

PLANT A-2

ESTIMATED OPERATING COSTS FOR THE MANUFACTURE OF PRESERVED WOOD – ORGANIC TREATMENT

Cylinder Size: 5 cylinders, each 7' diameter x 130' long, 5000 cubic feet
Capital Cost: $6,509,000 (1978)
Location: South Central
Production: 2000 cubic feet per charge; 30 hours per charge (Boultonizing)
3 shifts per day, 300 days per year
Product: 2,400,000 cubic feet per year of Railroad Ties

Item	Units	Unit Cost ($)	Units Per Cubic Foot	Dollars Per Cubic Foot	Thousand Dollars Per Year
Raw Materials:					
Wood	Cubic feet	2.15	1.0	2.15	5,160
Creosote	Gallons	0.70	1.0	0.70	1,680
Total Raw Materials				2.85	6,840
Processing:					
Labor, Operating	Man hours	6.00	0.012	0.250	600
Labor, Maintenance	Man hours	6.50	0.003	0.076	182
Maintenance Supplies				0.090	216
Consumable Supplies				0.046	110
Fuel and Power				0.135	326
Plant Overhead	50% of Labor			0.163	391
Taxes and Insurance	4% of Capital			0.108	260
Total Processing				0.869	2,085
Total Cost, F.O.B. Plant				3.719	8,925

Source: Arthur D. Little, Inc., estimates based on industry interviews.

TABLE B-3

PLANT B-1

ESTIMATED OPERATING COSTS FOR THE MANUFACTURE OF PRESERVED WOOD – ORGANIC TREATMENT

Cylinder Size: 2 cylinders, each 7' diameter x 130' long, 5000 cubic feet
Capital Cost: $3,300,000 (1978)
Location: South Central
Production: 2000 cubic feet per charge; 16 hours per charge (Steaming)
3 shifts per day, 300 days per year
Product: 1,800,000 cubic feet per year of Southern pine poles

Item	Units	Unit Cost ($)	Units Per Cubic Foot	Dollars Per Cubic Foot	Thousand Dollars Per Year
Raw Materials:					
Wood	Cubic feet	3.00	1.0	3.00	5,400
Pentachlorophenol	Pounds	0.42	0.5	0.21	378
Total Raw Materials				3.21	5,778
Processing:					
Labor, Operating	Man hours	6.00		0.173	311
Labor, Maintenance	Man hours	6.50		0.048	86
Maintenance Supplies				0.048	86
Consumable Supplies				0.024	46
Fuel and Power				0.072	132
Plant Overhead	50% of Labor			0.111	199
Taxes and Insurance	4% of Capital			0.073	132
Total Processing				0.549	992
Total Cost, F.O.B. Plant				3.759	6,770

Source: Arthur D. Little, Inc., estimates based on industry interviews.

TABLE B-4

PLANT B-2

ESTIMATED OPERATING COSTS FOR THE MANUFACTURE OF PRESERVED WOOD – ORGANIC TREATMENT

Cylinder Size: 5 cylinders, each 7' diameter x 130' long, 5000 cubic feet
Capital Cost: $6,509,000 (1978)
Location: South Central
Production: 2000 cubic feet per charge; 16 hours per charge (Steaming)
3 shifts per day, 300 days per year
Product: 4,500,000 cubic feet per year of Southern pine poles

Item	Units	Unit Cost ($)	Units Per Cubic Foot	Dollars Per Cubic Foot	Thousand Dollars Per Year
Raw Materials:					
Wood	Cubic feet	3.00	1.0	3.00	13,500
Pentachlorophenol	Pounds	0.42	0.5	0.21	945
Total Raw Materials				3.21	14,445
Processing:					
Labor, Operating	Man hours	6.00		0.133	600
Labor, Maintenance	Man hours	6.50		0.040	182
Maintenance Supplies				0.048	216
Consumable Supplies				0.024	110
Fuel and Power				0.072	326
Plant Overhead	50% of Labor			0.087	391
Taxes and Insurance	4% of Capital			0.058	260
Total Processing				0.463	2,085
Total Cost, F.O.B. Plant				3.673	16,530

Source: Arthur D. Little, Inc., estimates based on industry interviews.

TABLE B-5

PLANT C-1

ESTIMATED OPERATING COSTS FOR THE MANUFACTURE OF PRESERVED WOOD – ORGANIC TREATMENT

Cylinder Size: 2 cylinders, each 7' diameter x 130' long, 5000 cubic feet
Capital Cost: $3,630,000 (1978)
Location: West Coast
Production: 2000 cubic feet per charge; 40 hours per charge (Boultonized)
3 shifts per day, 300 days per year
Product: 720,000 cubic feet per year of Douglas fir poles

Item	Units	Unit Cost ($)	Units Per Cubic Foot	Dollars Per Cubic Foot	Thousand Dollars Per Year
Raw Materials:					
Wood	Cubic feet	3.40	1.0	3.40	2,448
Pentachlorophenol	Pounds	0.42	0.75	0.32	230
Total Raw Materials				3.72	2,678
Processing:					
Labor, Operating	Man hours	6.00		0.432	311
Labor, Maintenance	Man hours	6.50		0.119	86
Maintenance Supplies				0.119	86
Consumable Supplies				0.064	46
Fuel and Power				0.183	132
Plant Overhead	50% of Labor			0.276	199
Taxes and Insurance	4% of Capital			0.201	145
Total Processing				1.396	1,005
Total Cost, F.O.B. Plant				5.116	3,683

Source: Arthur D. Little, Inc., estimates based on industry interviews.

TABLE B-6

PLANT C-2

ESTIMATED OPERATING COSTS FOR THE MANUFACTURE OF PRESERVED WOOD – ORGANIC TREATMENT

Cylinder Size: 5 cylinders, each 7' diameter x 130' long, 5000 cubic feet
Capital Cost: $7,160,000 (1978)
Location: West Coast
Production: 2000 cubic feet per charge; 40 hours per charge (Boultonized)
3 shifts per day, 300 days per year
Product: 1,800,000 cubic feet per year of Douglas fir poles

Item	Units	Unit Cost ($)	Units Per Cubic Foot	Dollars Per Cubic Foot	Thousand Dollars Per Year
Raw Materials:					
Wood	Cubic feet	3.40	1.0	3.40	6,120
Pentachlorophenol	Pounds	0.42	0.75	0.32	576
Total Raw Materials				3.72	6,696
Processing:					
Labor, Operating	Man hours	6.00		0.333	600
Labor, Maintenance	Man hours	6.50		0.101	182
Maintenance Supplies				0.120	216
Consumable Supplies				0.061	110
Fuel and Power				0.181	326
Plant Overhead	50% of Labor			0.217	391
Taxes and Insurance	4% of Capital			0.159	286
Total Processing				1.163	2,093
Total Cost, F.O.B. Plant				4.883	8,789

Source: Arthur D. Little, Inc., estimates based on industry interviews.

TABLE B-7

PLANT D-1

ESTIMATED OPERATING COSTS FOR THE MANUFACTURE OF PRESERVED WOOD – ORGANIC TREATMENT

Cylinder Size: 2 cylinders, each 7' diameter x 130' long, 5000 cubic feet
Capital Cost: $3,300,000 (1978)
Location: South Central
Production: 2000 cubic feet per charge; 16 hours per charge (Steaming)
3 shifts per day, 300 days per year
Product: 1,800,000 cubic feet per year of Southern pine lumber

Item	Units	Unit Cost ($)	Units Per Cubic Foot	Dollars Per Cubic Foot	Thousand Dollars Per Year
Raw Materials:					
Wood	Cubic feet	3.60	1.0	3.60	6,480
CCA	Pounds	1.00	0.33	0.33	594
Total Raw Materials				3.93	7,074
Processing:					
Labor, Operating	Man hours	6.00		0.173	311
Labor, Maintenance	Man hours	6.50		0.048	86
Maintenance Supplies				0.048	86
Consumable Supplies				0.024	46
Fuel and Power				0.072	132
Plant Overhead	50% of Labor			0.111	199
Taxes and Insurance	4% of Capital			0.073	132
Total Processing				0.549	992
Total Cost, F.O.B. Plant				4.479	8,066

Source: Arthur D. Little, Inc., estimates based on industry interviews.

TABLE B-8

PLANT D-2

ESTIMATED OPERATING COSTS FOR THE MANUFACTURE OF PRESERVED WOOD – ORGANIC TREATMENT

Cylinder Size: 5 cylinders, each 7' diameter x 130' long, 5000 cubic feet
Capital Cost: $6,509,000 (1978)
Location: South Central
Production: 2000 cubic feet per charge; 16 hours per charge (Steaming)
3 shifts per day, 300 days per year
Product: 4,500,000 cubic feet per year of Southern pine lumber

Item	Units	Unit Cost ($)	Units Per Cubic Foot	Dollars Per Cubic Foot	Thousand Dollars Per Year
Raw Materials:					
Wood	Cubic feet	3.60	1.0	3.60	16,200
CCA	Pounds	1.00	0.33	0.33	1,485
Total Raw Materials				3.93	17,685
Processing:					
Labor, Operating	Man hours	6.00		0.133	600
Labor, Maintenance	Man hours	6.50		0.040	182
Maintenance Supplies				0.048	216
Consumable Supplies				0.024	110
Fuel and Power				0.072	326
Plant Overhead	50% of Labor			0.087	391
Taxes and Insurance	4% of Capital			0.058	260
Total Processing				0.463	2,085
Total Cost, F.O.B. Plant				4.393	19,770

Source: Arthur D. Little, Inc., estimates based on industry interviews.

APPENDIX C

EPA FINANCIAL 308 SURVEY

TABLE C-1

RESPONSES TO EPA FINANCIAL 308 SURVEY

	#	%*
Total Mailed	601	–
Less Duplicates	27	–
Net Responses	424	87.1
Total Applicable Responses	337	69.2
Total Non-Applicable Responses**	87	–
No Answer	150	30.8

*Based on sum of "Total Applicable" and "No Answers" (487).

**Plants which indicated that they do not treat wood.

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

INSTRUCTIONS AND DEFINITIONS RELATING TO WOOD PRESERVING

1. This survey must be completed by each manufacturing facility that treats wood either as a treating service only (TSO) or treats wood products owned by it for subsequent sale to others.

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

3. Please submit one completed questionnaire for *each* plant in the enclosed, pre-addressed envelope by October 21, 1977.

4. All questions contained in this survey are intended to obtain information about your manufacturing operations and activities as they pertain to *wood preserving 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 the answer 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 sheet.

DEFINITIONS

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.*

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.*

General and Administrative Cost – Salaries, wages, and related labor costs not directly associated with production activity; state and local taxes; selling expense insurance and other overhead costs.

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

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.

OSHA – The Occupational Safety and Health Administration.

Other Materials Cost – Chemicals and other supplies used in the production of wood treated products.

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

Payroll Costs – Wages, unemployment insurance, FICA and other related costs of direct labor (and indirect) employed in treating wood products.

Peak Design Capacity = Design Void x 0.6 x Charge Factor

Design Void = 3.142 x (Cylinder Radius)^2 x Cylinder Length

Charge Factor = Average number of possible charges per 24 hour period

Peak Capacity as Modified = Modified Void x 0.6 x Charge Factor

Modified Void = 3.142 x (Current Cylinder Radius)^2 x Current Cylinder Length

Process Waste – Any used water or liquid waste product 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 wood preserving process or from raw material-intermediate product-final product, storage, transportation, handling, processing or cleaning. For purposes of this survey, cooling water, sanitary wastewater, storm water and boiler blowdown are not considered process waste 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 actual corporate tax rate.

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

Return on Investment – The average annual revenue (or decreased cost) realized on an investment, expressed as a percentage of the original investment cost.

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

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

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

Treated Wood Products – Wood treated with organics (oils) or with inorganic salt solutions or dual oil and salt treatment.

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.

Wood Cost – If this plant is treating service only (TSO), wood cost should be zero. If treating owned wood products, show the cost of the wood products *before* treatment. (Use approximate cost as a percentage of sales if actual cost is unknown.)

308 QUESTIONNAIRE

WOOD PRESERVING

Company Code # _____
(for EPA use)

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

i. Name of Plant _____

ii. Plant Site Address _____
Street

_____
City State Zip

iii. Name of Respondent* _____

iv. Address of Respondent _____
Street City State Zip

v. Telephone of Respondent _____

vi. Parent Company _____

vii. Total number of wood treating wood plants owned by parent _____

viii. Is this plant engaged in treating wood products?

Yes ☐ Continue with Questionnaire

No ☐ Do not fill out the questionnaire but return after completing this page, through Question viii with a cover letter describing the nature of your business.

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

1 ☐	5 ☐	10 ☐	14 ☐	18 ☐	22 ☐	26 ☐
2 ☐	7 ☐	11 ☐	15 ☐	19 ☐	23 ☐	
3 ☐	8 ☐	12 ☐	16 ☐	20 ☐	24 ☐	
4 ☐	9 ☐	13 ☐	17 ☐	21 ☐	25 ☐	

*Person to be contacted in case of questions.

308 QUESTIONNAIRE

WOOD PRESERVING

Company Code _____
(for EPA use)

A. GENERAL INFORMATION

1. What is the form of business organization of this plant?

   Proprietorship or Partnership ☐
   Co-op ☐
   Privately-held Corporation ☐
   Publically-held Corporation ☐

2. Is this wood treating plant a stand-alone operation or part of a multi-plant complex at this location?

   Stand-alone ☐
   Multi-plant complex ☐

3. Approximately what percent of total sales at this complex or plant was from wood treating in FY 1976? _____%

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

   Urban ☐
   Suburban ☐
   Rural ☐

5. What year did the wood treating plant begin operation? _____

B. EFFLUENT INFORMATION

6. How does this plant dispose of liquid process waste?

   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. This plant does not generate liquid process waste ☐
   g. Other ☐ Please specify _____

   IF THE ANSWER TO QUESTION 6 IS (c), (d), (e), OR (f), YOU MAY OMIT ANSWERS TO THE FOLLOWING QUESTIONS:

   7, 10, 20, 21b, 22, 25

7.a If you do not discharge liquid *process waste* 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* into a sewer system, on what basis are your sewer charges made?

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

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

   e. If you discharge liquid process waste 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? $ _____

C. SALES AND PRODUCT MIX

8. Fiscal year 1976 wood treating plant sales (thousands of dollars).

Under 70	☐	301-700	☐	1,801-2,400	☐	4,801-7,200	☐
71-155	☐	701-1,200	☐	2,401-3,200	☐	7,201-11,500	☐
156-300	☐	1,201-1,800	☐	3,201-4,800	☐	More than 11,500	☐

9. Which of the following product types are treated at this plant:

Treated Wood Products	Treated at Plant	As a percent of Plant Sales					
		Under 10	11-30	31-50	51-70	71-90	Over 90
a. Organic (Oil or Dual Oil and Salt Treatment)							
(1) Railroad Ties	☐	☐	☐	☐	☐	☐	☐
(2) Pilings, Poles	☐	☐	☐	☐	☐	☐	☐
(3) Timber, Lumber, and Other	☐	☐	☐	☐	☐	☐	☐
b. Inorganic (Salt Based)							
(1) Pilings, Poles	☐	☐	☐	☐	☐	☐	☐
(2) Timber, Lumber, and Other	☐	☐	☐	☐	☐	☐	☐

10.a. Are any changes (other than normal business fluctuations) planned in production process or product mix?

Yes ☐ No ☐ (If No, Go to Part D)

b. Process change towards:

More Organic ☐ More Inorganic ☐

Less Organic ☐ Less Inorganic ☐

c. Product Mix Change

More Ties ☐ More Poles ☐ More Other ☐

Less Ties ☐ Less Poles ☐ Less Other ☐

d. Other, please specify nature of change _____.

D. PLANT CAPACITY AND PRODUCTION

11. What is your *peak design capacity* (or *peak capacity as modified*)? _____ cu. ft. Cubic Feet/24 hour period*

12.a. What region of the country is the origin of *most* of the wood treated at this facility?

Northeast ☐ Southeast ☐ Midwest ☐

Northwest ☐ Southwest ☐ Other ☐

b. Is the wood mostly:

Hardwood ☐ or Softwood ☐

*If unable to calculate peak (design) capacity by the formula shown in "DEFINITIONS" attach a separate sheet describing the radius and length of each cylinder.

13. Typical number of production days per week?

1-4 ☐ 5 ☐ 6 ☐ 7 ☐

14. Number of weeks at each shift level (total should add to 52 weeks):

No. of Weeks

a. _____ at 0 shifts (shut down or no wood preserving)

b. _____ at 1 shift

c. _____ at 2 shifts

d. _____ at 3 shifts

e. _____ at 4 shifts

52 Weeks **TOTAL OF (a) + (b) + (c) + (d) + (e)**

15. 1976 Production (Thousands of cubic feet) _____

16. Typical number of *production workers* in 1976:

1-3 ☐ 7-9 ☐ 20-34 ☐ 49-75 ☐ 100-125 ☐

4-6 ☐ 10-19 ☐ 35-48 ☐ 76-99 ☐ Over 125 ☐

17. This facility is primarily engaged in (a) treating service only (TSO), and or (b) treating owned wood products for sale to others:

		Approximate Percent of Sales				
		Under 10	10-25	26-50	51-75	Over 75
a.	Treating Service Only	☐	☐	☐	☐	☐
b.	Treating Owned Wood Products	☐	☐	☐	☐	☐

18. What proportion of owned wood is from company-owned timberland?

Approximate Percent of Owned Wood Supply				
None	1-24	25-49	50-74	75-100
☐	☐	☐	☐	☐

E. FINANCIAL STATEMENT

19. Revenue and Expenses

Check the box for each item which most closely approximates your 1976 fiscal year expenses as a percent of sales.

	Cost as a Percent of Plant Sales							
	Under 10	10-15	16-21	22-28	29-38	39-48	49-60	Over 60
a. *Wood Cost*	☐	☐	☐	☐	☐	☐	☐	☐
b. *Other Materials Cost*	☐	☐	☐	☐	☐	☐	☐	☐
c. *Payroll Cost*	☐	☐	☐	☐	☐	☐	☐	☐

	Under 1	1-2	3-5	6-8	Over 8
d. *Depreciation*	☐	☐	☐	☐	☐

	Under 10	11-15	16-25	26-30	Over 30
e. *Gross Margin*	☐	☐	☐	☐	☐

	Under 1	1-5	6-10	11-15	Over 15
f. *General and Administrative Cost*	☐	☐	☐	☐	☐

	Under 1	1-4	5-8	9-12	Over 12
g. *Interest Expense*	☐	☐	☐	☐	☐

	Under 1	1-4	5-8	9-12	Over 12
h. *Profit Before Tax*	☐	☐	☐	☐	☐

	Under 1	1-2	3-4	5-7	Over 7
i. *Profit After Tax*	☐	☐	☐	☐	☐

20. How representative was this plant's 1976 profit before tax experience versus the average for 1971-1975?

About the same	☐
Better than Average	☐
Worse than Average	☐

21. Factors related to Revenues and Expenses

a. Fixed Costs: If the plant faces lease, rental or mortgage commitments beyond 1976, (for buildings or equipment), indicate the average annual charges and the year the commitments expire.

	Leases/ Rental ☐	Wood Contracts ☐	Debt Payment ☐	Other* ☐
(1) Average Annual Charge:	$_____	$_____	$_____	$_____
(2) Commitment Expires:	19_____	19_____	19_____	19_____

(*if other commitments attach separate sheet)

b. What *Depreciation* Method is Used:

	Equipment	Buildings
(1) **Book Basis:**		
Straight-Line	☐	☐
Double-Declining Balance	☐	☐
Sum of Year's Digits	☐	☐
Other:	☐	☐
(Please Specify) _____		
(2) **Tax Basis:**		
Straight Line	☐	☐
Double-Declining Balance	☐	☐
Sum of Year's Digits	☐	☐
Other:	☐	☐
(Please Specify) _____		

(3) **Pollution Control Equipment Amortization:**

Accelerated Over 5 Years ☐
Same method as other equipment ☐

22. Unusual Production Costs

Are there any circumstances peculiar to this plant which result in unusual production costs?

Yes ☐ No ☐

If Yes, please describe: _____

_____

23. Historical/Annual Cost of Pollution Control and Other Environmental Regulations:

	Don't Know	None	Fiscal Year Ending 1975	Fiscal Year Ending 1976
(1) Water Pollution Regulations:				
(a) Annual Operating Costs	☐	☐	$_____	$_____
(b) Annual Depreciation Charges	☐	☐	$_____	$_____
(2) Solid Waste Disposal (including waste water sludge and wood waste, contract hauling):				
(a) Annual Operating Costs	☐	☐	$_____	$_____
(b) Annual Depreciation Charges	☐	☐	$_____	$_____
(3) Other Environmental Regulations Affecting Production Processes and Production Costs		Air ☐	OSHA ☐	
(Please Specify): _____				
(a) Annual Operating Costs	☐	☐	$_____	$_____
(b) Annual Depreciation Charges	☐	☐	$_____	$_____
(4) Other Administrative Costs: Environmental department, research, litigation, consultants, additional administrative costs.	☐	☐	$_____	$_____

24. Value of wood treating plant Assets and Liabilities (as of the end of the most recent fiscal year).

a. Net *Fixed Assets* (Gross *Fixed Assets* less cumulative depreciation) $_____ Don't Know ☐

b. Total Assets: (Net *Fixed Assets*, Cash receivables, inventory, other assets) $_____ Don't Know ☐

c. What was the value of this wood treating plant's accounts receivable? $_____

d. What was the value of this wood treating plant's accounts payable? $_____

e. Current Plant Debt (i.e., debt maturing in current year or payable on demand). $_____

f. Long-Term Plant Debt (debt maturing beyond the current year [1977]) $_____

g. Total Plant Liabilities (long-term debt, accounts payable, deferred taxes, other debt, etc.) $_____

25. Capital Investment Criteria for the Plant

a. What investment criteria do you use?

Return on Investment (ROI)	☐
Payback	☐
Discounted Cash Flow	☐
Other	☐

b. If you use return on investment criteria:

(1) What is the target internal pre-tax rate of return on capital required for investment in this plant? _____.

(2) At what ROI would you consider plant shutdown? _____.

c. If you use *payback period* criteria, what is the required payback period for investment?

_____ years

d. What is the current long term interest rate you must pay for new capital?

_____ percent per year

26. Capital Investment for the Plant (not including capitalized operating or maintenance expenses).

	(1) Total Capital Investment	(2) Water Pollution Control	(3) Other Environmental Regulation (State or Federal) Impacting Production Processes
(Actual) 1971-76	$_____	$_____	$_____
(Planned) 1977	$_____	$_____	$_____

STRAIGHT TABULATION OF WOOD PRESERVING INDUSTRY RESPONSES

A. GENERAL INFORMATION

1. What is the form of business organization of this plant?

	Number	Percent
Proprietorship or Partnership	31	9.28
Co-op	1	.30
Privately-held Corporation	230	68.86
Publically-held Corporation	72	21.56
Total	334	100.00

2. Is this wood treating plant a stand-alone operation or part of a multi-plant complex at this location?

	Number	Percent
Stand-alone	268	80.00
Multi-plant complex	67	20.00
Total	335	100.00

3. Approximately what percent of total sales at this complex or plant was from wood treating in FY1976?

0	1-9%	10-19%	20-29%	30-39%	40-49%	
11	21	10	5	6	5	number
0.297	6.231	2.967	1.484	1.780	1.484	percentage
1	21	10	5	6	5	number
0.297	6.231	2.967	1.484	1.780	1.484	percentage

50-59%	60-69%	70-79%	80-89%	90-99%	
17	2	15	22	58	number
5.045	0.593	4.451	6.528	17.211	percentage
17	2	15	22	58	number
5.045	0.593	4.451	6.528	17.211	percentage

100%	NO ANSWER	ROW SUMS
155	20	337
45.994	5.935	100.000
155	20	337
45.994	5.935	100.000

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

	Number	Percent
Urban	98	29.38
Suburban	85	25.22
Rural	153	45.40
Total	336	100.00

5. **What year did the wood treating plant begin operation?**

BEFORE 1930	1931-1940	1941-1950	1951-1960	
58	13	46	83	number
17.456	3.846	13.609	24.556	percentage
59	13	46	83	
17.456	3.846	13.609	24.556	

1961-1970	1971-1977	OTHER	NO ANSWER	ROW SUMS	
76	56		5	337	number
22.485	16.568		1.479	100.000	percentage
76	56		5	337	number
22.485	16.568		1.479	100.000	percentage

B. EFFLUENT INFORMATION

6. How does this plant dispose of liquid process waste?

	Number	Percent
Direct discharge	10	2.9
Indirect-steaming	30	7.8
Indirect-Boulton	10	2.7
Disposed on plant site	98	26.2
Disposed off plant site	18	4.8
No discharge (recycled)	126	33.8
No liquid waste	60	16.1
Inorganic	5	1.3
Other	7	1.9
No entry	9	2.4
Total	337	100.0

IF THE ANSWER TO QUESTION 6 is (c), (d), (e) OR (f), YOU MAY OMIT ANSWERS TO THE FOLLOWING QUESTIONS:

7, 10, 20, 21b, 22, 25

7.(a) If you do not discharge liquid process waste into a municipal sewer, do you have the option to connect?

	Number	Percent
Yes	2	6.67
No	19	63.33
Don't Know	9	30.00
Total	30	100.00

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

0-5,000	5,000-10,000	10,000-15,000	15,000-20,000	20,000-25,000	
	1				number
	0.296				percentage

1
0.296

25,000-30,000	30,000-35,000	35,000-40,000	40,000-45,000	45,000-50,000	> 50,000	
						number
						percentage

DONT KNOW	NO ANSWER	ROW SUMS	
11	325	337	number
3.254	96.450	100.000	percentage
11	325	337	number
3.254	96.450	100.000	percentage

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

	Number	Percent
Flat annual fee	7	17.07
Gallon of effluent	21	51.22
Other	13	31.71
Total	41	100.00

7.(d.) If you discharge into a municipal sewer, what were your total sewer charges in 1976? $_____.

7.(e) If you discharge liquid process waste into navigable waters, do you have an NPDES permit?

	Number	Percent
Yes	10	62.50
No	4	25.00
Don't Know	2	12.50
Total	16	100.00

7. (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?

0-500	500-1,000	1,000-1,500	1,500-2,000	2,000-2,500	
2	1	2	2	2	number
0.592	0.296	0.592	0.592	0.592	percentage
2	1	2	2	2	number
0.592	0.296	0.592	0.592	0.592	percentage

2,500-3,000	3,000-3,500	3,500-4,000	4,000-4,500	4,500-5,000	> 5,000	
3			2	2	13	number
0.888			0.592	0.592	3.846	percentage
3			2	2	13	number
0.888			0.592	0.592	3.846	percentage

NO LAND	NO ANSWER	ROW SUMS	
32	277	337	number
9.467	81.953	100.000	percentage
32	277	337	number
9.467	81.953	100.000	percentage

C. SALES AND PRODUCT MIX

8. Fiscal year 1976 wood treating plant sales (thousands of dollars).

	Number	Percent
Under 70	25	7.86
71 - 155	25	7.86
156 - 300	29	9.12
301 - 700	48	15.09
701 - 1,200	50	15.72
1,200 - 1,800	21	6.60
1,801 - 2,400	21	6.60
2,401 - 3,200	26	8.18
3,201 - 4,800	24	7.55
4,801 - 7,200	30	9.43
7,201 - 11,500	13	4.09
More than 11,500	6	1.89
Total	318	100.00

9. Which of the following product types are treated at this plant:

a. Organic (Oil or Dual Oil and Salt Treatment)

(1) Railroad Ties	Number	Percent
Under 10	35	34.65
11 - 30	19	18.81
31 - 50	7	6.93
51 - 70	10	9.90
71 - 90	10	9.90
Over 90	20	19.80
Total	101	100.00

(2) Pilings, Poles	Number	Percent
Under 10	23	15.43
11 - 30	30	20.13
31 - 50	21	14.10
51 - 70	15	10.07
71 - 90	25	16.78
Over 90	35	23.49
Total	149	100.00

(3) Timber, Lumber, and Other	Number	Percent
Under 10	64	30.77
11 - 30	48	23.07
31 - 50	33	15.86
51 - 70	14	6.73
71 - 90	19	9.13
Over 90	30	14.42
Total	208	100.00

9b. Inorganic (Salt Based)

(1) Pilings, Poles	Number	Percent
Under 10	33	70.21
11 - 30	11	23.40
31 - 50	0	.00
51 - 70	0	.00
71 - 90	1	2.13
Over 90	2	4.25
Total	47	100.00

(2) Timber, Lumber, and Other	Number	Percent
Under 10	13	9.92
11 - 30	26	19.85
31 - 50	13	9.92
51 - 70	6	4.58
71 - 90	14	10.68
Over 90	59	15.04
Total	131	100.00

		Number	Percent
9c.	Other	1	100.00

10a. Are any changes (other than normal business fluctuations) planned in production process or product mix?

	Number	Percent
Yes	11	8.21
No	123	91.79
Total	134	100.00

10b. Process changes towards:

	Number	Percent
More Organic	1	10.00
Less Organic	6	60.00
More Inorganic	3	30.00
Less Inorganic	0	.00
Total	10	100.00

10c. Product Mix Change

	Number	Percent
More Ties	2	33.33
Less Ties	0	.00
More Poles	0	.00
Less Poles	0	.00
More Other	4	66.67
Less Other	0	.00
Total	6	100.00

D. PLANT CAPACITY AND PRODUCTION

12a. What region of the country is the origin of most of the wook treated at this facility?

	Number	Percent
Northeast	15	4.55
Northwest	65	19.75
Southeast	146	44.37
Southwest	39	11.85
Midwest	40	12.16
Other	24	7.29
Total	329	100.00

12b. Is the wood mostly:

	Number	Percent
Hardwood	62	18.84
Softwood	267	81.16
Total	329	100.00

13. Typical number of production days per week?

	Number	Percent
1 - 4 days	32	9.79
5 days	252	77.06
6 days	26	7.95
7 days	17	5.20
Total	327	100.00

14. Number of weeks at each shift level (total should add to 52 weeks):
at 0 shifts (shut down or no wood preserving)

0-9	10-19	20-29	30-39	
281	12	10	6	number
83.136	3.550	2.959	1.775	percentage
281	12	10	6	number
83.136	3.550	2.959	1.775	percentage

40-49	50-52	POOR DATA	ROW SUMS	
1	1	27	338	number
0.296	0.296	7.983	100.000	percentage
1	1	27	338	number
0.296	0.296	7.988	100.000	percentage

14. Number of weeks at each shift level (total should add to 52 weeks):
(cont)

at 1 shift

0-9	10-19	20-29		
96	10	17		number
30.868	3.215	5.466		percentage
96	10	17		number
30.868	3.215	5.466		percentage

30-39	40-49	50-52	ROW SUMS	
16	19	153	311	number
5.145	6.109	49.196	100.000	percentage
16	19	153	311	number
5.145	6.109	49.196	100.000	percentage

14. Number of weeks at each shift level (total should add to 52 weeks): (cont)

at 2 shifts

0-9	10-19	20-29	
261	19	8	number
83.923	6.109	2.572	percentage
261	19	8	number
83.923	6.109	2.572	percentage

30-39	40-49	50-52	ROW SUMS	
5	4	14	311	number
1.608	1.286	4.502	100.000	percentage
5	4	14	311	number
1.608	1.286	4.502	100.000	percentage

14. Number of weeks at each shift level (total should add to 52 weeks):
(cont) at 3 shifts

0-9	10-19	20-29	
231	4	5	number
74.277	1.286	1.608	percentage
231	4	5	number
74.277	1.286	1.608	percentage

30-39	40-49	50-52	ROW SUMS	
5	7	59	311	number
1.608	2.251	18.971	100.000	percentage
5	7	59	311	number
1.608	2.251	18.971	100.000	percentage

14. Number of weeks at each shift level (total should add to 52 weeks):
(cont) at 4 shifts

0-9	10-19	20-29	
307	2		number
98.714	0.643		percentage
307	2		number
98.714	0.643		percentage

30-39	40-49	50-52	ROW SUMS	
		2	311	number
		0.643	100.000	percentage
		2	311	number
		0.643	100.000	percentage

15. 1976 Production (Thousands of cubic feet).

0	< 250,000	250,000- 500,000	
	120	56	number
	35.61	16.617	percentage
	120	56	number
	35.61	16.617	percentage

500,000- 750,000	750,000- 1,000,000	> 1,000,000	NO ANSWER	
30	17	59	55	number
8.902	5.044	17.751	16.320	percentage
30	17		55	number
8.902	5.044	17.751	16.320	percentage

	ROW SUMS	
	337	number
	100.000	percentage
	337	number
	100.000	percentage

16. Typical number of production workers in 1976:

	Number	Percent
1 - 3	73	22.32
4 - 6	39	11.93
7 - 9	26	7.95
10 - 19	56	17.12
20 - 34	55	16.92
35 - 48	27	8.26
49 - 75	35	10.70
76 - 99	8	2.45
100 - 125	6	1.83
Over 125	2	.61
Total	327	100.00

17. This facility is primarily engaged in (a) treating service only (TSO), and/or (b) treating owned wood products for sale to others:

a. Treating Service Only	Number	Percent
Under 10	134	52.55
10 - 25	49	19.22
26 - 50	30	11.76
51 - 75	14	5.49
Over 75	28	10.98
Total	256	100.00

b. Treating Owned Wood Products	Number	Percent
Under 10	21	6.80
10 - 25	20	6.47
26 - 50	17	5.50
51 - 75	39	12.12
Over 75	212	68.61
Total	309	100.00

18. What proportion of owned wood is from company-owned timberland?

	Number	Percent
None	256	77.81
1 - 24	59	17.93
25 - 49	3	.91
50 - 74	2	.61
75 - 100	9	2.74
Total	329	100.00

E. FINANCIAL STATEMENT

19. Revenue and Expenses

a.

Wood Cost	Number	Percent
Under 10	17	5.67
10 - 15	10	3.34
16 - 21	10	3.34
22 - 28	15	5.02
29 - 38	49	16.39
39 - 48	59	19.73
49 - 60	69	23.08
Over 60	70	23.41
Total	299	100.00

b.

Other Materials Cost	Number	Percent
Under 10	65	21.60
10 - 15	74	24.50
16 - 21	72	23.92
22 - 28	44	14.62
29 - 38	27	8.97
39 - 48	13	4.32
49 - 60	1	.33
Over 60	5	1.66
Total	301	100.00

c. Payroll Cost	Number	Percent
Under 10	103	33.66
10 - 15	102	33.23
16 - 21	45	14.71
22 - 28	36	11.76
29 - 38	13	4.24
39 - 48	4	1.30
49 - 60	1	.33
Over 60	2	.65
Total	306	100.00

d. Depreciation	Number	Percent
Under 1	59	19.22
1 - 2	117	38.11
3 - 5	85	27.69
6 - 8	26	8.47
Over 8	20	6.51
Total	307	100.00

e. Gross Margin	Number	Percent
Under 10	102	33.33
10 - 15	53	17.32
16 - 25	87	28.43
26 - 30	27	8.82
Over 30	37	12.09
Total	306	100.00

f. General and Administrative Cost	Number	Percent
Under 1	18	6.10
1 - 5	88	29.83
6 - 10	93	31.52
11 - 15	48	16.27
Over 15	48	16.27
Total	295	100.00

g. Interest Expense	Number	Percent
Under 1	171	59.37
1 - 4	84	29.01
5 - 8	24	8.33
9 - 12	5	1.73
Over 12	4	1.38
Total	288	100.00

h. Profit Before Taxes	Number	Percent
Under 1	68	23.53
1 - 4	83	28.72
5 - 8	61	21.11
9 - 12	46	15.92
Over 12	31	10.73
Total	289	100.00

1. Profit After Tax	Number	Percent
Under 1	76	27.84
1 - 2	63	23.08
3 - 4	56	20.51
5 - 7	45	16.42
Over 7	33	12.04
Total	273	100.00

20. How representative was this plant's 1976 profit before tax experience versus the average for 1971-1975?

	Number	Percent
About the Same	70	40.69
Better than Average	36	20.93
Worse than Average	66	38.37
Total	172	100.00

21. Factors related to Revenues and Expenses

a. Fixed Costs: If the plant faces lease, rental or mortgage commitments beyond 1976, (for buildings or equipment), indicate the average annual charges and the year the commitments expire.

Leases/Rental

(1) Average Annual Charge: $_____

0	< 25,000	25,000-50,000	50,000-75,000	75,000-100,000	
247	68	10	4	1	number
73.077	20.118	2.959	1.183	0.296	percentage
247	68	10	4	1	number
73.077	20.118	2.959	1.183	0.296	percentage

100,000-125,000	125,000-150,000	150,000-175,000	175,000-200,000	200,000-225,000	225,000-250,000	
3	2	3				number
0.888	0.592	0.888				percentage
3	2	3				number
0.888	0.592	0.888				percentage

> 250,000	ROW SUMS	
	338	number
	100.000	percentage
	338	number
	100.000	percentage

21. Factors related to Revenues and Expenses
(cont)

a. Fixed Costs: If the plant faces lease, rental or mortgage commitments beyond 1976, (for buildings or equipment), indicate the average annual charges and the year the commitments expire.

Wood Contracts

(1) Average Annual Charge; $_____

0	< 25,000	25,000- 50,000	50,000- 75,000	75,000- 100,000	
325	5	1		3	number
96.154	1.479	0.296		0.888	percentage
325	5	1		3	number
96.154	1.479	0.296		0.888	percentage

100,000- 125,000	125,000- 150,000	150,000- 175,000	175,000- 200,000	200,000- 225,000	225,000- 250,000	
1	3					number
0.296	0.888					percentage
1	3					number
0.296	0.888					percentage

> 250,000	ROW SUMS	
	338	number
	100.000	percentage
	338	number
	100.000	percentage

21. Factors related to Revenues and Expenses
(cont)

a. Fixed Costs: If the plant faces lease, rental or mortage commitments beyond 1976, (for buildings or equipment), indicate the average annual charges and the year the commitments expire.

Debt Payment

(1) Average Annual Charge: $_____

0	< 25,000	25,000-50,000	50,000-75,000	75,000-100,000	
257	31	24	11	2	number
76.036	9.172	7.101	3.254	0.592	percentage
257	31	24	11	2	number
76.036	9.172	7.101	3.254	0.592	percentage

100,000-125,000	125,000-150,000	150,000-175,000	175,000-200,000	200,000-225,000	225,000-250,000	
5	1	3		1		number
1.479	0.296	0.888		0.296		percentage
5	1	3		1		number
1.479	0.296	0.888		0.296		percentage

> 250,000	ROW SUMS	
3	338	number
0.888	100.000	percentage
3	338	number
0.888	100.000	percentage

21. Factors related to Revenues and Expenses
(cont)

a. Fixed Costs: If the plant faces lease, rental or mortgage commitments beyond 1976, (for buildings or equipment), indicate the average annual charges and the year the commitments expire.

Other

(1) Average Annual Charge: $_____

0	< 25,000	25,000-50,000	50,000-75,000	75,000-100,000	
333	2		1		number
98.521	0.592		0.296		percentage
333	2		1		number
98.521	0.592		0.296		percentage

100,000-125,000	125,000-150,000	150,000-175,000	175,000-200,000	200,000-225,000	225,000-250,000	
						number
						percentage

> 250,000	ROW SUMS	
2	338	number
0.592	100.000	percentage
2	338	number
0.592	100.000	percentage

21. (cont) Factors related to Revenues and Expenses

a. Fixed Costs: If the plant faces lease, rental or mortgage commitments beyond 1976, (for buildings or equipment), indicate the average annual charges and the year the commitments expire.

Leases/Rental

(2) Commitment Expires: 19_____

BEFORE 1985	1985-1995	AFTER 1995	NO ANSWER	ROW SUMS	
55	14	4	265	338	number
16.272	4.142	1.183	78.402	100.000	percentage
55	14	4	265	338	number
16.272	4.142	1.183	78.402	100.000	percentage

21. Factors related to Revenues and Expenses

(cont) a. Fixed Costs: If the plant faces lease, rental or mortgage commitments beyond 1976, (for buildings or equipment), indicate the average annual charges and the year the commitments expire.

Wood Contracts

(2) Commitment Expires: 19_____

BEFORE 1985	1985-1995	AFTER 1995	NO ANSWER	ROW SUMS	
11			327	338	number
3.254			96.746	100.000	percentage
11			327	338	number
3.254			96.746	100.000	percentage

21. Factors related to Revenues and Expenses

(cont) a. Fixed Costs: If the plant faces lease, rental or mortgage commitments beyond 1976, (for buildings or equipment), indicate the average annual charges and the year the commitments expire.

Debt Payment

(2) Commitment Expires: 19_____

BEFORE 1985	1985-1995	AFTER 1995	NO ANSWER	ROW SUMS	
54	20	3	261	338	number
15.976	5.917	0.888	77.219	100.000	percentage
54	20	3	261	338	number
15.976	5.917	0.888	77.219	100.000	percentage

21. Factors related to Revenues and Expenses
(cont)

a. Fixed Costs: If the plant faces lease, rental or mortgage commitments beyond 1976, (for buildings or equipment), indicate the average annual charges and the year the commitments expire.

Other

(2) Commitment Expires: 19_____

BEFORE 1985	1985-1995	AFTER 1995	NO ANSWER	ROW SUMS	
6	1		331	338	number
1.775	0.296		97.929	100.000	percentage
6	1		331	338	number
1.775	0.296		97.929	100.000	percentage

b. What Depreciation Method is Used:

(1) Book Basis	Equipment Number	Equipment Percent	Buildings Number	Buildings Percent
Straight-Line	109	73.65	121	87.60
Double-Declining Balance	35	23.65	13	9.48
Sum of Year's Digits	2	1.34	2	1.46
Other	2	1.35	2	1.46
Total	148	100.00	137	100.00

(2) Tax Basis	Equipment Number	Equipment Percent	Buildings Number	Buildings Percent
Straight-Line	81	52.26	99	72.26
Double-Declining Balance	68	43.87	31	22.63
Sum of Year's Digits	4	2.58	4	2.92
Other	2	1.29	3	2.19
Total	155		138	100.00

(3) Pollution Control Equipment Amortization

	Number	Percent
Accelerated Over 5 Years	13	11.92
Same method as Other Equipment	96	88.08
Total	109	100.00

22. Unusual Production Costs--Are there any circumstances peculiar to this plant which result in unusual production costs?

	Number	Percent
Yes	17	9.77
No	157	90.23
Total	174	100.00

23. Historical/Annual Cost of Pollution Control and Other Environmental Regulations

(1) Water Pollution Regulations

a. Annual Operating Costs	Number	Percent
Don't Know	145	63.60
None	83	36.40
Total	228	100.00

b. Annual Depreciation Charges	Number	Percent
Don't Know	125	57.07
None	94	42.93
Total	219	100.00

(2) Solid Waste Disposal (including waste water sludge and wood waste, contract hauling)

a. Annual Operating Costs	Number	Percent
Don't Know	134	56.07
None	105	43.93
Total	239	100.00

b. Annual Depreciation Charges	Number	Percent
Don't Know	126	51.63
None	118	48.37
Total	242	100.00

(3) Other Environmental Regulations Affecting Production Processes and Production Costs

	Number	Percent
Air	49	40.83
OSHA	33	27.50
Both	38	31.67
Total	120	100.00

a. Annual Operating Costs	Number	Percent
Don't Know	129	64.82
None	70	35.18
Total	199	100.00

b. Annual Depreciation Charges	Number	Percent
Don't Know	122	58.94
None	85	41.06
Total	207	100.00

(4) Other Administrative Costs: Environmental department, research litigation, consultants, additional administrative costs.

	Number	Percent
Don't Know	126	59.43
None	86	40.57
Total	212	100.00

24. Value of wood treating plant Assets and Liabilities (as of the end of the most recent fiscal year).

a. Net FIXED ASSETS (Gross FIXED ASSETS less cumulative depreciation). $_____

0	1	2	3	4
86	42	32	15	17
25.444	12.426	9.467	4.438	5.030
86	42	32	15	17
25.444	12.426	9.467	4.438	5.030

5	6	7	8	9	1,000,000-2,000,000
11	4	7	4	3	19
3.254	1.183	2.071	1.183	1.183	5.621
11	4	7	4	3	19
3.254	1.183	2.071	1.183	1.183	5.621

> 2,000,000	NO ANSWER	ROW SUMS
7	90	337
2.071	26.627	100.000
7	90	337
2.071	26.627	100.000

24. (cont) Value of wood treating plant Assets and Liabilities (as of the end of the most recent fiscal year).

b. Total Assets: (Net FIXED ASSETS, Cash receivables, inventory, other assets) $_____

0	1	2	3	4
32	26	19	11	22
9.467	7.692	5.621	3.254	6.509
32	26	19	11	22
9.467	7.692	5.621	3.254	6.509

5	6	7	8	9	1,000,000-2,000,000
7	8	7	8	3	35
2.071	2.367	2.071	2.367	0.888	10.355
7	8	7	8	3	35
2.071	2.367	2.071	2.367	0.888	10.355

> 2,000,000	NO ANSWER	ROW SUMS
40	119	337
12.130	35.207	100.000
40	119	337
12.130	35.207	100.000

24. Value of wood treating plant Assets and Liabilities (as of the end of the most recent fiscal year). (cont)

c. What was the value of this wood treating plant's accounts receivable? $_____

< 25,000	25,000-50,000	50,000-75,000	75,000-100,000
47	18	23	18
13.905	5.325	6.805	5.325

100,000-125,000	125,000-150,000	> 150,000	NO ANSWER	ROW SUMS
14	13	98	106	337
4.142	3.846	29.290	31.361	100.000

24. Value of wood treating plant Assets and Liabilities (as of the end of the most recent fiscal year). (cont)

d. What was the value of this wood treating plant's accounts payable? $_____

< 25,000	25,000-50,000	50,000-75,000	75,000-100,000
68	28	14	15
20.116	8.284	4.142	4.438

100,000-125,000	125,000-150,000	> 150,000	NO ANSWER	ROW SUMS
13	4	70	127	337
3.846	1.183	20.414	37.574	100.000

24. (cont) **Value of wood treating plant Assets and Liabilities (as of the end of the most recent fiscal year).**

e. Current Plant Debt (i.e., debt maturing in current year or payable on demand) $_____

< 25,000	25,000- 50,000	50,000- 75,000	75,000- 100,000
50	24	12	8
14.793	7.101	3.550	2.367

100,000- 125,000	125,000- 150,000	> 150,000	NO ANSWER	ROW SUMS
9	1	47	186	337
2.663	0.296	13.905	55.325	100.000

24. Value of wood treating plant Assets and Liabilities (as of the end of the most recent fiscal year). (cont)

f. Long-Term Plant Debt (debt maturing beyond the current year [1977]) $_____

0	1	2	3	4
65	25	5	7	9
19.231	7.396	1.479	2.071	2.663
65	25	5	7	9
19.231	7.396	1.479	2.071	2.663

5	6	7	8	9	1,000,000-2,000,000
5		1			2
1.479		0.296			0.592
5		1			2
1.479		0.296			0.592

> 2,000,000	NO ANSWER	ROW SUMS
1	217	337
0.296	64.497	100.000
1	217	337
0.296	64.497	100.000

25. Capital Investment Criteria for the Plant

a. What investment criteria do you use?

	Number	Percent
Return on Investment (ROI)	75	63.02
Payback	21	17.64
Other	23	19.34
No Answer	218	
Total	337	100.00

24. Value of wood treating plant Assets and Liabilities (as of the end of the (cont) most recent fiscal year).

g. Total Plant Liabilities (long-term debt, accounts payable, deferred taxes, other debt, etc.) $_____

0	1	2	3	4
63	29	18	14	9
18.639	8.580	5.325	4.142	2.663

5	6	7	8	9	1,000,000-2,000,000
8	5	4	3	2	13
2.367	1.479	1.183	0.888	0.592	3.846

> 2,000,000	NO ANSWER	ROW SUMS
4	165	337
1.183	49.112	100.000

26. Capital Investment Criteria for the Plant
(cont)

b. If you use return on investment criteria:

(1) What is the target internal pre-tax rate of return on capital required for investment in this plant?_____

0-4%	5-9%	10-14%	15-19%	20-24%
	2	7	11	8
	0.592	2.071	3.254	2.367

25-29%	30-34%	35-39%	40-44%	45-49%	50% OR GREATER
12	8		3		1
3.846	2.367		0.888		0.296

NOT APPLIC	NO ANSWER	ROW SUMS
265	20	333
78.402	5.917	100.000
265	20	338
78.402	5.917	100.000

26. Capital Investment Criteria for the Plant
(cont)

b. If you use return on investment criteria:

(2) At what ROI would you consider plant shutdown?_____

0-4%	5-9%	10-14%	15-19%	20-24%
5	8	6	6	7
1.479	2.367	1.775	1.775	2.367

25-29%	30-34%	35-39%	40-44%	45-49%	50% OR GREATER
		1			1
		0.296			0.296

NOT APPLIC	NO ANSWER	ROW SUMS
265	38	337
78.402	11.243	100.000

26. Capital Investment Criteria for the Plant
(cont)

c. If you use payback period criteria, what is the required payback period for investment?_____years

< 2 YRS	2	3	4	5
1	2	2	2	6
0.296	0.592	0.592	0.592	2.071

6	7	8	9	10	> 10 YRS
				3	3
				0.888	0.888

NOT APPLIC	NO ANSWER	ROW SUMS
317	1	337
93.787	0.296	100.000

26. Capital Investment Criteria for the Plant

(cont) d. What is the current long term interest rate you must pay for new capital?_____percent per year

< 7%	7	8	9	10
3	1	11	20	25
0.888	0.296	3.550	5.917	7.396

11	12	> 12%	NO ANSWER	ROW SUMS
3	5	17	252	337
0.888	1.479	5.030	74.556	100.000

26. (cont) Capital Investment for the Plant (not including capitalized operating or maintenance expenses).

(1)
Total Capital Investment

(Actual) 1971-76 $_____

ZERO ENTRY	1-250,000	250,000-500,000
	113	56
	33.432	16.568
	113	56
	33.432	16.568

500,000-750,000	750,000-1,000,000		NO ANSWER
24	34		110
7.101	10.355		32.544
24	34		110
7.101	10.355		32.544

	ROW SUMS
	337
	100.000
	337
	100.000

26. (cont) Capital Investment for the Plant (not including capitalized operating or maintenance expenses).

(1)
Total Capital Investment

(Planned) 1977 $_____

ZERO ENTRY	0	1	2
3	93	32	9
0.888	27.515	9.467	2.663

3	NO ANSWER	ROW SUMS
13	188	337
3.846	55.621	100.000
13	188	337
3.846	55.621	100.000

26. Capital Investment for the Plant (not including capitalized operating or (cont) maintenance expenses).

(2)
Water Pollution Control
$_____

(Actual) 1971-76

ZERO ENTRY	0	1	2
	101	16	1
	29.882	4.734	0.296
	101	16	1
	29.882	4.734	0.296

3	NO ANSWER	ROW SUMS
5	215	337
1.479	63.609	100.000
5	215	337
1.479	63.609	100.000

26. Capital Investment for the Plant (not including capitalized operating or (cont) maintenance expenses).

(2)
Water Pollution Control

(Planned) 1977 $_____

ZERO ENTRY	0	1	2
3	67	3	
0.888	19.822	0.888	

3	NO ANSWER	ROW SUMS
1	264	338
0.296	78.107	100.000

26. Capital Investment for the Plant (not including capitalized operating or (cont) maintenance expenses).

(3)

Other Environmental Regulation (State or Federal) Impacting Production Processes

(Actual) 1971-76 $_____

ZERO ENTRY	0	1	2
1	43	3	1
0.296	12.722	0.888	0.296
1	43	3	1
0.296	12.722	0.888	0.296

3	NO ANSWER	ROW SUMS
1	289	338
0.296	85.503	100.000
1	289	338
0.296	85.503	100.000

26. (cont) Capital Investment for the Plant (not including capitalized operating or maintenance expenses).

(3)

Other Environmental Regulation (State or Federal) Impacting Production Processes

(Planned) 1977 $_____

ZERO ENTRY	0	1	2
5	26	2	
1.479	7.692	0.592	

3	NO ANSWER	ROW SUMS
1	304	338
0.296	89.941	100.000
1	304	338
0.296	89.941	100.000

☆ U S GOVERNMENT PRINTING OFFICE · 1979 311-132/152