INITIAL ANALYSIS OF THE ECONOMIC IMPACT OF WATER POLLUTION CONTROL COSTS UPON THE TEXTILE INDUSTRY

This study is one of a series commissioned by the Environmental Protection Agency to provide an initial assessment of the economic impact of water pollution control costs upon industry, and to provide a framework for future industrial analysis.

For the purpose of this initial analysis, the water pollution control requirements were assumed to be those developed in 1972 as effluent limitation guidance by the EPA Office of Permit Programs. Costs were developed by the EPA Economic Analysis Division on the basis of treatment technologies assumed necessary to meet the effluent limitation guidance.

Because of the limitations of time and information available, these studies are not to be considered definitive. They were intended to provide an indication of the kinds of impacts to be expected and to highlight possible problem areas.

This document is a preliminary draft. It has not been formally released by EPA and should not at this stage be construed to represent Agency policy. It is being circulated for comment on its technical accuracy and policy implications.

FINAL REPORT

Analysis of the Economic Impact of Water Pollution Control Costs on the Textile Industry

ENVIRONMENTAL PROTECTION AGENCY

Washington, D. C.

This report is of a proprietary nature and intended solely for the information of the client to whom it is addressed.

January 5, 1973

BOOZ · ALLEN PUBLIC ADMINISTRATION SERVICES, Inc. 1025 Connecticut Avenue, N W
Washington D C. 20036
(202) 293-3600

January 5, 1973

Mr. Lyman Clark
Environmental Protection Agency
Waterside Mall
401 M Street, S. W.
Washington, D. C.

Dear Mr. Clark:

We are pleased to submit our final report on the Economic Impact of the Cost of Meeting Federal Effluent Limitation Guidance standards on the Textile Industry. Contained in this volume are an Executive Summary, a detailed Final Report of findings and conclusions and an Appendix which describes significant Textile Industry characteristics and trends.

Very truly yours,

Booz, Allen
Public Administration Services, Inc.

EXECUTIVE SUMMARY

This summary covers the contents of Chapter I-VI of the detailed Final Report contained in this volume. Following the Final Report is an Appendix which provides a general description of textile industry characteristics and trends.

1. THERE ARE ABOUT 7,100 TEXTILE PLANTS CURRENTLY IN OPERATION WITH 10 PERCENT OF THESE PLANTS CONSUMING APPROXIMATELY 97 PERCENT OF THE WATER USED BY THE INDUSTRY

The textile industry is highly diffuse with about 7,100 plants in operation. Plants range from large highly integrated facilities to small contract plants which process goods owned by others. Similarly, textile firms range from large integrated and diversified producers such as Burlington Industries to small, privately held single plant companies with limited product and process capabilities.

In terms of plant type, wet process plants which number about 684 consume about 97 percent of the water used by the textile industry. The specific wet processes are:

- Scouring
- Desizing
- Dyeing
- Mercerizing
- Other wet finishing
- Bleaching
- Bonding & laminating

Water pollution abatement requirements and costs will be concentrated among these plants.

2. IT IS ESTIMATED THAT 90 PERCENT OF WET PROCESS PLANTS EITHER HAVE ACCESS TO MUNICIPAL WATER TREATMENT OR PROVIDE SOME IN-HOUSE TREATMENT

Only 10 percent of the wet process plants currently in operation provide no water treatment. Of the other plants, about one-half use

municipal water treatment with the balance providing some degree of in-house treatment. In general, plants having access to or using municipal treatment should face the lowest incremental water pollution abatement costs with plants providing no treatment, and unable to connect to municipal systems, facing the highest costs. Incremental costs for plants currently providing in-house treatment will depend on the degree of upgrading required to meet ELG* standards. There is currently no data available which would permit an identification of which specific wet process plants face high or low cost pollution abatement alternatives. The estimates presented above are based on samplings conducted by the American Textile Manufacturers Institute which did not identify specific plants.

3. BASED ON GENERAL INDUSTRY CHARACTERISTICS, PLANTS WHICH ARE MOST AND LEAST VULNERABLE TO ABATEMENT COSTS CAN BE DESCRIBED

Exhibit S-I, following this page, summarizes the characteristics of wet process plants most and least likely to be adversely affected by water pollution abatement costs. The advantages of large plants owned by large producers are as follows:

- Large producers are growing more rapidly and are more profitable than small producers. They are most likely to possess modern plants with water treatment facilities already in place.

- Water treatment costs in large plants per unit of output should be lower than in similar small plants

- Wet process plants which are part of a fully integrated production complex should be better able to maintain production in slack demand periods than non-integrated plants

- Multiple product plants have more flexibility to handle demand (fashion) changes than single or limited product plants

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* Effluent Limitation Guidance (1972) prepared by the Office of Permit Programs, EPA

EXHIBIT S-1

Environmental Protection Agency

PLANT TYPES MOST AND LEAST VULNERABLE TO POLLUTION ABATEMENT COSTS

	Least Vulnerable Plant	Most Vulnerable Plant
Ownership	Public	Private
Size of Firm	Large ($50 million sales)	Small (sales less than $50 million)
Size of Plant	Large	Small
Degree of Integration	Part of a Fully Integrated Complex	Non-integrated
Product Lines	Multiple Product Lines	Single Product Capability
Water Treatment and Disposal	Discharge to Municipal Sewers	In-House Treatment direct discharge to waterway

- Other things being equal, plants with access to municipal treatment will face lower pollution abatement costs than plants without such an option. The historical structure of municipal water use charges favors large water users.

As indicated above, the data needed to relate general characteristics to specific plants, especially regarding water treatment options are not currently available. Detailed data regarding plant location, ownership, employment, and products has been provided to EPA under separate cover.

4. TEXTILE MANUFACTURERS DO NOT HAVE THE OPTION OF PASSING ON COST INCREASES IN THE FORM OF PRICE INCREASES

Textile prices are controlled by relatively free market forces related to supply and demand with no producer or group of producers in a position to administer prices. Accordingly, textile producers charge what the market will bear (excluding consideration of price controls). Thus, price relief from pollution abatement costs must come in the form of a strong textile market which itself will cause prices to rise, assuming competition from low cost imports is restrained.

5. POLLUTION ABATEMENT COSTS ARE A MINOR COMPONENT OF THE COST/PRICE PROBLEM FACED BY TEXTILE PRODUCERS

For a hypothetical textile producer, faced with the need to install in-plant pollution abatement equipment, the price increase required to pass on all costs could be as high as 1.4 percent cumulative over 1972 average prices.* Compared to potential price increases required to pass on increased manufacturing costs and to bring producer profit margins and return on equity levels up to

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* Maximum price increases could be higher for specific products. The 1.4 percent estimate represents an average across all product lines.

"satisfactory"* levels the problem of pollution abatement costs is relatively minor. If it is assumed that textile manufacturing costs will increase at a rate of 3 percent per year over the next five years, including allowances for productivity gains relative cumulative price increases required by the above producer would be as follows:

	(%) Cumulative	% of Total Price Increases
To cover manufacturing costs	20.0%	86.2%
To increase profitability	1.6%	6.9%
To cover pollution abatement costs	1.6%	6.9%
Total	23.2%	100.0%

The key to achieving required price increases lies in market behavior and the rate at which manufacturing costs actually increase over the next five years, and it is apparent that pollution abatement cost will be a relatively minor part of the cost/price problem to be faced by the textile industry, even by those producers whose pollution abatement costs will be relatively high.

6. DURING 1971 SMALL PRODUCERS WERE, AS A GROUP, MORE PROFITABLE THAN LARGE PRODUCERS BUT THIS SITUATION IS UNLIKELY TO CONTINUE

Exhibit S-II, following this page, summarizes the comparative financial performance of large (sales over $50 million) textile producers and small (sales under $50 million) textile producers for the period 1967-1971. During 1971 small producers outperformed large producers both in terms of sales growth and profitability. This situation which runs counter to the 1967-1971 trend should be reversed in the future for the following reasons:

- Roughly 73 percent of industry capital spending over the past five years has been accounted for

* Satisfactory return on equity is assumed to be 9.2 percent, the average of the best 5 years for the textile industry during the 1960's

EXHIBIT S-II

Environmental Protection Agency

FINANCIAL PERFORMANCE OF
LARGE AND SMALL TEXTILE FIRMS

Year	($) SALES Total* Industry	48 Major Firms (000)	Other Firms	($) NET PROFIT Total* Industry	48 Major Firms (000)	Other Firms	NET PROFIT % OF SALES Total* Industry	48 Major Firms (000)	Other Firm
1972	18,683**	N/A	N/A	463	N/A	N/A	2.5	N/A	N/A
1971	22,938	9,872	13,066	558	249	309	2.4	2.5	2.4
1970	21,599	9,386	12,213	413	245	168	1.9	2.6	1.4
1969	21,780	9,205	12,575	621	302	319	2.9	3.3	2.5
1968	20,841	8,430	12,411	654	315	339	3.1	3.7	2.7
1967	18,672	7,436	11,236	540	268	272	2.9	3.6	2.4

CAPITAL EXPENDITURES
(000)

Year	Total Industry	48 Major Firms	Other Firms	% of Total by 48 Major Firms
1972	710	N/A	N/A	N/A
1971	610	445	165	73.0
1970	560	437	123	78.0
1969	630	519	111	82.4
1968	530	398	132	75.1
1967	680	381	299	62.5

* 48 Major Firms represent those with annual sales of $50 million and over. On an industry wide basis, such firms account for 47% of total sales. Data from 48 major firms cover 43% of total sales. Thus, the category Other Firms is representative of the performance of small firms (sales of $50 million and under).

** Covers 3 quarters through September 30, 1972

Source: Federal Trade Commission, Chase Manhattan Bank Financial Summary, Moody's Industrial Manual

by large producers which account for less than 50 percent of industry sales. Accordingly, their plant and equipment should be more modern than that of small producers

- Differential growth rates favor large producers; the trend toward concentration of output should continue

- Large producers are better able to maintain performance in the face of tight markets as is evidenced by relative 1970 performance. In periods of demand growth, small producer performance may increase sharply as occurred in 1971.

7. FUTURE PROFITABILITY WILL BE THE MAJOR FACTOR CONTROLLING TEXTILE INDUSTRY CAPITAL ACCESS

As indicated by Exhibit S-II, industry profitability during 1971 and 1972 while higher than during 1970 remains low. Future prospects for improved profitability are clouded. While overall demand is expected to improve as the overall state of the economy improves, the questions of future import penetration, even with existing controls, and manufacturing costs remain unanswered. Unless profitability improves, however, most producers will find capital access restricted to that which can be generated internally:

- Raising additional equity in the open market is out of the question at this time, in most cases

- Large producers have spent heavily for capital equipment which has yet to produce a significant return. Thus, significant additional borrowing must await some demonstration that additional capital investment can produce real profits.

- Small producers overall should have less total borrowing capacity than large producers due to risk as highlighted by industry trends. Thus, while small producers are on average less highly leveraged than large producers their access to additional debt should be similarly limited.

8. INITIAL POLLUTION ABATEMENT COST ESTIMATES WERE PROVIDED BY EPA WITH FINAL ESTIMATES DEVELOPED JOINTLY BY EPA AND BOOZ, ALLEN

Exhibit S-III, following this page, contains the initial water pollution abatement cost estimates supplied by EPA. The estimates shown are based on Effluent Limitation Guidance standards developed in 1972 by the EPA Office of Permit Programs. The estimates shown presume that no water treatment is currently provided and that the option of municipal treatment does not exist.

Specific plants which have municipal treatment options or treatment facilities operating in-house should experience costs lower than those shown. Data required to estimate cost differentials for differing treatment options could not be obtained within the scope of this study.

Because textile plant operating cost data to which the EPA cost estimates could be applied were not available, pollution abatement capital requirements and annual cost estimates were prepared on an industry wide basis. The methodology used was developed jointly by EPA and Booz, Allen. These estimates were based on several significant assumptions which are detailed in the body of the report. These assumptions basically relate to validity of base data and water treatment scaling factors provided by EPA as well as patterns of textile industry water usage.

Exhibit S-IV summarizes estimated total industry capital investment required for water pollution abatement, assuming no current treatment and no municipal treatment options. Annual cost estimates were derived from the capital expenditures as follows:

- Operating and Maintenance Costs = 9 percent of capital investment
- Depreciation = 10 percent of capital investment
- Capital Cost = 14.2 percent of capital investment before taxes (Assumes 50 percent of investment is borrowed at a 10 percent rate) and 50 percent is financed internally at an after tax return required of 9.2 percent)

O & M cost and depreciation factors were supplied by EPA. Capital cost factors were developed by Booz, Allen.

For purposes of evaluating pricing implications and economic impact, it assumed that the relationship of capital investment ($641 million - $1,015 million) and annual cost ($220 million - $350 million) for pollution abatement to total textile industry sales and profits would approximate the situation faced by a producer required to install complete in-house treatment facilities. Thus, the relationships assumed were used to approximate a high cost situation.

9. TEXTILE SHUTDOWNS ARE POSSIBLE BUT NOT PRIMARILY DUE TO POLLUTION ABATEMENT COSTS

Pollution abatement costs are likely to be a relatively minor component of the total cost problem to be faced by textile producers. However, in combination with other cost/price factors, notably related to future textile demand and prices, pollution abatement costs, at least for producers faced with high costs, could result in plant shutdowns and production curtailment. If such occurs, however, it cannot be said that pollution abatement cost was the determining factor. All of the factors identified above, including pollution abatement costs, will have been contributory.

What adverse profitability impacts do occur are most likely to affect small firms as a group more severely than large firms, principally because of the apparent existence in this industry sector of the least efficient and oldest plant and equipment.

The impact of pollution abatement costs on industry profits depends on future industry performance. If no improvement in profits takes place, pollution abatement costs will aggravate an already serious situation and could, along with other factors, cause production curtailments and plant shutdowns for producers faced with high pollution abatement costs. The prospects for profit improvement are mixed. Imports have been restrained, although shifts in exporting countries may aggravate the problem in the future. Demand is increasing and prices have firmed significantly since 1970, however, profits have not improved significantly indicating a continuing cost squeeze. Within this cloudy picture, it is not possible to predict with any confidence how the textile industry will perform over the next five years. However, it is apparent that significant profit improvement depends on significant improvement in several demand, price and cost factors.

The local impact of those plant shutdowns which do occur is likely to be severe, principally because plant locations tend to be rural with little alternative employment opportunities for the displaced labor force. Closures would cause negative balance of payments impacts as imports would increase to full supply/demand gaps. Because of the availability of imports, consumers should not be significantly affected. Raw materials suppliers would suffer unless export markets could be found. Those providing local support for a closed plant in the form of general supplies or services would likely be hard pressed to find alternate local markets.

10. THE MAJOR LIMITATIONS IN THIS REPORT RELATE TO LIMITED POSSIBLE SPECIFICITY AND UNCERTAINTY REGARDING TEXTILE INDUSTRY PROFITABILITY

Because of data limitations, it has been possible to evaluate the economic impact of water pollution abatement costs on the textile industry only in a general way. The vulnerability of specific plants to closure and their basic cost relationship remain unknown.

The major uncertainty in this report, as has been previously indicated, is over the prospects for future textile industry growth and profitability. Indications are contradictory and a projection of performance with any degree of certainty has not been possible.

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I. INDUSTRY SEGMENTS

I. INDUSTRY SEGMENTS

This chapter discusses the manner in which various textile industry segments may be affected by water pollution abatement costs.

1. THE TEXTILE INDUSTRY IS HIGHLY FRACTIONATED

There are approximately 7,100 plants currently in operation in the domestic textile industry. Facilities range from highly integrated manufacturing complexes processing basic raw materials such as raw cotton into finished products such as bed sheets, to small non-integrated contract plants which process goods owned by other producers. There is also a wide distribution of textile firms by type. Producers range from relatively large integrated and diversified producers such as Burlington Industries to small single plant, single ownership producers with limited product and process capabilities.

2. APPROXIMATELY 10 PERCENT OF DOMESTIC TEXTILE PLANTS CONSUME 97 PERCENT OF THE WATER USED BY THE INDUSTRY

For purposes of this report, textile plants can be placed in two categories:

- Plants using wet processes
- Plants using dry processes

Wet process plants, which are those sensitive to water pollution abatement costs, are almost exclusively engaged in textile dying and finishing which apply to virtually all textile products made. The specific wet processes of interest are as follows:

- Scouring
- Desizing
- Dyeing
- Mercerizing

- Other wet finishing
- Bleaching
- Bonding and laminating

Dry process plants (spinning, weaving, knitting, etc.) as a rule use water only for sanitation and climate control. Water pollution abatement problems in such installations are accordingly not severe.

Exhibit I, following this page, summarizes the numbers of wet process plants by product and process. Note that categories are not mutually exclusive in that a single plant may have multiple product/process capabilities. Of the 7,100 plants in the textile industry, approximately 684 plants or 10 percent of the total use wet processes.

3. IT IS ESTIMATED THAT WATER USED BY 90 PERCENT OF THE WET PROCESS PLANTS RECEIVES EITHER PRIVATE OR MUNICIPAL TREATMENT

Recent surveys by the American Textile Manufacturers Institute indicate the following:

- 45 percent of wet process plants provide some level of waste water treatment prior to discharge
- An additional 45 percent of wet process plants discharge waste water into municipal sewer systems. The prevalence of pretreatment in use is indeterminate
- 10 percent of all wet process plants release waste water into water courses with no treatment

Date regarding the adequacy of existing in-house water treatment in relation to ELG standards* are not available nor are data which can be used even to identify which specific plants provide such treatment

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* Effluent Limitation Guidance (1972) prepared by the Office of Permit Programs, EPA

EXHIBIT I

Environmental Protection Agency

NUMBER OF TEXTILE PLANTS BY
WET PROCESS AND RAW MATERIAL USED*

	Raw Material Used					
	Wool	Cotton	Rayon/ Acetate	Nylon	Polyester	Other Synthetics
Scouring/Desizing	101	62	60	92	78	2
Dyeing	433	865	760	970	729	38
Mercerizing	19	106	83	76	98	-
Other Wet Finishing	395	757	665	767	642	39
Bleaching	210	538	395	464	360	11
Printing	64	186	169	162	153	10
Bonding/Laminating	126	195	202	231	214	18

* One plant can use more than one process and raw material

or discharge into municipal sewer systems. While data on specific plants are not available, it is possible to draw some conclusions regarding the types of plants which are potentially most vulnerable to adverse economic impacts as a result of water pollution abatement costs.

(1) Water Pollution Abatement Costs Should Be Highest for Plants Requiring In-House Water Treatment

The potential incremental water pollution abatement costs to be borne by plants discharging into municipal systems may take two forms:

- Costs to install and operate in-house pre-treatment facilities
- Increased municipal sewerage charges to cover the costs of upgraded municipal treatment facilities

It should be noted that ELG standards do not apply to municipal treatment facilities, however, it is reasonable to assume some increased cost to producers as municipal standards are developed and applied. While it is not possible to estimate incremental pollution abatement costs to producers using municipal sewers, it is safe to conclude that, in most cases, municipal water treatment will be less costly than providing the full range of treatment required on an in-house basis.

Where in-house water treatment is required, incremental costs will depend on:

- The level of in-house treatment currently provided
- The adaptability of existing treatment facilities to upgrading as opposed to complete tear down and replacement

Plants having no treatment facilities will, of course, experience the largest incremental pollution abatement cost, while incremental costs in plants having some treatment facilities may vary over a fairly wide range depending on the factors identified above. In any case, wet process plants not discharging into municipal sewer systems should, as a group, be most heavily impacted by pollution abatement requirements from a cost standpoint.

(2) Incremental Abatement Costs Per Unit of Output Should Be Lower In Large Plants Than in Small Plants

In general, water usage in textile plants varies with output. Economies of scale in water treatment for large users should accordingly work to the advantage of larger wet process plants. Municipal sewerage rates in many cases are based on formulas which produce decreasing per gallon charges as water use increases, again working in favor of large water users.

(3) Non-Integrated, Limited Product Wet Process Plants Are Most Vulnerable To Adverse Economic Impact From Any Source

Overall textile demand is governed largely by the general vigor of the economy while demand for specific products is governed in many cases by fashion. Because of this, non-integrated plants with limited product process capabilities or markets are most vulnerable to adverse economic impacts:

- Unit textile costs are volume sensitive which means that in slack demand periods, producers will tend to concentrate production in efficient, integrated plants. The past two years has highlighted this fact as many of the larger textile producers have spent considerable sums to integrate and balance production facilities.

- Large diversified producers are best able to hedge the risk of fashion changes because of their multiple product line capabilities. Non-integrated processors located within range of multiple product customers may fare relatively well as fashion changes since most wet processing plants can accommodate several different textile types. In cases where non-integrated producers are tied to non-diversified fashion vulnerable customers, however, significant danger of adverse fashion impacts exists.

As indicated above, trends toward production concentration and product diversification among fewer firms highlights the economic vulnerability of small non-integrated independent processors and plants.

(4) Small Firms Should Be More Vulnerable to Adverse Economic Impacts Than Large Firms

Exhibit II following this page summarizes operating results and capital expenditure patterns for large ($50 million annual sales and over) and small (annual sales under $50 million) textile producers for the period 1967-1971. The significant conclusions to be drawn from the exhibit are as follows:

- Small producers, in general, are less profitable than large producers. With the exception of 1971, profit margins of large producers were 32-86 percent greater than for small producers. In 1971 small producer profit margins approached those for large producers as small producer sales increased by 7 percent compared to a 5 percent increast for large producers.

- Small producers are more vulnerable to decreases in overall demand than are large producers. During 1970, a year in which industry sales decreased by about 1 percent from the preceding year, total sales by the major producers increased by approximately 2 percent while small producer sales decreased by about 3 percent. In the face of this

EXHIBIT II

Environmental Protection Agency

FINANCIAL PERFORMANCE OF
LARGE AND SMALL TEXTILE FIRMS

Year	($) SALES Total* Industry	48 Major Firms (000)	Other Firms	($) NET PROFIT Total* Industry	48 Major Firms (000)	Other Firms	NET PROFIT % OF SALES Total* Industry	48 Major Firms (000)	Other Firms
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** Covers 3 quarters through September 30, 1972

Source: Federal Trade Commission, Chase Manhattan Bank Financial Summary, Moody's Industrial Manual

volume loss, small producer profit margins decreased by 44 percent, more than double the decrease suffered by large producers.

- Industry growth has been concentrated among the large producers. Between 1967 and 1972 large producer sales increased by 33 percent while small producer sales increased by only 16 percent.

- The most modern plant and equipment and the best water treatment facilities are probably concentrated among the large producers. During the 1967-1972 period the large producers which accounts for less than 50 percent of industry sales accounted for approximately 73 percent of total industry capital expenditures. Large producer capital spending during this period was equal to approximately 5 percent of total sales while small producer expenditures amounted to only about 1 percent of sales.

On the basis of differential growth, profitability and modernization, it appears safe to conclude that, other things such as access to municipal water treat being equal, small textile producers with annual sales of less than $50 million will be most vulnerable to adverse economic impacts of water pollution abatement costs.

Exhibit III, following this page, summarizes the characteristics of wet process plants most and least likely to be adversely affected by water pollution abatement costs. As is described in the foregoing sections, size, flexibility, and access to low cost municipal water treatment are the determining factors relating to vulnerability.

Due to the limitations of available data, it has not been possible to identify specific plants or numbers of plants and their relative vulnerability to pollution abatement costs. Detailed data on plant location, size, ownership, product lines, and degree of integration has been provided to EPA under separate cover. The additional data required to assess relative pollution abatement cost vulnerability, namely water

EXHIBIT III

Environmental Protection Agency

PLANT TYPES MOST AND LEAST VULNERABLE TO POLLUTION ABATEMENT COSTS

	Least Vulnerable Plant	Most Vulnerable Plant
Ownership	Public	Private
Size of Firm	Large ($50 million sales)	Small (sales less than $50 million)
Size of Plant	Large	Small
Degree of Integration	Part of a Fully Integrated Complex	Non-integrated
Product Lines	Multiple Product Lines	Single Product Capability
Water Treatment and Disposal	Discharge to Municipal Sewers	In-House Treatment direct discharge to waterway

treatment alternatives, is not available. To acquire such data, a direct survey of wet process plants would be required.

II. PRICE EFFECTS

II. PRICE EFFECTS

This chapter is addressed to the manner in which textile prices are determined and the potential textile price changes which might occur in the face of pollution abatement costs.

1. IN THE TEXTILE INDUSTRY, THE MARKET RATHER THAN PRODUCERS CONTROLS PRICES

In terms of general economic theory, the textile industry exhibits many of the characteristics of an industry faced by perfect competition in that:

- No single producer or small group of producers control supply
- Market entry is relatively easy
- There are a large number of producers

Accordingly, market forces control prices which are volatile and subject to significant swings as supply and demand fluctuate.

2. TEXTILE MAKERS ARE ATTEMPTING TO DEVELOP CONSUMER BRAND PREFERENCES

The larger textile makers are attempting, through heavy advertising, to develop consumer brand loyalty for apparel and other textile products such as bedding and carpets; however, there is no evidence that such efforts will have a significant impact on overall market behavior in the near term.

In the long term, increasing industry concentration and integration coupled with aggressive marketing may cause demand to become less elastic to price in some consumer products such as sportswear and bedding.

3. BECAUSE OF THE NATURE OF THE MARKET IT IS NOT CLEAR THAT TEXTILE PRODUCERS WILL BE ABLE TO PASS ON POLLUTION ABATEMENT COSTS TO CONSUMERS

As indicated in the appendix, slack demand in recent years, coupled with import competition, have resulted in relatively low textile prices and profit margins. With resumed economic growth and the establishment of voluntary import quotas, it may be expected that textile prices will improve. Two cautionary notes must, however, be observed:

- Wage rates in this labor intensive industry are a major cost determining factor and any rapid future increase in average wages could offset price and productivity gains.

- Imports, while restricted, remain substantial. There is some evidence that imports from countries which are not parties to voluntary quotas are increasing. If this trend accelerates, competitive pressures could significantly limit price gains.

The Wholesale Price Index for textile mill products actually decreased from 1968 to 1971 from 104.1 to 103.6, reflecting softness in the general economy and competition from imports. During 1972, however, the index rose by 7.3 percent (11 months average) reflecting both economic recovery and control of imports. Profit margins, on the other hand, have not improved significantly, reflecting cost increases which have offset price gains. Assuming a continued period of economic expansion and import control for the next five years, it can be expected that textile prices overall will continue to advance, though not at a 7 percent rate. However, unless cost of production is tightly controlled much of these price gains could be offset by cost increases.

4. MAXIMUM CUMULATIVE TEXTILE PRICE INCREASES TO COVER POLLUTION ABATEMENT COSTS SHOULD RANGE FROM 0.9 PERCENT TO 1.4 PERCENT

For the textile industry, return on equity in 1971 was 6.6 percent compared to 9.7 percent for all manufacturing. Return on invested capital (equity and long term debt) during the same year was 4.9 percent for textiles and 7.1 percent for all manufacturing. The proportion of debt in the textile industry capital structure is almost identical to that for all manufacturing, equal to 25 percent of invested capital. Textile industry profit margins during 1971 were equal to 2.4 percent of sales, compared to 4.1 percent for all manufacturing.

Over the past decade, textile industry profitability has tended to lag behind that for all manufacturing. During the worst year of the decade for all manufacturing industries, profit margins were 4.1 percent of sales and return on equity was 9.7 percent. Average profit margins and return on equity for the textile industry during the most profitable five years of the decade were 3.3 percent and 9.2 percent respectively.

If a return on equity of 9.2 percent were to be considered satisfactory for the textile industry, an average increase of 1.8 percent would have been required during 1971, above prevailing 1971 prices to achieve it. If such had occurred, net profits would have been $770 million as opposed to $558 million with a profit margin equal to 3.0 percent of sales.

As indicated in Chapter V, if it is assumed that textile producers currently provide no in-house water treatment and do not have the option of municipal treatment, total capital investment required for water pollution abatement would range from $641 million to $1,015 million. An approximation can be made of the price increases needed to cover the pollution abatement costs of a hypothetical producer currently providing no treatment who cannot use municipal sewers under the following assumptions:

- A "satisfactory" return on producer equity is 9.2 percent per year
- Pollution abatement capital expenditures will be financed on a 50 percent debt, 50 percent equity basis

- Pollution abatement capital expenditure requirements for the hypothetical producer will be proportional to industry-wide requirements, assuming total industry requirements of $641 million - $1,105 million. The assumption of proportional costs implicitly assumes a fully integrated producer as the hypothetical company. Price increases for a non-integrated wet process producer could be significantly higher in terms of the base cost.

- Producer profit margin (after tax) for 1971-1972 was 2.5 percent of sales.

- Capital expenditures and annual costs for pollution abatement will be fully incurred at the end of five years.

Exhibit IV, following this page, shows the price increases required by a hypothetical textile producer to cover water pollution abatement costs. The range of price increases shown at 0.9 percent - 1.4 percent approximates maximum possible price increases as the computations are based on the worst cases (i.e., no treatment currently provided and no municipal sewerage options). For approximately 90 percent of producers, required price increases should be somewhat lower than the range shown above due to prior installation of water treatment facilities and use of municipal water treatment facilities. On the basis of currently available data, however, it is not possible to estimate either the magnitude or distribution of such price increases.

If it is assumed that the 0.9 percent - 1.4 percent price increases represent a cumulative increase over a 5-year period, then average annual price increases required over the period would be slightly less than 0.18 percent - 0.28 percent.

5. PRICE INCREASES RELATED TO POLLUTION ABATEMENT SHOULD BE A MINOR FACTOR IN RELATION TO OTHER TEXTILE INDUSTRY NEEDS

Textile producers will require price increases over the next five years to cover increases in manufacturing costs and to bring profitability and return on investment up to satisfactory levels. Since the advent of wage and price controls and because of the volatility of producers raw materials costs, it is not possible to forecast textile manufacturing cost increases with any significant degree of accuracy.

EXHIBIT IV

Environmental Protection Agency

PRICE INCREASE REQUIRED TO COVER *
WATER POLLUTION ABATEMENT COSTS
IF NO TREATMENT IS CURRENTLY PROVIDED
(Millions of $)

	Industry Totals		Hypothetical Producer
	$	%	$
Sales	$24,729	100.0	100.0
Net Profit	638	2.6	2.6
Long Term Debt	2,979	25.5	25.5
Shareholders Equity	8,720	74.5	74.5
Total Investment	$11,699	100.0	100.0

	Range		Range	
	Low	High	Low	High
Pollution Abatement*				
Capital Expenditures ($)	$ 663	1,051	2.7	4.3
As a % of Sales	2.7	4.3	N/A	N/A
Annual Costs***	$		$	
Operation & Maintenance	60	95	0.2	0.4
Depreciation	66	105	0.3	0.4
Interest	33	53	0.1	0.2
Return to Equity	61	97	0.3	0.4
Total	220	350	0.9	1.4
Percent Price Increased Required	0.9	1.4	0.9	1.4

* Based on Textile Industry operating results for the four quarters ending September 30, 1972

** Inflated by 3.5% to reflect 1972 basis

*** Basis for Annual Costs:

- Operation & Maintenance - 9% of capital investment
- Depreciation 10% of capital investment
- Interest 10% of .5 x capital investment
- Return to Equity - 9.2% x .5 (capital investment) x 2 (9.2% return to equity requires 18.4% before taxes)

However, an example, based on several assumptions regarding cost behavior, will serve to highlight the relative pricing magnitude of pollution abatement and other cost factors. Significant assumptions are as follows:

- The total cost of manufacturing textiles will increase at a rate of 3 percent per year after allowing for wage and raw material costs and productivity.
- Price increases will be required to increase return on equity to 9.2 percent.
- Debt/equity ratios will remain constant

If the above assumptions are applied to the hypothetical producer, total price increases required over a five year period, assuming overall 3 percent annual inflation, would be as follows:

Price Increase	%	% of Total Increase
To cover manufacturing costs	20.0	86.2
To improve profitability	1.6	6.9
To cover pollution abatement costs	1.6	6.9
Total	23.2	100.0

As is apparent, even with the assumption of a moderate 3 percent annual rate of increase in the cost of manufacturing textiles, the cost of water pollution abatement represents a very minor component of potentially required price increases.

6. THE KEY TO ACHIEVING REQUIRED PRICE AND PROFIT INCREASES LIES IN MARKET AND COST BEHAVIOR

As indicated previously, the market, not producers, determines achievable textile price increases. Of course the rate of manufacturing cost increases over the next five years will also be a significant determining factor in relation to the magnitude price increases

required to cover costs and improve profitability. Factors governing market behavior are basically growth in overall textile demand which is governed by overall economic growth and control of imports. In any case, pollution abatement costs are a very minor price factor in relation to the overall rate of increase in textile manufacturing costs.

III. FINANCIAL PROFILES

III. FINANCIAL PROFILES

This chapter discusses textile industry financial profiles.

1. DURING 1971 SMALL PRODUCERS WERE MORE PROFITABLE THAN LARGE PRODUCERS

While profit margins on average are roughly equivalent, return on investment for small producers was higher than for large producers, as shown in Exhibit V, following this page. With respect to overall profitability, 1971 represented a significant increase over 1970 for small producers with profit margins increasing from 1.9 percent of sales to 2.4 percent of sales as both volume of production and share of total production increased. Large producer profitability in 1971 was about the same as for 1970. Overall industry profit margins during 1972 have remained roughly the same as those for 1971 in the face of an 11 percent sales increase (for three quarters 1972) and a price increase of roughly 7 percent. This would indicate that the industry as a whole continues to be caught in a cost squeeze.

The relatively strong performance of the small textile producers (sales of under $50 million) during 1971 as compared to large producers (sales over $50 million) appears to have reversed a trend. Large producer profit margins have ranged from 44 percent to 86 percent greater than small producer margins, with the exception of 1971 as indicated on Exhibit II, following page 5. In addition, over the period 1967-1971, large producer sales have increased by 33 percent while small producer sales have increased by only 16 percent.

The debt burden borne by large producers is significantly higher than that of small producers. Two reasons contribute to higher debt ratios:

- Roughly 73 percent of industry capital spending over the past five years has been accounted for by large producers which account for less than 50 percent of industry sales.

- On the basis of past performance and risk, large producers as a group should be able to tolerate a more highly levered financial position than small producers.

The comparative cash flow during 1971 for large and small producers is shown in Exhibit VI, following this page. The capital expenditure rates and dividend payout rates of large producers account for the accumulation of relatively heavy debt burdens in comparison with small producers

2. IN THE FUTURE, LARGE PRODUCERS IN GENERAL SHOULD OUT PERFORM SMALL PRODUCERS

The relative performance of small and large textile producers over the past five years indicates the following:

- Differential growth rates favor large producers; the trend toward concentration of output should continue.

- Large producers are better able to maintain performance in the face of tight markets as is evidenced by relative 1970 performance. In periods of demand growth, small producer performance may increase sharply as occurred in 1971.

- On the basis of relative capital expenditure rates, large producers should possess more modern and efficient plant and equipment than small producers. This differential should have a significant future impact on relative performance.

3. THE VALUE OF A TEXTILE PLANT IN LIQUIDATION SHOULD BE RELATIVELY LOW

If a textile plant is to be shut down and sold for its salvage value, the value of its assets should be relatively low. The physical

EXHIBIT VI

Environmental Protection Agency

TEXTILE INDUSTRY CASH FLOWS
1971
(in millions)

Size Category	Net Profit	Depre-ciation	Total	Divi-dends	Capital Expendi-tures	Total	Net Cash
750 and over	56	121	177	60	150	210	(33)
500 - 749	N/A	N/A	N/A	N/A	N/A	N.A	N/A
250 - 499	98	100	198	48	139	187	11
100 - 249	64	40	104	15	111	126	(22)
50 - 99	30	27	57	14	48	62	(5)
0 - 49	310	376	686	85	162	247	439
Total Industry	558	664	1,222	222	610	832	390

assets of the plant would be as follows:

- Land
- Buildings
- Machinery and equipment

Land value will depend on location. If the location is desirable for manufacturing, the land could bring a good price. If the location is rural and not desirable for manufacturing, it may be difficult to find a buyer. Buildings will be valued on the basis of their usability for other purposes and age. If the buildings are old and/or not favorably located, they may tend to reduce the value of the land by an amount equal to net demolition cost. Machinery and equipment will be valued in terms of age and process capability. The newer the machinery and the more adaptable it is to processing textile products with strong markets, the higher will be its value.

Raw materials, in process, and finished goods in inventory will be valued in relation to the market price for them. Again the type of goods in inventory in relation to overall demand and fashion will determine value.

Since it is the smaller, older and more obsolete factories that are most likely to close due to pollution abatement costs, the value of buildings and equipment will probably be minimal.

While the qualitative factors affecting the value of a plant in liquidation can be identified, estimates of actual dollar value would have to be made on a case by case basis.

4. FUTURE PROFITABILITY WILL BE THE MAJOR FACTOR CONTROLLING TEXTILE INDUSTRY CAPITAL ACCESS

The textile industry must compete in capital markets with other industries. As has been indicated previously, textile industry profitability has been low in relation to all manufacturing which puts textile makers at a relative disadvantage in seeking capital. In addition, relatively heavy capital expenditures by large producers have yet to pay off in terms of increased profits.

(1) Most Equity Capital Must be Raised Internally For The Foreseeable Future

Because of poor profit performance and uncertain demand, especially as regards the future role of imports, many textile producers are currently excluded from the stock market as a source of financing. Thus, whatever equity is raised by these companies must be raised through earnings retention.

(2) Access to Debt Will Depend on Expected Future Performance

To gain access to additional long term debt, large textile producers will have to maintain their dividends which to lenders are an indicator of a producer's ability to cover principal and interest payments. In addition, producers will have to produce evidence that prospects for stable growth and profitability are reasonably good. It is unlikely at the present time that lenders would tolerate any significant increase in large producers' debt levels in relation to equity.

Small producers face a slightly different debt access problem. While stronger on the average than large producers in terms of balance sheet relationships (debt/equity), the performance risk based on past experience is higher. In addition, small producers as a group face a greater modernization requirement. Thus a small producer who must borrow to install pollution abatement equipment must convince potential lenders that his plant or plants are capable of operating profitably. If the plant is old and relatively inefficient, what may be required is significant modernization in addition to pollution abatement equipment installation. In such cases, small producers will be hit with greater short term investment needs. In addition, they will be "bucking" a trend toward concentration of output. As a consequence, some small producers could be put in a position where the capital to replace a marginal plant would not be forthcoming from lenders.

5. DETAILED TEXTILE INDUSTRY COST AND PRICING DATA IS NOT AVAILABLE

One of the objectives of the study was to develop detailed manufacturing cost profitability and cash flow models for representative textile plants in terms of plant size, processes employed, and products produced. The only source of data on which to base such models is textile producers themselves. Contacts were made with a relatively large number of producers. In each case producers were unwilling to release such information because of the perceived possibility of placing themselves at a competitive disadvantage. The degree of competition in the textile industry has led to a situation where plant production costs, product line wholesale prices, and profitability are closely guarded. The synthesis of plant profiles using an engineering approach proved not to be practical in view of the limited time available for the study, the virtually non-existent data base, and the wide variety of possible product/process combinations.

IV. POLLUTION CONTROL REQUIREMENTS

IV. POLLUTION CONTROL REQUIREMENTS

This chapter discusses pollution control requirements and costs.

1. BASIC WATER POLLUTION ABATEMENT COST ESTIMATES WERE DEVELOPED BY EPA

The water pollution abatement capital investment and annual cost estimates prepared by EPA are shown in Exhibit VII, following this page. These cost estimates which are applicable to "typical" wet plants treating wool, cotton, and synthetic fabrics were prepared on the basis of Effluent Limitation Guidance (ELG) standards prepared in 1972 by the EPA Office of Permit Programs. The estimates shown presume that no water treatment is currently provided and that the option of municipal treatment does not exist.

2. PLANTS WHICH PRETREAT EFFLUENTS MAY HAVE TO UPGRADE THEIR FACILITIES TO MEET THE ELG STANDARDS

Of the 684 textile plants using wet processes, 192 currently pretreat their effluent water to some extent. The common types of pretreatment and the plants using one or more of these are shown in Exhibit VIII, following Exhibit VII.

These plants may have to expand or upgrade their facilities to meet the new standards. The extent to which each plant will have to install new facilities or connect to public facilities cannot be determined until the pollution content for each plant effluent is quantified.

3. EPA ESTIMATES THAT A PLANT WITH NO FACILITIES IN PLACE AND DISCHARGING 800,000 GALLONS/DAY OR MORE WILL HAVE TO SPEND A MINIMUM OF $325,000 TO BUILD ADEQUATE WATER TREATMENT FACILITIES

EPA estimates that a textile processing plant with no treatment facilities discharging approximately 800,000 gallons per day, will incur

EXHIBIT VIII

Environmental Protection Agency

TYPES OF WASTE WATER TREATMENT
USED BY TEXTILE PLANTS

Treatment Type	Plants Using Treatment*
Coagulation	14
Settling - Primary	60
Secondary	30
Trickling Filters	15
Activated Sludge	27
Digestion	30
Ponds or Lagoons	89
pH	19
Land Filtration	9
Chlorination	28
Actation	48

* Some plants utilize more than one form of treatment

Source: 1967 Census of Manufacturers

an investment cost of anywhere from $325,000 to $587,000, depending on the basic raw material processed. The investment cost for plants discharging over 800,000 gallons per day will be higher, but will not increase in direct proportion to the volume of water processed. Additional investigation is necessary to determine the relationship, on a unit basis, between cost and capacity of the waste treatment facilities. Cost curves should be constructed to determine the investment cost required for different textile effluent flow levels.

4. COSTS FOR PLANTS THAT ELECT TO USE EXISTING MUNICIPAL SYSTEMS ARE NOT KNOWN BUT ARE LIKELY TO BE LESS THAN THOSE INCURRED TO CONSTRUCT TREATMENT FACILITIES

Costs for plants using municipal water treatment systems are undetermined at this time. The costs are expected to include connection costs and use costs. The factors affecting the costs and decisions are described below.

(1) Connection Costs to Tie In To Municipal Facilities Are Difficult to Estimate

To discharge waste water into municipal systems, the affected plants will incur connection costs. These costs will vary depending on:

- Distance to treatment plant or sewer line
- Size of pipe required to transfer discharge volume
- Construction labor costs in the area

A typical connecting line would be approximately 24 inches in diameter and would cost anywhere from $10 to $20 per foot exclusive of pumping stations.

(2) Plants Which Utilize Municipal Facilities Will Be Assessed a Processing Cost Based on Their Pollution Load

Plants connecting to municipal sewer systems will have to pay a fee for having their waste water treated. This cost, paid by plants now connected to municipal systems, presently ranges from $0.03 to $0.17 per thousand gallons. The cost varies because of different assessment rates, procedures used, and size and effectiveness of the municipal facilities

(3) The Decision to Connect to Municipal Sewers or to Build New or Expand Existing Treatment Facilities Will be Based on Local Economics and Regulations

Each textile company can be expected to weigh the economic impact of using municipal facilities or constructing its own. However, it is expected that the use of public facilities will be less expensive than building and operating a private treatment plant.

Some cities or regional water treatment areas may require textile plants to connect to existing or proposed treatment plants. One of the companies interviewed indicated that it had been required to tie in to a proposed treatment plant rather than construct its own. However, capital and operating cost savings were expected not only for the textile company but for other companies in the area.

(4) Textile Plants Now Tied to Municipal Systems May Not Require Additional Investments Although Use Charges May Increase

The ELG standards, as presently defined, do not call for control on the contents of the waste water discharged to municipal sewer systems. As a result, textile plants now using municipal sewer systems will not have to invest money to clean their discharges. However, it appears certain that similar guidelines will be imposed on municipal facilities and that a surcharge, based on effluent constituents may well be imposed on these textile plants. The definition of this surcharge is beyond the scope of this study.

Also, municipalities may request textile companies to pretreat the waste water to some extent. This could range from regulating the release of waste water to avoid shock situations, to the removal of particular types of waste that cannot be readily treated or would decrease the efficiency of the municipal facility. The investment by textile companies for pretreatment facilities cannot be quantified at this time.

5. DATA LIMITATIONS MADE EPA POLLUTION ABATEMENT COST ESTIMATES INADEQUATE FOR ANALYSIS AS ORIGINALLY PRESENTED

Because textile plant specific operating cost, profitability and cash flow data to which the EPA cost estimates could be applied were not available, a more generalized approach to estimating and expressing pollution abatement capital investment requirements and operating costs was used. This methodology was developed jointly by Booz, Allen and EPA personnel.

6. POLLUTION ABATEMENT CAPITAL INVESTMENT REQUIREMENTS AND ANNUAL COSTS WERE ESTIMATED ON AN INDUSTRY-WIDE BASIS

To establish compatability with available textile industry financial data, pollution abatement capital investment requirements and annual costs were estimated on an industry-wide basis.

(1) Estimates Were Based On Several Significant General Assumptions

In preparing estimates, the following general assumptions were made:

- EPA data used in the analysis were assumed to be valid. These data were not separately evaluated by Booz, Allen.

- For purposes of the analysis, it was assumed that there exists a direct correlation between water consumption levels, BOD, and BOD reduction requirements. The effect on treatment requirements and cost of specific types of contaminants and water flow and effluents per unit of cloth or type of cloth processed has not been considered.

- Water consumption levels by type of plant (SIC code) were derived from the 1963 Census of Manufacturers. Total industry water usage is based on 1968 data. In developing estimates, it was assumed that the pattern of water usage by type of plant had remained constant through 1968.

- It was assumed that primary and secondary treatment would be required to meet ELG standards.

(2) Several Potential Costs Were Not Included In The Analysis

The following potential costs were not included in the analysis:

- In-plant costs such as surveys, piping and roads have not been considered.

- Land costs have not been considered. Interviews with industry sources indicate a median potential land cost of $1,250 per acre with a potential range of land requirements from 20 to 125 acres depending on local needs.

(3) A Formula For Relating Plant Water Flow to Pollution Abatement Capital Expenditures Was Provided By EPA

Base water flow and investment data to which the formula was applied were as follows:

	Water Flow (gal/day)	% BOD Reduction (%)	Capital Investment
Primary Treatment	660,000	30	$ 100,000
Secondary Treatment	800,000	93	1,000,000

Capital investment requirements for primary and secondary treatment are assumed to be additive. That is, to achieve a 93 percent BOD reduction using secondary treatment, primary treatment is first required. The formula used to compute capital investment requirements for primary or secondary treatment installations in plants groupings having varying water usage rates is:

$$C_1 = C_2 \ (F1/F2)^{.6} F_3$$

where:

C_1 = Total capital investment required

C_2 = Capital investment for hypothetical installation

- $100,000 for primary treatment
- $1 million for secondary treatment

F_1 = Average daily water flow for plant groups for which estimate is to be made

F_2 = Daily water flow for hypothetical installation

- 660,000 gallons per day for primary treatment
- 800,000 gallons per day for secondary treatment

F_3 = Total daily water flow for all plants in plant group for which estimate is to be made

The exponent (.6) is an engineering efficiency factor supplied by EPA.

Data required to define F_1 and F_3 were derived from the water flow data contained in the 1963 and 1967 Census of Manufacturers. Exhibit IX, following this page, contains the capital investment requirements derived using the above formula. The range of estimates in each category reflects the manner in which water flow data are summarized in the Census of Manufacturers which categorizes plants in terms of a range of daily water

usage rates (e.g., 500,000 GPD - 1 million GPD). Thus, the low and the high end of the range are dependent on the value of F_1 used in the computation.

(4) Pollution Abatement Annual Cost Estimates Were Derived From Capital Expenditure Estimates On The Basis Of Factors Provided EPA With Some Adjustment By Booz, Allen

The following factors were provided by EPA for deriving pollution abatement annual costs from capital investment estimates:

- Operating and maintenance costs = 9 percent of capital investment
- Depreciation = 10 percent of capital investment
- Capital cost = 12 percent of capital investment

The factors for estimating operating and maintenance costs and depreciation were used for analysis as provided. Capital cost used for analysis was derived as follows:

- It was assumed that 50 percent of the required capital would be borrowed at an interest rate of 10 percent before taxes
- The balance of the required capital was assumed to be drawn from internal sources. The cost of such capital was assumed to be 18.4 percent before taxes (9.2 percent after taxes) as explained in Chapter II.

All costs as originally computed were expressed in terms of 1968 dollars. An inflation factor of 35 percent provided by EPA was used to make adjustments to 1971 levels.

The specific application of pollution abatement costs and their impact on prices and profitability are covered in Chapter II, Price Effects and Chapter V, Economic Impact, which follows.

V. ECONOMIC IMPACT

V. ECONOMIC IMPACT

This chapter discusses the potential economic impact of water pollution abatement costs on the textile industry.

1. THE POTENTIAL IMPACT OF WATER POLLUTION ABATEMENT COSTS ON TEXTILE INDUSTRY PROFITS DEPENDS ON FUTURE INDUSTRY PERFORMANCE AND PRODUCER WATER TREATMENT OPTIONS

As indicated in Chapter II, a fully integrated producer required to install in-house water treatment equipment with no option for municipal treatment would have to achieve a cumulative price increase of approximately 0.9 percent to 1.4 percent (1972 basis) accross all products to cover incremental operating and capital costs required in the wet processes. If the market behaved in such a manner that textile prices remained relatively stable at 1972 levels, and no other cost increases were incurred, the profit margin (% of sales) for the hypothetical producers shown on Exhibit IV, following page 10, would be reduced from 2.6 percent (after tax) to 2.1 percent to 2.3 percent of sales, a reduction of 11 percent to 19 percent. Return on total investment (long term debt and equity) would be reduced from 5.5 percent to the range of 4.0 percent to 4.5 percent. Of course the impact on profitability would be less severe for those producers who are highly profitable and significantly more severe for those producers who are less profitable than the hypothetical producer.

Since the water pollution abatement costs for producers with municipal treatment options or in-place treatment equipment are not known, it is impossible to specify cost impact. However, it is reasonably safe to conclude that for these producers, who account for about 90 percent or more of wet process plants, the costs of water pollution abatement will be less and consequently the impact of those costs will be less than that cited above.

Pollution abatement costs aside, the future profitability of the textile industry is uncertain. Current profit and return on investment

levels are considered unsatisfactory, Recovery of profits and investment returns to satisfactory levels can occur over the next five years if:

- Real economic growth continues at a high rate without a significant slowdown and the textile market becomes stronger as a result
- Imports are controlled
- Production costs, especially wage rates, are held in line

As was pointed out in Chapter III, pollution abatement costs are likely to be a relatively minor component of the total cost problem to be faced by textile producers. However, in combination with other cost/price factors, notably related to future textile demand and prices, pollution abatement costs, at least for producers faced with high costs, could result in plant shutdowns and production curtailment. If such occurs, however, it cannot be said that pollution abatement cost was the determining factor. All of the factors identified above, including pollution abatement costs, will have been contributory.

What adverse profitability impacts do occur are most likely to affect small firms as a group rather than large firms, principally because it is the small companies that own many of the least efficient and oldest plant and equipment.

In summary, the impact of pollution abatement costs on industry profits depends on future industry performance. If no improvement in profits takes place, pollution abatement costs will aggravate an already serious situation and could, along with other factors, cause production curtailments and plant shutdowns for producers faced with high pollution abatement costs. The prospects for profit improvement are mixed. Imports have been restrained, although shifts in exporting countries may aggravate the problem in the future. Demand is increasing and prices have firmed significantly since 1970, however, profits have not improved significantly indicating a continuing cost squeeze. Within this cloudy picture, it is not possible to predict with any confidence how the textile industry will perform over the next five years. However, it is apparent that significant profit improvement depends on substantial improvement in several demand, price and cost factors.

2. THE FACTORS AFFECTING CAPITAL AVAILABILITY ARE BASICALLY THE SAME AS THOSE AFFECTING PROFITABILITY

Producers using municipal treatment or having municipal treatment options will likely be required to make relatively modest water pollution abatement capital outlays. Capital outlays for producers with currently operating in-house water treatment facilities will depend on the upgrading required to meet ELG standards and cannot be estimated at this time.

As a group, large producers are currently in a position of net annual borrowing to finance basic capital expenditures as indicated on Exhibit V, following page 14. It is probable that unless profit improvement is shown that such producers will find themselves unable to raise significant additional debt. Funds could be generated internally and could be used to finance the installation of abatement equipment only at the expense of expenditures for basic plant and equipment which could in turn jeopardize future profit performance. The unknown factors in the equation are, of course, what the capital requirements for pollution abatement for these producers will be, and what future profit performance will be. Capital requirements may be somewhat lower than for small producers as large producers are most likely to have water treatment equipment on stream. If industry growth and profits show steady improvement, it is likely that financing could be obtained in the debt market. If not, financing must be internal with the adequacy of such funds depending on the capital requirements of individual producers.

Small producers appear to be faced with a somewhat different problem. While the cash flows shown on Exhibit V, following page 14 would indicate a relatively large cash availability, it also indicates a relatively low rate of capital spending. This brings up the question of the magnitude of plant replacement required in the future to maintain or increase profits and the economic justification of installation of pollution abatement equipment in old plants. These questions cannot be answered within the scope of this study. It appears, however, that the degree of basic capital spending needed during the next five years to modernize plant and equipment and the accelerated replacement of plant and equipment required by pollution abatement costs could significantly impact capital needs for some small producers. Of course this problem would be obviated for those small producers who currently use or will be able to use municipal treatment. The capacity of small producers to raise additional debt, as with large producers, is largely conditional upon improved profit performance.

3. FUTURE TEXTILE INDUSTRY PRODUCTION LEVELS DEPEND PRIMARILY ON FACTORS OTHER THAN POLLUTION ABATEMENT

As indicated above, pollution abatement costs should not have a major affect on basic textile industry growth. Such growth depends on other factors previously discussed. However, if industry growth and profitability do not improve, the possibility exists that pollution abatement costs in some cases could motivate accelerated production curtailments and plant shutdowns. However, this would be merely accelerating events which are bound to occur in any industry which is not sufficiently profitable to attract capital. The expected degree of impact in terms of number of plants to be shut down cannot be evaluated in light of available data and the uncertainties regarding future industry performance.

The net effect of plant shutdowns should be to bring capacity into line with demand with fewer producers operating more profitably assuming that ease of entry into the industry does not result in cronic excess capacity with a high producer turnover.

4. IN THE EVENT OF PLANT SHUTDOWNS, LOCAL EMPLOYMENT IMPACTS COULD BE SEVERE

Textile plants in many cases are located in rural areas and are often the dominant local employer. If a plant in such a situation were to shut down, local unemployment could be severe on both a direct and indirect basis. Since the textile plant would be a major factor in bringing income into the local area, secondary unemployment could possibly equal or exceed that produced directly creating a situation similar to those observed in coal mining towns toward the end of a prolonged strike.

In addition, most textile workers are unskilled and consequently possess limited job mobility. This factor could serve to make replacement of lost jobs more difficult than with a more skilled, more job mobile labor force.

Plant shutdowns in more populous areas with a more diversified economic base should produce relatively less long term unemployment, both direct and secondary.

5. POLLUTION ABATEMENT COSTS WILL HAVE LITTLE BALANCE OF PAYMENTS IMPACT, ALTHOUGH TEXTILE IMPORTS ARE A SERIOUS INDUSTRY PROBLEM

Foreign textile producers, especially those in the Far East and lesser developed countries, currently enjoy a significant production cost advantage over domestic producers due primarily to low wage rates. Were imports not restricted, it is probable that such producers could sell all of the textiles which they could produce to U.S. customers. Pollution abatement costs would have no impact because the only significant constraint operating without pollution abatement costs would be foreign producer capacity not price. It is unlikely that in the foreseeable future that domestic textiles can become price competitive with imports. This situation provides the justification used for import restraints (quotas) and the fundamental economics are not altered by pollution abatement costs.

6. TEXTILE CONSUMERS SHOULD NOT BE SIGNIFICANTLY AFFECTED

It can be expected that only potential domestic textile production curtailments will be made up almost immediately by imports. If domestic producers were to regain reasonable profit levels, assuming imports were restrained, consumer demand will have to increase to a point where textile price increases are possible.

7. PLANT CLOSURES COULD IMPACT SUPPLIERS

Any industry production curtailments could impact suppliers of raw materials and supplies and services. Raw material suppliers would be impacted to the degree that overseas markets for their products would be unavailable. Such availability being a function of world wide product capacity and demand balances. Those providing supplies and services would be required to find substitute markets. In several areas this would probably prove most difficult.

VI. LIMITS OF THE ANALYSIS

VI. LIMITS OF THE ANALYSIS

This chapter is addressed to limitations and uncertainties in analysis contained in this report.

1. THE MAJOR LIMITATIONS IN THE STUDY RELATE TO LIMITED POSSIBLE SPECIFICITY AND UNCERTAINTY REGARDING TEXTILE INDUSTRY PROFITABILITY

Because of data limitations, it has been possible to evaluate the economic impact of water pollution abatement costs in the textile industry only in a general way. The vulnerability of specific plants to closure and their basic cost relationship remain unknown.

The major uncertainty in this report, as has been previously indicated, is over the prospects for future textile industry growth and profitability. Indications are contradictory and a projection of performance with any degree of certainty has not been possible.

2. THE VALIDITY OF POLLUTION ABATEMENT COST ESTIMATES IS UNCERTAIN

As indicated in Chapter IV, the methodology for developing pollution abatement cost estimates used during the study excluded any empirical examination of the basic assumptions used. While the methodology is logical, because no empirical confirmation was obtained, the validity of the estimates must remain open to question.

Summaries of industry profit performance by size of firm are subject to error as they are based on data from several sources. However, such error as exists should not be sufficient to impact significantly any conclusions related to the estimates.

3. MAJOR UNANSWERED QUESTIONS RELATE TO SPECIFIC PRODUCER CHARACTERISTICS AND PROBLEMS

The major unanswered questions in the study which require further analysis are as follows:

- Are pollution abatement costs accurate as estimated? What are incremental costs likely to be
  - For municipal treatment?
  - To upgrade existing facilities?
- What plants do or do not have municipal treatment options?
- What plants do or do not presently operate in house treatment facilities? For which plants will costs be high or low?
- What plants are so old as to require replacement rather than simply a cleanup?
- Which plants are profitable/not profitable?
- What will future government policy be regarding imports?
- What will future policy be regarding wage and price control?
- Can it be that producers in rural areas may expect significant local government assistance in meeting abatement costs in a manner similar to that used in many southern states to promote industrial development?

Finally, the most critical question of all: Will the textile industry be able to attain and sustain future growth at reasonable profit levels?

* * * *

APPENDIX

TEXTILE INDUSTRY DESCRIPTION

LISTING OF

APPENDIX EXHIBITS

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A-II TOTAL END-USE CONSUMPTION OF FIBERS

A-III HOME FURNISHINGS MARKET--FIBER CONSUMPTION BY TYPE

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A-XX PLANT LOCATION SUMMARY OF THE TEN MAJOR STATES

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TEXTILE INDUSTRY DESCRIPTION

1. FOUR BASIC PRODUCTS ARE PRODUCED BY THE TEXTILE INDUSTRY

The four basic textile product classifications are:

- Woven products
- Knitted goods
- Tufted goods
- Miscellaneous products

The basic textile products are subsequently converted into consumer goods by the finished-product manufacturers. Typical examples of finished products produced from textile products are shown below:

Textile Products	Finished Goods
Woven cloth	Trousers Shirts Pillowcases
Knitted cloth	Hosiery Men's shirts Men's underwear
Tufted goods	Carpets Bedspreads
Miscellaneous goods	Sewing thread Felt goods Ribbons

2. TEXTILE PRODUCTS REACH FIVE MAJOR MARKETS

Textile mill products reach five major end-use markets:

- Apparel
- Home furnishings
- Industrial fabrics
- Other consumer products
- Exports

The apparel market has been the largest consumer but its share has decreased steadily from 41.7 percent in 1960 to 34.5 percent in 1971. This decline in market share is due to increased consumption by other end uses, since the poundage consumed by the apparel market increased by 1 billion pounds from 1960 to 1971. Exhibit A-I, following this page, illustrates textile product consumption by end-use market.

(1) Home Furnishings Is the Fastest Growing Market for Textile Products

Home furnishings has been one of the fastest growing end-use markets for textile products over the last ten years, and is expected to show continued growth over the next few years. Home furnishings consumed 30 percent of all fibers in 1970 compared with 25.3 percent in 1960, and expanded fiber usage by approximately 1.3 billion pounds during this same period of time. Exhibits A-II and A-III, following Exhibit A-I, illustrate this upward trend in consumption. Estimates for 1971 show the home furnishings market growing at an even faster rate, consuming 33.1 percent of all fibers. The continuing growth of this market is attributable to the:

- Sharp rise in residential construction, increasing the demand for home furnishing products, such as carpets, rugs and upholstery fabric.
- Increased family income.
- Increased mobile home production.
- Increased use of carpeting in commercial establishments, office buildings, restaurants, etc.

(2) The Industrial Market and Other Consumer-Type Product Markets Are Expected to Grow

The industrial market comprised an estimated 16.7 percent of the total market for textile products in 1971. Although there has been a slight decline in the proportion of textile products consumed by this end-use market since 1960, there has been about a 50-percent increase in the volume of fibers used--from 1,210 million pounds in 1960 to an estimated 1,820 million pounds in 1971 (see Exhibit A-I). The largest segments of the industrial market are the tire industry, which consumed 523 million pounds of fiber in 1970, and the reinforced plastics industry, which consumed 268 million pounds of fiber in 1970.

EXHIBIT A-II

Environmental Protection Agency

TOTAL END-USE CONSUMPTION OF FIBERS
(Percentages)

	FIBER* CONSUMPTION BY END USE MARKET					
YEAR	APPAREL	FURNISHINGS	INDUSTRIAL USES	OTHER CONSUMER TYPE PRODUCTS	EXPORTS	TOTAL
1970	36.9%	30.4%	16.7%	13.5%	2.5%	100%
1969	36.0%	30.5%	18.4%	12.4%	2.7%	100%
1968	37.8%	29.8%	18.3%	11.9%	2.2%	100%
1967	38.7%	28.9%	18.1%	11.7%	2.6%	100%
1966	38.6%	28.6%	18.6%	11.5%	2.7%	100%
1965	40.0%	29.0%	17.3%	11.1%	2.6%	100%
1964	41.2%	28.2%	16.8%	10.9%	2.9%	100%
1963	42.0%	27.3%	16.6%	11.1%	3.0%	100%
1962	42.2%	26.1%	17.4%	11.0%	3.3%	100%
1961	42.5%	25.1%	17.6%	11.1%	3.7%	100%
1960	41.7%	25.3%	18.3%	10.9%	3.9%	100%

*Includes cotton, wool, and manmade fibers.

Source: Textile Organon

Improvements in the quality of the synthetic fibers produced (i.e., strength, uniformity, dyeability, etc.) are expected to broaden the present market, especially for fabrics used by the transportation industry, such as automobile and aircraft upholstery and carpets. Also, non-woven fabrics are expected to increase with markets such as air-pollution filters, disposable surgical gowns and fireproof cloth. The use of fireproof cloth should increase rapidly as new regulations are established. Other consumer product markets include:

- Handiwork yarns and threads
- Textiles for
  - Toys
  - Medical and surgical products
  - Sanitary products
- Apparel linings
- Umbrellas
- Sports equipment

The above market(s) consumed 13.2 percent of the textile products in 1971, as shown in Exhibit A-1. Fiber consumption by this end-use market has been trending upward since 1960, increasing not only in proportion of total fiber consumed but also in volume. There was approximately a 100-percent increase in volume from 721 million pounds in 1960 to 1,305 million pounds in 1970, as shown in Exhibit A-IV, following this page. Although estimates for 1971 indicate this market leveled off from its 1970 peak, it is anticipated that the market will expand in the next few years. Home sewing is expected to continue to grow, as well as the renewed interest in textile handicrafts such as knitting, crewel and crocheting. Increases in the use of textiles for toys, medical and surgical products is also expected to continue.

(3) Exports Will Continue to Account for a Small Proportion of Total Fiber Consumption

The export market comprised the smallest end-use market for textile mill products, accounting for an estimated 2.6 percent of fiber consumption in 1971. The export market has declined in overall proportion of fibers consumed since 1960 when it accounted for 3.9 percent as shown in Exhibit A-I. Exports are not expected to grow substantially

due to increased foreign textile production and stiff price competition in the foreign market.

3. ECONOMIC TRENDS IN THE TEXTILE INDUSTRY

The textile industry is emerging from a period of intense competition and declining profit margins. Demand has improved and is expected to continue growing as business conditions continue to improve.

(1) Textile Mill Product Sales Are Trending Upward

Textile mill product sales are beginning to trend upward again after a slight decline in 1970. Sales in 1971 were up 6 percent over 1970, and this trend is expected to continue through 1972. Second quarter 1972 sales are up $570,000, or 10.4 percent over second quarter 1971 sales. Trends in textile mill product sales since 1964 are shown below:

		Textile Mill Product Sales ($Millions)	
1972			
	2nd quarter	6,050	
	1st quarter	5,616	
1971			21,968
	4th quarter	5,694	
	3rd quarter	5,446	
	2nd quarter	5,480	
	1st quarter	5,348	
1970			21,598
1969			21,780
1968			20,841
1967			18,672
1966			19,513
1965			18,028
1964			16,249

(2) The Textile Production Index Was Up for 1971

The overall production index for textiles gained a little over 2 points in 1971 over a recent low of 106.3 in 1970, as shown on Exhibit A-V, following this page. Industry segments show a mixed

EXHIBIT A-V

Environmental Protection Agency

TEXTILE PRODUCTION INDICES

PRODUCT GROUPINGS	PRODUCTS	1967(1)	1968	1969	1970	1971
Textile Mill Products		100.0	108.8	113.2	106.3	108.5
	Cotton Fabrics	100.0	94.1	90.0	87.4	90.7
Woven Cloth	Manmade Fabrics	100.0	127.3	137.0	125.6	118.9
	Wool Fabrics	100.0	107.2	91.1	72.5	47.5
	Knit Goods	100.0	116.8	132.0	130.5	134.4
Knitted Goods	Hosiery	100.0	123.1	156.1	164.1	156.4
	Knit Garments	100.0	113.7	119.8	113.6	123.3
Tufted Goods	Carpeting	100.0	118.2	134.5	129.3	148.0
Yarn & Miscellaneous Textiles		100.0	107.3	108.4	96.6	103.1

Source: Federal Reserve Board

(1) 1967 Base Year

performance during 1971, with the cotton production index up and the man-made fiber index down when compared to 1970. Accounting for this shift in production is the renewed popularity of fabrics made out of cotton (denim) and the increased production of women's apparel. The wool index continued to decline, reflecting the trend toward lighter-weight fabrics and reduced demand for men's suits and coats.

Production of knit goods and garments was up in 1971, showing the continuing trend toward knits for apparel. The value of knit cloth almost doubled in value between 1967 ($1,212 million) and 1971 ($2,020 million). The carpet production index increased approximately 20 points in 1971--from 129.3 in 1970 to 148.0 in 1971. The increase in carpet production is primarily a result of the increase in the home furnishings market for textile products resulting from a record start of two million houses in 1971.

(3) Wholesale Prices of Textiles Have Remained Relatively Stable from 1960 to 1971

According to the Wholesale Price Index, the price of textiles has remained relatively stable from 1960 to 1971. During this time period, there was a 1.8 point increase in wholesale prices, with no dramatic price fluctuation for any one year. This compares to an 18.7-point change in wholesale prices for all industry commodities during the same period.

	Wholesale Price Index (1967 = 100)	
	Textiles	All Industries
1971	103.6	114.0
1970	103.2	110.0
1969	104.6	106.0
1968	104.1	102.5
1967	100.0	100.0
1966	100.2	98.5
1965	102.6	96.4
1960	105.0	95.3

Source: U.S. Department of Labor

Wholesale prices of major textile mill product groupings, such as cotton products, wool products and man-made fiber products, have shown substantial fluctuations on a yearly basis. These price fluctuations are primarily due to fluctuations in raw material costs, shifts in demand, imports and changes in technology. Fluctuations between cotton products and man-made fiber textile products for the years 1963 through the first half of 1972 are shown in Exhibit A-VI, following this page.

Changes in textile prices generally either move ahead of or lag behind downturns or upturns in the general economy. Textile price downturns generally lead general economic downturns; and when the economy is on the upturn, textile prices are late in recovering. In general, in the textile industry it takes approximately one year for a price movement to be felt.

(4) U.S. Government Influence on the Textile Market Is Insignificant

Military demand accounts for the major purchases by the Government. In 1970 Government purchases amounted to 0.49 percent of total purchases. In 1971 they totaled 0.12 percent. This change reflects the direct relationship of Government purchases and military activity.

(5) There Are No Readily Available Substitutes for Textile Products

There are at present no readily available non-textile products which can be substituted for existing textile products. In the long range, however, paper and plastic products have the biggest potential for replacement. While competition from non-textile products for textile markets is minimal, the competition between textile raw materials is intense. Synthetic fibers have replaced natural fibers to a large extent, and new textile products, such as felt and stitchbonded fabrics, are now being evaluated as replacements for many traditional textiles.

4. TEXTILE PRODUCT DISTRIBUTION SYSTEM

The manufacture and distribution of textile goods begins with the transfer of raw materials from the farm or fiber-manufacturing plant to the manufacturer of textile products.

Cotton is harvested and taken to gin mills, where cotton seeds and lint are separated from the raw fiber. The cotton fiber is then baled and forwarded

EXHIBIT A-VI

Environmental Protection Agency

WHOLESALE PRICE INDEX FOR COTTON, WOOL AND MAN-MADE FIBER TEXTILE PRODUCTS

	1967	1968	1969	1970	1971
Cotton Products	100.0	104.5	104.5	105.6	110.6
Wool Products	100.0	100.4	101.3	99.4	93.5
Manmade - Fiber Textile Products	100.0	104.9	106.6	102.1	100.8

Source: U.S. Department of Labor

to yarn manufacturers. There are several steps involved in the movement of cotton from the farm to the textile plant. They are the:

- Harvesting
- Ginning and baling
- Warehousing
- Marketing and selling
- Transporting

Most of the American cotton crop is ready for market during the first half of the crop year. To protect the cotton and to prevent its destruction by fire and other hazards, the cotton is stored in warehouses. These stocks are held in the warehouses until needed by the textile mills.

Wool is harvested and packed in bags for shipment. It is then sold to middlemen who sort the wool into uniform lots and bag or bale it. The wool is then stored in warehouses until purchased by the manufacturers. Manufacturers buy the wool as needed, and will either remove the grease and dirt (scouring) from the wool themselves or have it done by a scouring mill.

Man-made fibers are bought directly from the fiber manufacturer. Fibers can be bought in continuous-filament form or as staple (short fiber lengths). Continuous filaments are delivered wound in bobbins or on beams, while staple is delivered in bales.

Cotton, wool and man-made staple is converted into yarn and woven, knitted or tufted as desired. Man-made continuous-filament yarns do not have to be converted into yarn prior to weaving or knitting. However, in many cases it is processed (texturized) prior to weaving or knitting, to impart to the yarn specific desired characteristics (i. e., elasticity, bulk, etc.).

Once the product is made it is then finished to market requirements. The product can be finished in a variety of ways (dyeing, waterproofing, flameproofing, etc.) to meet market requirements.

One or several manufacturing plants can be involved in the process of making textile products. Some plants can perform all of the functions required, while other specialize in certain functions. The same breakdown takes place within multiplant companies.

Once the textile product is made, it is sold to finished-goods manufacturers, wholesalers or retailers. Finished-goods manufacturers will purchase textile products and convert them into consumer products. The consumer products are then sold to wholesalers or retailers for subsequent sale to consumers. Textile products not requiring conversion to consumer goods are sold by the textile manufacturers to the wholesalers or retailers for resale to consumers.

The distribution system of the textile product until it reaches the consumer is detailed in schematic form in Exhibit A-VII, following this page.

5. THE TEXTILE INDUSTRY USES DIFFERENT PRODUCTION PROCESSES DEPENDING ON THE RAW MATERIAL USED

Each of the three raw materials (cotton, wool and synthetics) used by the textile industry requires different processes in order to produce a finished product. While many of the steps performed in each process are similar, unique steps in each process are required because of the characteristics of each fiber. The steps required to process each fiber are described below.

(1) Cotton Processing Consists of Three Basic Steps: Spinning, Weaving or Knitting, and Finishing

Spinning is a mechanical process requiring no wetting agents which is composed of several subprocesses. These processes remove foreign material from the cotton fiber and turn the fibers into yarn by straightening, aligning and twisting the fibers. The yarn is then wound on spools for transfer to other operations or for sale to textile weavers or knitters.

The yarn is woven or knitted into cloth. The weaving operation starts by sizing (or slashing) the yarn. This is done to strengthen the yarn to permit it to resist subsequent chafing and abrasion. A starch solution is generally used to size the yarn.

Sized yarn is woven or knitted into cloth. The goods produced are known as greige goods.

Greige goods must be finished to customer specifications. The first step in finishing cotton greige goods consists of removing the starch (desizing) applied to the cloth prior to weaving. Once desized, cotton cloth can be finished to meet the desires of the market by either bleaching, mercerizing, dyeing, printing or any other special-purpose finish.

Exhibit A-VIII, following Exhibit A-VII, details the operations performed in the production of cotton textile goods.

6. SEVERAL RAW MATERIALS ARE USED IN THE TEXTILE INDUSTRY

Several types of raw materials are used to make the many textile products used today. The basic raw materials used are:

- Cotton fibers
- Wool fibers
- Synthetic fibers

The following sections describe the sources and production volume of each type of raw material.

(1) Cotton

Cotton is grown across the southern belt of the United States. The leading producer state is Texas, where 27.2 percent of all the cotton produced in 1972 in the United States was harvested. Exhibit A-XI, following this page, shows the total cotton production for 1972, while Exhibit A-XII, following Exhibit A-XI, shows the areas where cotton is grown.

The total poundage of cotton grown averaged 5.9 billion pounds from 1960 to 1972, and fluctuated between 3.5 billion in 1967 and 7.3 billion in 1963. The total production in 1972 is expected to be 6.4 billion pounds. Exhibit A-XIII, following Exhibit A-XII, shows the production of cotton over the last 12 years.

Of the 6,404 million pounds of cotton to be harvested in 1972, approximately 3,840 million pounds will be consumed by domestic textile mills. Of the balance, 1,440 million pounds will be exported and the rest will be stored (1,124 million pounds). Of the cotton exported, approximately 41 percent will be exported under special government programs.

The price of cotton varies according to the expected size of the crops and estimated consumption. Over the last three years the price of cotton has ranged between 28 and 39 cents a pound.

(2) Wool

Wool is produced in significant amounts in 25 states. Approximately 159 million pounds of wool were produced in 1971, with the same

EXHIBIT A-XI

Environmental Protection Agency

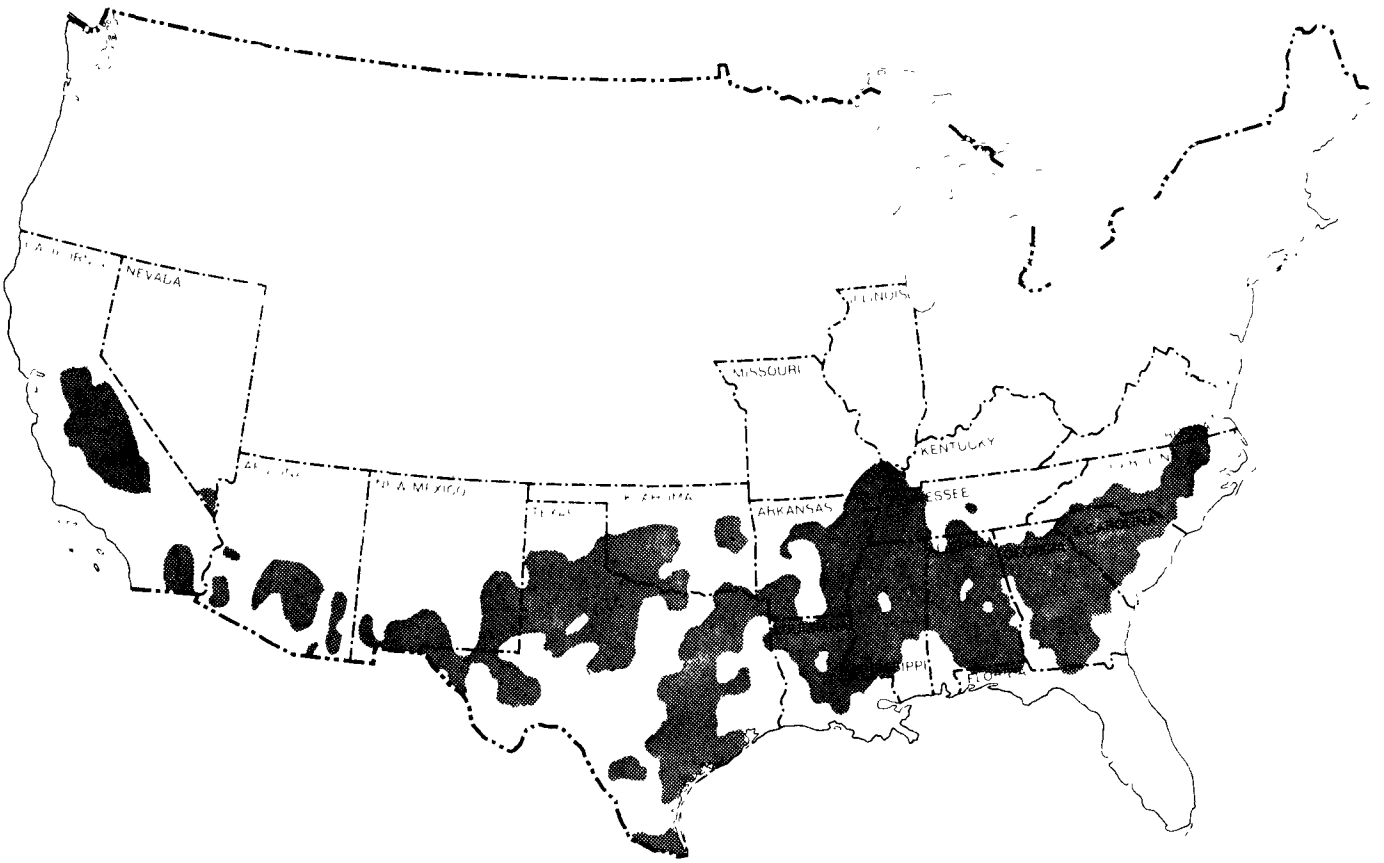
1972 PRELIMINARY COTTON PRODUCTION
BY LARGE PRODUCER STATES

STATE	1972 PRODUCTION		
	BALES (000's)	POUNDS (000's)	%
Texas	3,631	1,742,880	27.2
Mississippi	2,200	1,056,000	16.5
Arkansas	1,600	768,000	12.0
California	1,460	700,800	10.9
Louisiana	850	408,000	6.4
Alabama	675	324,000	5.1
Tennessee	600	288,000	4.5
Arizona	597	286,560	4.4
Missouri	491	235,680	3.7
Georgia	400	192,000	3.0
South Carolina	280	134,400	2.1
Oklahoma	254	121,920	1.9
New Mexico	158	75,840	1.2
North Carolina	125	60,000	0.9
Other States	22	10,560	0.2
Total U.S.	13,343	6,404,640	100.0

EXHIBIT A-XII

Environmental Protection Agency

AREAS WHERE COTTON IS GROWN



Cotton is grown in 19 states and is a major crop in some 14 states where it averages a third of all crop marketings. Cotton, furthermore, is big business for the nation as a whole. It forms the basis of a $24 billion industry in terms of investment. Cotton and cottonseed marketings add up to about $2.5 billion per year. More than nine million Americans depend more or less directly on cotton as their source of income.

Source: Cotton from Field to Fabric, National Cotton Council of America.

EXHIBIT A-XIII

Environmental Protection Agency

UNITED STATES COTTON PRODUCTION

YEAR	PRODUCTION BALES (000's)	PRODUCTION POUNDS (000's)
1960	14,237	6,833,760
1961	14,283	6,855,840
1962	14,827	7,116,960
1963	15,294	7,341,120
1964	15,144	7,269,120
1965	14,951	7,176,480
1966	9,555	4,586,400
1967	7,443	3,572,640
1968	10,925	5,244,000
1969	9,990	4,795,200
1970	10,192	4,892,160
1971	10,473	5,027,040
1972	13,343	6,404,640

Source: "Cotton Situation" USDA

output expected in 1972. Exhibit A-XIV, following this page, shows the wool production for selected years by producing state.

The production of wool in the United States is insufficient to satisfy the demand of American domestic textile manufacturers. As a result, raw wool is imported to supply the needed material. Approximately 126 million pounds of raw wool were imported in 1971 to meet consumption of 191.5 million pounds. Exhibit A-XV, following Exhibit A-XIV, shows the consumption of wool by United States mills and the pounds of wool imported. Wool is imported from basically four countries: Australia, New Zealand, South Africa and Argentina.

The price of wool (grease basis) has ranged between $0.168 and $0.419 per pound over the last four years. In comparison, scoured, clean wool sells for between $0.55 and $1.10 per pound, depending on the type and quality of the wool. Foreign scoured wool can be purchased from $0.61 to $1.17 per pound, depending on the type and the country of origin.

(A detailed analysis of the cotton and raw wool production, consumption, and sales prices can be found in "Cotton Situation" and "Wool Situation," published four times a year by the Research Service of the U.S. Department of Agriculture.)

(3) Synthetic Fibers

Synthetic fibers were first produced commercially in the United States in 1910. The first synthetic fiber produced was rayon. This was followed by nylon in 1939, and many others since then. Nineteen generic names have been assigned by the Federal Trade Commission to cover the types of man-made fibers. These generic names are:

- Rayon
- Acetate
- Triacetate
- Acrylic
- Anidex
- Aylon*
- Glass
- Lastrile*
- Metallic
- Modacrylic
- Nylon
- Nytril*
- Olefin
- Polyester
- Rubber
- Saran
- Spandex
- Vinal*
- Vinyon

Approximately 5 billion pounds of man-made fibers are produced annually in the United States, with production steadily increasing. Nylon is the fiber produced in the largest quantity, and it represents 27.4

* Not currently produced in the United States.

EXHIBIT A-XIV

Environmental Protection Agency

WOOL PRODUCTION FOR SELECTED YEARS BY STATE

State	1955	1960	1965	1970	1971	1972
	1,000 pounds	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*
Texas	47,285	51,980	41,109	30,784	30,397	29,765
Wyoming	19,320	22,839	18,945	16,756	16,185	15,842
Colorado	11,869	14,808	11,001	10,817	12,081	10,564
California	18,927	19,419	14,741	11,665	11,580	10,363
South Dakota	9,718	14,941	12,032	9,509	9,585	9,702
Utah	12,610	11,950	9,595	9,922	9,167	9,127
Montana	15,553	17,041	12,462	9,468	9,016	8,871
Idaho	10,384	11,304	7,856	6,845	6,911	6,754
New Mexico	11,304	10,368	8,669	6,833	6,858	6,458
Ohio	8,996	8,501	6,366	5,318	5,015	5,107
Iowa	8,292	10,776	8,293	5,349	5,160	4,649
Oregon	6,723	7,596	5,053	4,430	4,312	4,264
Arizona	3,006	3,204	4,068	3,559	3,772	3,666
Minnesota	5,954	6,575	5,013	3,643	3,468	3,158
North Dakota	4,508	5,625	4,079	2,878	2,873	2,680
Kansas	3,571	4,841	3,525	2,606	2,715	2,634
Nebraska	3,016	4,970	3,452	2,736	2,610	2,500
Illinois	4,546	4,787	3,678	2,296	2,010	1,983
Missouri	5,152	5,393	2,924	1,895	1,820	1,799
Michigan	2,864	3,068	2,422	1,803	1,708	1,619
Nevada	4,080	2,786	2,075	1,828	1,751	1,580
Indiana	3,462	3,360	2,330	1,794	1,628	1,477
Pennsylvania	1,732	1,679	1,322	1,110	1,051	1,007
Virginia	1,699	1,670	1,284	1,104	1,023	961
West Virginia	1,472	1,403	1,067	885	798	783
Other States	15,241	14,393	8,102	5,893	5,590	5,200
United States	241,284	265,277	201,463	161,726	159,084	152,513

Crop Reporting Board, SRS.

EXHIBIT A-XV

Environmental Protection Agency

WOOL CONSUMPTION AND SOURCES

YEAR	MILL CONSUMPTION (000's LBS)	U.S. PRODUCTION (000's LBS)	IMPORTED (000's LBS)
1962	429,100	159,860	269,240
1963	411,743	134,585	277,158
1964	356,669	144,322	212,347
1965	387,026	115,446	271,580
1966	370,174	93,012	277,162
1967	312,510	125,234	187,276
1968	329,697	80,381	249,316
1969	312,793	123,606	189,187
1970	240,261	87,127	153,134
1971	191,461	64,886	126,575

Source: "Wool Situation" USDA

percent of total production for 1970. Exhibit A-XVI, following this page, shows the production of man-made fibers for 1960, 1969 and 1970 by fiber type.

There are 192 plants producing man-made fibers in 1972. These plants are located mainly in the southeastern United States and employ almost 113,000 workers. A detailed breakdown of the use of raw materials by end use is shown in Exhibits A-XVII, A-XVIII and A-XIX, following Exhibit A-XVI.

7. MOST TEXTILE MANUFACTURING IS CONCENTRATED IN TEN STATES

This section discusses textile plant location and employment patterns by state. Attention is focused on plants with 20 or more workers.

(1) There are 7,100 Textile Mills in the United States

Of these 7,100 plants, 4,369 (61.5 percent) employ 20 or more workers.* A listing of these mills and their location by state has been made available to EPA.

Textile World conducted a survey at 4,144 of the plants with 20 or more workers (94.9 percent of these plants). About 80 percent (3,364) of these plants were located in ten states. Exhibit A-XX, following Exhibit A-XIX, summarizes the geographic location of the 4,144 plants. The distribution of the remaining 780 plants not located in the ten states identified in Exhibit A-XX are presented in Exhibit A-XXI, following Exhibit A-XX. Eight of the states (including the District of Columbia) have no textile mills at all. Twenty-seven states with 50 plants or less, account for 59 percent of the total number of plants shown. Four states with 51 to 99 plants each, account for 41 percent of the total number of plants shown.

(2) Over 50 Percent of the Workers Employed in U.S. Textile Plants Are Concentrated in Three Southern States

Of a total employment of 1.05 million, 543,000 workers, or 52 percent of the total, are located in three southern states, as shown below.

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* U.S. Department of Commerce, 1963 Census of Manufacturers.

EXHIBIT A-XVI

Environmental Protection Agency

U.S. MAN-MADE FIBER PRODUCTION

(In Thousands of Pounds)

FIBER	1970	1969	1960
Cellulosic Fibers:			
Rayon	875,000	1,078,000	740,300
Acetate	498,200	498,200	280,200
Non-Cellulosic Fibers:			
Nylon	1,357,700	1,411,200	411,600
Acrylic	491,900	533,000	135,700
Olefin	255,200	265,700	13,700
Polyester Other	1,480,400	1,318,000	116,200
TOTALS	4,958,400	5,104,100	1,705,700

Source: "Man-made Fiber Fact Book," Man-made Fiber Producers Association, Inc.

EXHIBIT A-XVII

Environmental Protection Agency

END-USE CONSUMPTION OF WOOL

Year	Apparel	Home Furnishings	Industrial Uses	Other Consumer Type Products	Exports	Total
1970	62.3%	25.4%	2.3%	9.7%	0.3%	100%
1969	64.9%	24.8%	2.1%	8.0%	0.2%	100%
1968	67.2%	22.7%	2.0%	7.9%	0.2%	100%
1967	68.1%	23.3%	2.0%	6.4%	0.2%	100%
1966	66.2%	26.4%	1.7%	5.5%	0.2%	100%
1965	66.8%	25.6%	1.7%	5.7%	0.2%	100%
1964	64.3%	28.0%	1.7%	5.8%	0.2%	100%
1963	62.6%	29.5%	1.7%	5.5%	0.7%	100%
1962	64.3%	27.8%	1.8%	5.6%	0.5%	100%
1961	65.3%	27.6%	1.8%	4.8%	0.5%	100%
1960	63.2%	30.0%	1.7%	4.6%	0.5%	100%

Source: Textile Organon

EXHIBIT A-XVIII

Environmental Protection Agency

END-USE CONSUMPTION OF COTTON

YEAR	Apparel	Home Furnishings	Industrial Uses	Other Consumer Type Products	Exports	Total
1970	39.6%	31.2%	13.3%	12.5%	3.4%	100%
1969	39.1%	30.9%	13.7%	12.3%	4.0%	100%
1968	40.0%	30.7%	14.2%	12.2%	2.9%	100%
1967	40.6%	29.6%	15.1%	11.7%	3.0%	100%
1966	42.6%	28.4%	14.6%	11.5%	2.9%	100%
1965	43.8%	28.8%	14.0%	10.7%	2.7%	100%
1964	45.2%	27.5%	13.2%	10.6%	3.5%	100%
1963	45.0%	26.9%	13.7%	10.8%	3.6%	100%
1962	45.0%	26.2%	14.0%	10.8%	4.0%	100%
1961	44.3%	25.8%	14.7%	10.7%	4.5%	100%
1960	44.3%	26.1%	14.8%	10.4%	4.4%	100%

Source: Textile Organon

EXHIBIT A-XIX

Environmental Protection Agency

END-USE CONSUMPTION OF MAN-MADE FIBERS

Year	Apparel	Home Furnishings	Industrial Uses	Other Consumer Type Products	Exports	Total
1970	33.5%	30.3%	19.9%	14.4%	1.9%	100%
1969	31.4%	30.7%	23.2%	12.8%	1.9%	100%
1968	33.5%	29.8%	23.0%	11.9%	1.8%	100%
1967	33.7%	28.8%	22.8%	12.3%	2.4%	100%
1966	30.4%	29.2%	25.2%	12.4%	2.8%	100%
1965	31.1%	29.8%	23.9%	12.3%	2.9%	100%
1964	31.6%	29.3%	24.3%	12.2%	2.6%	100%
1963	33.4%	27.5%	23.9%	12.6%	2.6%	100%
1962	32.4%	25.5%	27.0%	12.4%	2.7%	100%
1961	32.9%	23.1%	27.6%	13.3%	3.1%	100%
1960	30.1%	22.1%	30.5%	13.6%	3.7%	100%

Source: Textile Organon

EXHIBIT A-XX

Environmental Protection Agency

PLANT LOCATION SUMMARY
OF THE TEN MAJOR STATES

EPA REGION	STATE	NUMBER OF PLANTS	%	REGIONAL TOTAL	%
I	Massachusetts	248	6.0		
	Rhode Island	177	4.3	425	10.3
II	New York	414	10.0		
	New Jersey	249	6.0	663	16.0
III	Pennsylvania	449	10.8	449	10.8
IV	North Carolina	947	22.8		
	Tennessee	111	2.7		
	South Carolina	335	8.1		
	Georgia	318	7.7		
	Alabama	116	2.8		
				1827	44.1
Sub-Total				3364	81.2
All Others				780	18.8
Total Identified in Textile World Survey				4144	100.0

Textile Mill Employee Concentration

EPA Region	State	Number of Employees	Percent of Total
IV	North Carolina	278,700	26.5
IV	South Carolina	148,000	14.1
IV	Georgia	116,400	11.1
Subtotals		543,100	51.7
	All Others	507,530	48.3
Totals		1,050,630	100.0

Source: American Textile Manufacturers Institute, Inc. and Textile World survey.

After Region IV, Region III leads in number of employees with Pennsylvania accounting for 7 percent of all employees. Other states having significant textile employment include New York (6 percent), Virginia (4 percent) and Alabama (4 percent).