United States
Environmental Protection
Agency

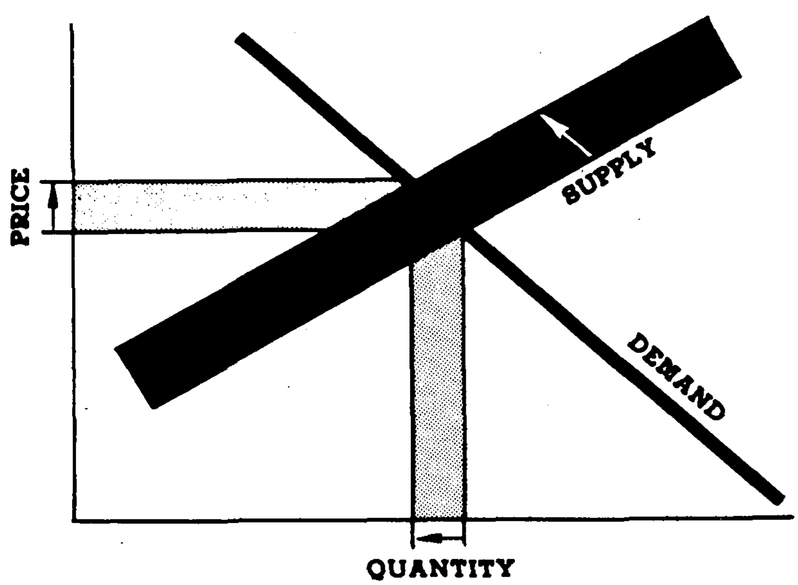
Office of Analysis and Evaluation
Office of Water and
Waste Management
Washington, DC 20460

EPA-440/2-80-002
November 1979

Water

EPA

Economic Impact Analysis of Proposed Revised Effluent Guidelines and Standards for the Ink Manufacturing Industry



EPA - 440/2-80-002
November 1979

ECONOMIC ANALYSIS OF PROPOSED REVISED EFFLUENT GUIDELINES AND STANDARDS FOR THE INK MANUFACTURING INDUSTRY

Prepared for

OFFICE OF WATER PLANNING AND STANDARDS
ENVIRONMENTAL PROTECTION AGENCY
Washington, D. C. 20460

under

Contract No. 68-01-4466

PREFACE

The attached document is a contractor's study prepared for the Office of Analysis and Evaluation of the Environmental Protection Agency ("EPA"). The purpose of the study is to analyze the economic impact which could result from the application of alternative BPT, BAT, PSES, NSPS, PSNS guidelines established under the Federal Water Pollution Control Act (the Act), as amended.

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

The study has been prepared with supervision and review of the Office of Analysis and Evaluation of the EPA. This report was submitted in fulfillment of Contract No. 68-01-4466 by Arthur D. Little, Inc. This report reflects work completed as of October 1979.

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

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I. EXECUTIVE SUMMARY

A. PURPOSE AND SCOPE

The work covered in this report was authorized by the Environmental Protection Agency under Contract Number 68-01446. The objective of the work was to examine the economic impact of various options for the control of wastewater from ink manufacturing plants. The control of wastewater from ink manufacturing plants will be covered under BAT, PSES, PSNS and NSPS regulations. BAT is the best available technology covered in the Development Document and will affect all plants which discharge wastewater. PSES is pretreatment standards for existing sources and the regulation will cover all plants which are currently indirect dischargers. PSNS and NSPS are regulations for new sources and cover pretreatment standards for indirect dischargers and performance standards for direct dischargers.

Technical data concerning costs for various control options, numbers, and sizes of ink plants and their respective wastewater discharge characteristics were furnished by the technical contractor to the Effluent Guidelines Division. Other information and data were obtained from National Association of Printing Ink Manufacturers, Morton Research Corporation, Company Annual Reports, various Trade Journals, Department of Commerce, and Arthur D. Little, Inc. estimates.

The regulations will be established to control discharge of pollutants by plants manufacturing ink as defined in SIC 2893. Captive plants owned by printers are not included in this study.

B. METHODOLOGY

The Ink Manufacturing Industry was characterized by a review of public data, company annual reports, a previous EPA economic study, Morton Research Corporation reports on the ink industry, National Association of Printing Ink Manufacturers data, and Arthur D. Little, Inc., estimates. Using these data, the industry was segmented by plant production size and financial models made for each size. Using before tax return on investment and investment for control as a percent of fixed assets, impacts were determined for each model. Price effects and total industry costs were calculated. Closure effects were not studied since there were no predicted closures.

C. PRESENT ECONOMIC CONDITIONS

The Ink Industry comprises some 460 plants. While many of these are small (50%), many are owned by large corporations and this is one of the major differences between ink plants and paint plants. In general, profits and return on investment are greater for ink plants than for paint plants.

D. SUMMARY OF ECONOMIC IMPACT

1. Industry Costs for Compliance

Two control options were examined to determine total industry costs. One, Physical Chemical Pretreatment, is expected to cost the industry $1.9 million as shown in Table 1. Option 2, Zero Discharge by contract hauling is expected to cost $3.0 million annually as shown in Table 2.

TABLE 1

INK INDUSTRY CONTROL COSTS – OPTION 1
(Physical Chemical Pretreatment)
($000)

Segment	Small	Large	Total
No. Plants	66	96	162
Annual Cost/Plant	$2.7	$17.6	–
Total Annual Cost	$178.2	$1689.6	$1867.8
Total Investment Cost	$244.2	$2985.6	$3229.8
Cost/Lb. Ink (¢)	1.2	0.5	0.5

TABLE 2

INK INDUSTRY CONTROL COSTS – OPTION 2
(Zero Discharge by Contract Hauling)
($000)

Segment	Small	Large	Total
No. Plants	75	109	184
Annual Cost/Plant	$5.0	$24.4	–
Total Annual Cost	$375.0	$2659.6	$3034.6
Total Investment Cost	$180.0	$1286.2	$1466.2
Cost/Lb. Ink (¢)	2.2	0.6	0.7

2. Summary of Impacts

The economic impact of physical chemical pretreatment costs and zero discharge costs on small and large ink plants is shown in Table 3.

TABLE 3

SUMMARY OF IMPACT OF WASTEWATER TREATMENT COSTS
($000)

Segment	Small		Large	
Treatment	A	B	A	B
Physical Chemical	8.7*	65.2*	17.0	8.5
Manually Operated Physical Chemical	11.4	15.3	–	–
Contract Hauling	13.1	9.9	16.7	3.2

A = Before Tax Return on Investment After Treatment
B = Control Investment as % of Fixed Assets

*Potential Impact

The only potential for high impact is shown for small plants using physical chemical pretreatment. Since these plants would probably use manually operated physical chemical pretreatment, then no potentially high impact occurs. No plant closures or unemployment effects are predicted.

E. LIMITS OF THE ANALYSIS

1. Model Plants

It is assumed that all plants in the model have the same financial data. Any serious discrepancy in the 1976 (Base year) profitability data could leave an effect on impact.

2. Control Investment Availability

Small plants usually have a difficult time raising capital for non-productive equipment except by self financing. Since the investment for control is not a large percentage of fixed assets, then even small plants should be able to borrow the necessary funds.

3. Contract Hauling Costs

Sensitivity analyses show that as contract hauling costs increase above 60¢/gal. then small plants become potentially impacted.

II. PURPOSE AND AUTHORITY

The Federal Water Pollution Control Act Amendments of 1972 established a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters," Section 101(a). By July 1, 1977, existing industrial dischargers were required to achieve "effluent limitations requiring the application of the best practicable control technology currently available" ("BPT"), Section 301(b) (1)(A); and by July 1, 1983, these dischargers were required to achieve "effluent limitations requiring the application of the best available technology economically achievable . . . which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants" ("BAT"), Section 301(B)(2)(A). New industrial direct dischargers were required to comply with Section 306 new source performance standards ("NSPS"), based on best available demonstrated technology; and new and existing dischargers to publicly owned treatment works ("POTW's") were subject to pretreatment standards under Sections 307(b) and (c) of the Act. While the requirements for direct dischargers were to be incorporated into National Pollutant Discharge Elimination System (NPDES) permits issued under Section 402 of the Act, pretreatment standards were made enforceable directly against dischargers to POTW's (indirect dischargers).

A. BAT EFFLUENT LIMITATIONS

The factors considered in assessing best available technology economically achievable (BAT) include the age of equipment and facilities involved, the process employed, process changes, non-water quality environmental impacts (including energy requirements) and the costs of application of such technology [(Section 304 (b)(2)(B)]. In general, the BAT technology level represents the best economically achievable performance of plants of various ages, sizes, processes or other shared characteristics. BAT may include process changes or internal controls, even when not common industry practice.

The Agency has considered the volume and nature of discharges, the volume and nature of discharges expected after application of BAT, the general environmental effects of the pollutants, and the costs and economic impacts of the required pollution control levels.

Despite this expanded consideration of costs, the primary determinant of BAT is effluent reduction capability. As a result of the Clean Water Act of 1977, the achievement of BAT has become the principal national means of controlling toxic water pollution. Although discharges of ink wastewater from ink manufacturing operations are small, the Agency is setting BAT limitations which are also applicable to existing indirect dischargers who might convert to direct discharge. The ink formulating industry discharges over 15 different toxic pollutants and EPA has considered three available BAT technology options which will reduce this toxic pollution by a significant amount.

B. NEW SOURCE PERFORMANCE STANDARDS

The basis for new source performance standards (NSPS) under Section 306 of the Act is the best available demonstrated technology. New plants have the opportunity to design the best and most efficient ink manufacturing processes and wastewater treatment technologies, and therefore, Congress directed EPA to consider the best demonstrated process changes, in-plant controls, and end-of-pipe treatment technologies which reduce pollution to the maximum extent feasible.

Because BAT represents the limit of current technology, the three options considered for NSPS are identical to the three options described above under BAT Effluent Limitations. No further improvement in technology is anticpated in new sources. However, a new plant may reduce the hazardous waste generated in meeting NSPS as a result of extensive in-plant control being incorporated into plant design.

C. PRETREATMENT STANDARDS FOR EXISTING SOURCES

Section 307(b) of the Act requires EPA to promulgate pretreatment standards for existing sources (PSES), which must be achieved within three years of promulgation. PSES are designed to prevent the discharge of pollutants which pass through, interfere with, or are otherwise incompatible with the operation of POTWs. The Clean Water Act of 1977 adds a new dimension by requiring pretreatment for pollutants, such as heavy metals, that limit POTW sludge management alternatives, including the beneficial use of sludges on agricultural lands. The legislative history of the 1977 Act indicates that pretreatment standards are to be technology-based, analogous to the best available technology for removal of toxic pollutants. The general pretreatment regulations (40 CFR Part 403), which served as the framework for these proposed pretreatment regulations for the ink formulating industry, can be found at 43 FR 27736 (June 26, 1978).

D. PRETREATMENT STANDARDS FOR NEW SOURCES

Section 307 (c) of the Act requires EPA to promulgate pretreatment standards for new sources (PSNS) at the same time that it promulgates NSPS. New indirect dischargers, like new direct dischargers, have the opportunity to incorporate the best available demonstrated technologies, including process changes, in-plant controls, and end-of-pipe treatment technologies, and to use plant site selection to ensure adequate treatment system installation. The pretreatment options for new dischargers to POTWs are the same as those for PSES, presented in the preceding section.

The purpose of this report is to provide the economic impact support for any BAT, BCT, or NSPS pretreatment standards for existing sources (PSES), and pretreatment standards for new segments of the Ink Industry, under Sections 301, 304, 306, 307 and 501 of the Clean Water Act.

III. METHODOLOGY

A. INDUSTRY SEGMENTS AND MODEL PLANTS

After the Ink Industry was characterized in a general way, the plants were segmented by size in terms of sales/production. Sizes were selected to correspond with available financial data. For each segment, a model statement of revenues minus total costs was prepared. The major item from which control costs were to be subtracted is profit before tax. Other features such as plant fixed assets, working capital, etc., were also calculated. Return on investment before tax was selected as a key financial indicator because there is little difference in this value for each of the model plants. It therefore offers the opportunity of comparing the impact of various control costs regardless of plant size-by applying a single criterion for evaluating the impacts.

B. PRELIMINARY DETERMINATION OF IMPACT

Applying costs for control to the profit before tax for each model resulted in an estimated profit before tax after treatment. This value divided by the total plant investment (Net Fixed Assets plus Working Capital) resulted in a Before Tax Return on Investment After Treatment.

For purposes of screening, it was assumed that any plant having a Before Tax Return on Investment After Treatment of 10% or less would be in the highly impacted category. For plants whose Before Tax Return on Investment After Treatment is significantly above this value no further detailed analyses were made. However, the cost for compliance for those plants was calculated and included in the total industry costs. In addition, any control option whose investment cost was greater than 25% of plant fixed assets was also considered to be highly impacted.

C. ECONOMIC IMPACTS

Any plants in the highly impacted category, as determined by the initial screening, were to be further examined by determining the sensitivity to variables such as contract hauling costs, capital payback periods, ratio of wastewater to product, etc.

1. Price Effects

Since one method of recovering costs would be to raise prices, the average cost per gallon of product was calculated for each segment to maintain its Before Tax Return on Investment Before Treatment. From this data, an average industry price increase was calculated by dividing industry costs by gallons produced.

2. Capital Costs and Availability

Assuming that the necessary capital must be raised from outside financial assistance, capital costs were calculated on the basis of a five year direct reduction payback at 12% annual interest.

IV. PRE-REGULATION INDUSTRY CONDITIONS

A. INDUSTRY CHARACTERISTICS

The ink industry is essentially a service industry for the printing industry. Unlike the paint industry, which is dominated by single-location companies, printing ink manufacturers are characterized by a relatively large proportion of companies with branch plants. (See Figure 1.) The product is manufactured by blending raw materials, using unsophisticated technology. About 95% of production is sold directly to printers, with the other 5% being sold through jobbers or merchant wholesalers. A few very large plants manufacture some of their own raw materials; many of these are subsidiaries of large chemical companies or oil refiners.

An overview of this industry shows that about one-half of the 460 plants are privately owned, 65% of the plants are branches, and only about 28% are single-company, single-location operations. About 75% of the plants have fewer than 20 employees, and the facilities are mostly in the 10- and 20-year age category. About 30% of the plants each produce less than 200,000 pounds of ink annually and about 40% report sales from printing ink of less than $500,000.

Little wastewater is generated in an ink plant. An estimated 60% of the industry practices zero discharge and 80% of the industry probably discharges less than 100 gallons per day.

1. Description of the Products

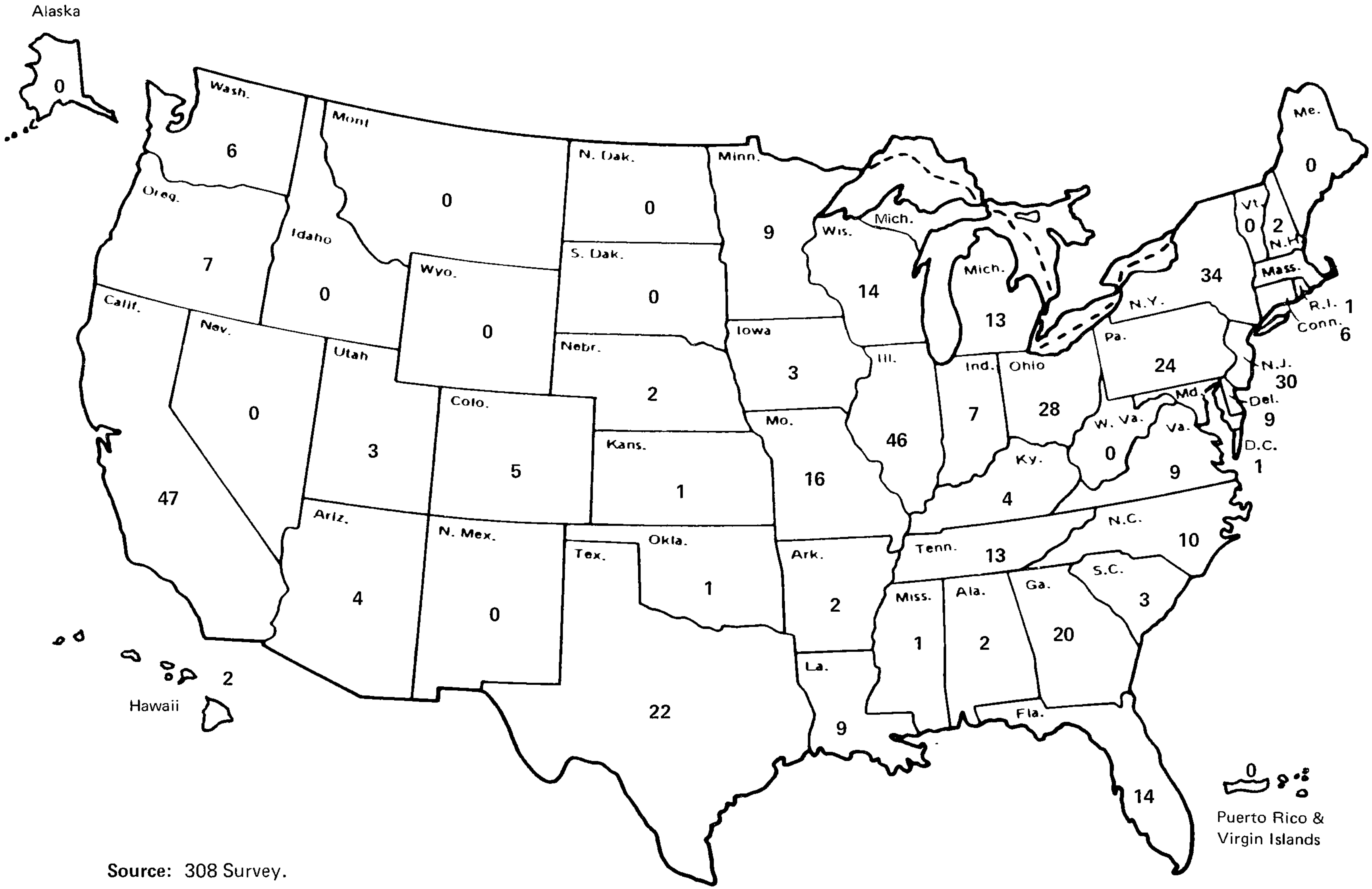
The ink industry manufactures a wide variety of products, dependent primarily on the process used by the printer; that is, the inks are generally classified as those used on letterpress, offset, flexo, or gravure printing presses. Some inks, such as those for newspapers and some periodicals, are manufactured in bulk and sold at very low prices. Newspaper ink is frequently sold in tank car or tank truck quantities to the larger users. For the most part, however, the industry is characterized as distributing their product in small units with five pound cans the most popular.

Inks are classified as paste inks or liquid inks depending upon end use. Paste inks generally are used in letterpress or litho printing while liquid inks are used for gravure and flexo. Both types are available in a wide variety of colors, drying characteristics, and in many cases are formulated specifically for certain pressroom requirements.

2. Industry Pricing

The cost of ink is not usually a major factor in the cost of the finished printed product. Demand in the industry is inelastic, i.e., the number of pounds of ink sold per year is reasonably independent of price and more dependent upon printing sales.

In spite of the apparently competitive situation on prices and the price structure of the newspaper, flexo, litho, and letterpress portions of the printing business, there is an opportunity for the independent ink manufacturer to provide service that allows it to compete with the larger and more highly organized companies. For well-managed and well-organized companies, the opportunities to make a reasonable margin of profit are good. For those that are not well-organized, the borderline between profit and loss may be tenuous.



Source: 308 Survey.

FIGURE 1 GEOGRAPHICAL DISTRIBUTION OF INK MANUFACUTRING PLANTS

At present, the cost of most raw materials used by the printing ink manufacturers is rising and how much more of an increase could be tolerated is open to question. Labor rates, like those in the paint industry, are also increasing. The opportunities for higher productivity are questionable, principally because of the small scale of production in most commercial printing ink plants. There may be some opportunities for higher productivity where large volumes of ink are generated, such as for newspapers, etc.

3. Types of Plants

A survey of the industry by the EPA, the previous economic study, and public data have provided enough information to characterize individual plants. The structure of the ink industry is such that a high percentage of ink plants are publicly owned, (Table 4) and this industry is characterized by a large number of branch plants and divisions of large companies (Table 5). Some ink manufacturing plants are owned by printing plants, and may be rather large, such as the ink manufacturing operation of the Bureau of Engraving and Printing; others are very small and really amount to color-matching or ink-blending operations. For the most part these captive plants have been eliminated from consideration in this study and will be included in the study on printing. Tables 6 through 8 show the average number of employees per plant, the distribution of plants by age of operation and the average production by plant.

TABLE 4

DISTRIBUTION OF INK PLANTS BY TYPE OF ORGANIZATION

	No. Plants	%
Public	192	41.7
Private	242	52.6
Partner	6	1.3
Proprietorship	9	2.0
Cooperative	7	1.5
Unknown	10	2.2

Source: 308 Survey

TABLE 5

DISTRIBUTION OF INK PLANTS BY SITE STATUS

	No. Plants	%
Only location	128	27.8
Branch	293	63.7
Division	26	5.6
Captive	7	1.5
Other	6	1.3

Source: 308 Survey

TABLE 6

DISTRIBUTION OF EMPLOYEES PER INK PLANT

Average No. Employees	No. Plants	%
Under 10	193	42.0
11-20	131	28.5
21-30	59	12.8
31-40	25	5.4
41-50	14	3.0
51-60	3	0.6
61-70	5	1.1
71-80	3	0.6
81-90	4	0.9
91-100	3	0.6
101-150	8	1.7
Over 150	4	0.9
Unknown	8	1.7

Source: 308 Survey

TABLE 7

DISTRIBUTION OF INK PLANTS BY AGE OF OPERATION

	No. Plants	%
Less than 3 years	49	10.6
3-5	51	11.1
6-10	95	20.6
11-20	125	27.2
21-30	59	12.8
Over 30	63	13.7
Unknown	18	3.9

Source: 308 Survey

TABLE 8

DISTRIBUTION OF INK PLANTS
BY 1976 PRODUCTION
(Pounds)

	No. Plants	%
Less than 250,000	120	26.1
250,001-500,000	76	16.5
500,001-1,000,000	76	16.5
1,000,001-3,000,000	74	16.1
Over 3,000,000	68	14.8
Unknown	46	10.0

Source: 308 Survey

4. Seasonality

The ink industry, much like the paint industry, suffered the problem of tremendous price increases for certain raw materials at the time of the 1974 petroleum shortage and has had to spend a considerable amount of money in reformulating products to satisfy its customers' needs. In general, these increases have been passed on to the customer and, as a result, profitability in the industry has made a small upturn. The ink industry is not as seasonal as some industries such as paint manufacturing and, because it is looked upon as a raw material, demand is fairly constant, although some cycling occurs with changes in the volume of printing production. For instance, in an economic downturn, when fewer advertising dollars are spent, this cutback will have a direct bearing on ink sales.

B. INDUSTRY SEGMENTATION

1. Model Plant Development

One of the difficulties in looking at profitability, cash flow, return on investment, etc., for the printing industry is that no data are available on a plant-by-plant basis. Large ink companies, however, would probably tend to keep a small plant open, even though its profitability was lower than that of other plants in the system, simply because it served printers in a certain area. This is particularly true where large printers with branch printing plants like to make their ink purchases through the corporate headquarters of the ink company but have the ink locally for quick delivery. Ink manufacturing plant models (Table 9) were constructed based on data from the National Association of Printing Ink Manufacturers, individual company data, and Arthur D. Little, Inc., estimates.

2. Model Plants

a. Large Ink Plants

Plants in this category have sales of $2.5 million annually and generally produce more than three million pounds of ink. They average more than 30 employees per plant.

TABLE 9

FINANCIAL PROFILES OF MODEL PLANTS
($000)

Segment	Small	Large
No. Plants	230	230
Annual Sales	300	2500
No. Employees	4	34
Annual Production (000 lbs.)	230	3750
Plant Profit Before Tax	18.3	220
Plant Net Worth	60	625
Plant Working Capital	74.7	792
Plant Total Assets	115	1356
Plant Fixed Assets	24.2	366
Plant Total Investment	98.92	1158
Before Tax Return on Investment (%)	18.5	19.0

b. Small Plants

Plants in this category have sales of $300,000 and produce less than 250,000 pounds of ink. They average four employees per plant.

The ink industry, like the paint and allied product industries, spends relatively little money on new capital equipment and buildings. An average of 2.2% of sales is a figure that has been used for estimating the amount of capital investment made annually. Most of this investment is made by the large plants, whereas the small plants tend to spend less money or to purchase used equipment to stretch their capital further.

Since the industry comprises many small, privately owned single-plant firms, these companies would probably self-finance any capital investment necessary to meet proposed regulations. The large plants that are part of large corporations would appear to have little difficulty in obtaining capital for this purpose.

V. CONTROL COSTS

A. OPTIONS

The EPA studied three alternative methods for controlling pollution from wastewater discharged by the ink manufacturing industry. They are:

1. Physical Chemical Pretreatment.
2. Manually Operated Physical Chemical Pretreatment.
3. Contract Hauling.

Investment and operating costs have been provided for several size plants. These costs are presented in detail in the Development Document and are also summarized in the following tables. Some interpolation of these costs was necessary to adjust to the financial model plants and to adjust the 1978 cost data to the 1976 base year. A deflation factor of 0.835 was used in accordance with ENR construction costs for 20 cities. (ENR 12,21,78 page 69) Total investment, annual capital costs, annual operating costs and total annual costs are shown. The investment capital necessary for control is assumed to be borrowed on a five-year direct reduction annual payback at 12% interest. Depreciation figures shown in the Engineering Report under operating costs have been deleted so that operating costs show only operating and maintenance costs. Annual investment cost shows the debt payback for control equipment only.

TABLE 10

PHYSICAL CHEMICAL PRETREATMENT COSTS
($000)

Segment	Small	Large
Total Investment	15.8	31.1
Annual Investment Cost	4.3	8.6
Annual Operating Cost	4.0	9.0
Total Annual Cost	8.3	17.6

TABLE 11

MANUALLY OPERATED PHYSICAL CHEMICAL PRETREATMENT COSTS
($000)

Segment	Small	Small at 9.2 gal/day
Total Investment	3.7	3.7
Annual Investment Cost	1.0	1.0
Annual Operating Cost	5.6	1.7
Total Annual Cost	6.6	2.7

TABLE 12

CONTRACT HAULING COSTS
($000)

Segment	Small	Large
Total Investment	2.4	11.8
Annual Investment Cost	0.7	3.3
Annual Operating Cost	4.3	21.1
Total Annual Cost	5.0	24.4

VI. ECONOMIC IMPACT

A. IMPACT SCREENING

To examine the degree of impact of control costs on the ink industry, the costs for control for each option were included in both model financial statements. It is assumed that all plants in each segment are identical to the financial model. The criteria used to determine potential closure was a 10% or less before tax return on investment after treatment and/or that the investment for control equipment is greater than 25% of plant fixed assets.

The effects of these costs on the model plants are shown in the following tables:

TABLE 13

IMPACT OF PHYSICAL CHEMICAL PRETREATMENT COSTS
($000)

Segment	Small	Large
Fixed Assets (Before Treatment)	24.2	366
Investment % Fixed Assets	65.2	8.5
Profit Before Tax	18.3	220
Total Annual Cost	8.3	17.6
Profit Before Tax after Treatment	10.0	202.4
Total Investment after Treatment	114.7	1189.1
Before Tax Return on Investment After Treatment (%)	8.7	17.0

TABLE 14

IMPACT OF MANUALLY OPERATED PHYSICAL
CHEMICAL PRETREATMENT COSTS
($000)

Segment	Small	Small at 9.2 gal/day
Fixed Assets	24.2	24.2
Investment % Fixed Assets	15.3	15.3
Profit Before Tax	18.3	18.3
Total Annual Cost	6.6	2.7
Profit Before Tax After Treatment	11.7	15.6
Total Investment After Treatment	102.6	102.6
Before Tax Return on Investment After Treatment (%)	11.4	15.2

TABLE 15

IMPACT OF CONTRACT HAULING COSTS
($000)

Segment	Small	Large
Fixed Assets	24.2	366
Investment % Fixed Assets	9.9	3.2
Profit Before Tax	18.3	220
Total Annual Cost	5.0	24.4
Profit Before Tax After Treatment	13.3	195.6
Total Investment After Treatment	101.3	1169.8
Before Tax Return on Investment After Treatment (%)	13.1	16.7

TABLE 16

SUMMARY OF IMPACT OF WASTEWATER TREATMENT COSTS
($000)

Segment	Small		Large	
Treatment	A	B	A	B
Physical Chemical	8.7*	65.2*	17.0	8.5
Manually Operated Physical Chemical	11.4	15.3	–	–
Contract Hauling	13.1	9.9	16.7	3.2

A = Before Tax Return on Investment after Treatment
B = Control Investment as % of Fixed Assets

*Potential Impact

Table 16 indicates that the only area of potential impact is with small plants using Physical Chemical Pretreatment. Small plants would probably use a manually operated physical chemical pretreatment system. The costs for this system in the Development Document were based on a plant discharging 30 gallons wastewater per day. The model plant has an average discharge of 9.2 gallons per day. If one assumes linear operating costs, but no change in capital costs, then the before tax return on investment after treatment for small plants becomes 15.2%.

On the basis of the above screening, no plant closures are predicted for the ink manufacturing industry. Therefore no analyses were made on closure effects, production effects or employment effects.

1. Plants Affected

According to the 308 survey 237 plants discharge no wastewater. 76 plants did not respond to that particular question. An examination of the answers to discharge practice by these 76 plants indicate that some 39 practice zero discharge. Of those plants discharging some 22 plants treat wastewater while 162 discharge untreated wastewater. In a follow-up of the survey, EPA determined that there were no direct dischargers. A summary of discharge practice is as follows:

276 Zero discharge
0 Direct dischargers
184 Indirect dischargers

460 Total

The 22 plants discharging treated wastewater are assumed to be able to meet Option I - Physical Chemical Pretreatment. A breakdown of affected plants therefore is as follows:

Plants Affected	S	L	Total
Option I - Physical Chemical Pretreatment	66	96	162
Option 2 - Zero Discharge	75	109	184

While no plant closures are predicted, the industry, nevertheless, will be impacted by control costs. One method for recovering these costs is through a price increase to pass on the cost to the customer. Assuming all plants affected will pass on costs, an average price increase can be calculated. This can be done by calculating the increase necessary to maintain pre-control return on investment. This is shown in the following tables assuming that Option 1 is a regulation based on physical chemical pretreatment and Option 2 is zero discharge by contract hauling.

TABLE 17

AVERAGE PRICE INCREASE TO MAINTAIN RETURN ON INVESTMENT
OPTION 1 – PHYSICAL CHEMICAL PRETREATMENT

Segment	No. Plants to Comply	Needed Revenues ($000)	Total Ink Lbs. (MM)	Cost per Pound (¢)
Small*	66	223.1	15.2	1.6
Large	96	2258.8	360.0	0.63
Total	162	2481.9	375.2	0.66

*For small plants using manually operated Physical Chemical Pretreatment, total annual costs of $2,700 were used.

TABLE 18

AVERAGE PRICE INCREASE TO MAINTAIN RETURN ON INVESTMENT
OPTION 2 – ZERO DISCHARGE BY CONTRACT HAULING

Segment	No. Plants to Comply	Needed Revenues ($000)	Total Ink Pounds (MM)	Cost per Pound (¢)
Small	75	408.0	17.25	2.4
Large	109	2906.2	408.8	0.7
Total	184	3314.2	426.05	0.8

On the basis of the price increase which would maintain the Return of Investment, a 1¢/lb price increase due to controls is forecast.

2. Industry Costs for Compliance

Total industry costs for compliance are shown in the following tables:

TABLE 19

INK INDUSTRY CONTROL COSTS – OPTION 1
PHYSICAL CHEMICAL PRETREATMENT
($000)

Segment	Small	Large	Total
No. Plants	66	96	162
Annual Cost/Plant	$2.7	$17.6	–
Total Annual Cost	$178.2	$1689.6	$1867.8
Total Investment	$244.2	$2985.6	$3229.8
Cost/Lb. Ink (¢)	1.2	0.5	0.5

TABLE 20

INK INDUSTRY CONTROL COSTS – OPTION 2
ZERO DISCHARGE BY CONTRACT HAULING
($000)

Segment	Small	Large	Total
No. Plants	75	109	184
Annual Cost/Plant	$5.0	$24.4	–
Total Annual Cost	$375.0	$2659.6	$3034.6
Total Investment	$180	$1286.2	$1466.2
Cost/Lb. Ink (¢)	2.2	0.6	0.7

VII. LIMITS OF THE ANALYSIS

A. MODEL PLANTS

Only two financial models were constructed because of the limited availability of financial information in the ink industry. Many plants will have much higher sales, production and profits than those shown. However, since the cost of control will have the greater impact on small plants, the models were constructed to accentuate this effect. Since control costs higher than those anticipated for the smallest plants were used in the impact analysis, no serious change in impact will result for plants which differ from the model.

B. CONTROL INVESTMENT COST

The investment for control can be difficult to obtain for very small plants. Any underestimates of these costs might indicate impact on small plants.

C. AMOUNT OF EFFLUENT

It is recognized that many plants will have wastewater ratios different than that shown by the engineering model. No serious change in impact will result, however, at ratios which are greater than those shown.

D. PRICE INCREASE

To fully recover costs and return on investment, small plants may have to achieve a 2.2¢/lb increase. This would result in a slightly larger total industry cost to the consumer.

E. CONTRACT HAULING COSTS

The engineering study used 30¢/gal for the cost of contract hauling process wastewater. Since the demands on landfill operations and regulations for this control may tend to increase these costs, the sensitivity of control costs by contract hauling was studied using 30, 60 and 90¢ per gal. The impact of these costs on model ink plants is shown in the following tables.

TABLE 21

SENSITIVITY OF CONTRACT HAULING COSTS ON
PHYSICAL CHEMICAL PRETREATMENT COSTS
($000)

Segment	Small			Large		
Hauling Cost (¢/gal)	30	60	90	30	60	90
Profit Before Taxes	18.3	18.3	18.3	220	220	220
Total Annual Cost	2.7	3.0	3.3	17.6	20.4	23.2
Profit Before Tax After Treatment	15.6	15.3	15.0	202.4	199.6	196.8
Before Tax Return on Investment After Treatment	15.2	14.9	14.6	17.0	16.8	16.6

TABLE 22

SENSITIVITY OF CONTRACT HAULING COSTS ON
ZERO DISCHARGE BY CONTRACT HAULING
($000)

Segment	Small			Large		
Hauling Cost (¢/gal)	30	60	90	30	60	90
Profit Before Tax	18.3	18.3	18.3	220	220	220
Total Annual Cost	5.0	7.3	9.5	24.4	43.1	61.9
Profit Before Tax After Treatment	13.3	11.0	8.8	195.6	176.9	158.1
Before Tax Return on Investment After Treatment	13.1	10.8	8.7	16.7	15.1	13.5

From this data it can be seen that for the zero discharge option the small plants are highly impacted when control costs for contract hauling increase to somewhere between 60 and 90 cents per gallon.

VIII. REFERENCES

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3. Selected Financial and Operating Ratios 1975-1976, National Association of Printing Ink Manufacturers, Inc.

4. Draft Engineering Report for Development of Effluent Limitations Guidelines for the Ink Manufacturing Industry. Burns and Roe.

5. U.S. Department of Commerce, Census of Manufactures.