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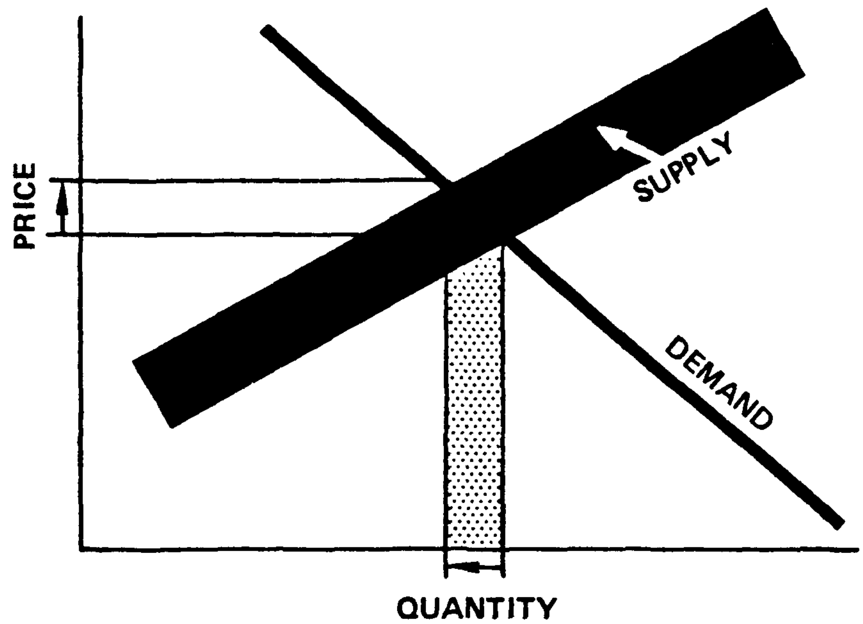
Economic Impact Analysis of Effluent Limitations and Standards for the Canmaking Industry



ECONOMIC IMPACT ANALYSIS OF EFFLUENT LIMITATIONS AND STANDARDS FOR CANMAKING SUBCATEGORY OF THE COIL COATING CATEGORY

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

This document is an economic impact assessment of the recently issued effluent guidelines. The report is distributed to EPA Regional Offices and state pollution control agencies and directed to the staff responsible for writing industrial discharge permits. The report includes detailed information on the costs and economic impacts of various treatment technologies. It should be helpful to the permit writer in evaluating the economic impacts on an industrial facility that must comply with BAT limitations or water quality standards.

The report is also being distributed to EPA Regional Libraries, and copies are available from National Technical Information Service (NTIS), 5282 Port Royal Road, Springfield, Virginia 22161, (703) 487-4650.

If you have any questions about this report, or if you would like additional information on the economic impact of the regulation, please contact the Economic Analysis Staff in the Office of Water Regulations and Standards at EPA Headquarters:

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PREFACE

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

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

This study has been prepared with the supervision and review of the Office of Water Regulations and Standards of EPA. This report was submitted in fulfillment of EPA Contract No. 68-01-6731 by Policy Planning & Evaluation, Inc. This analysis was completed in November 1983.

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1. EXECUTIVE SUMMARY

1. EXECUTIVE SUMMARY

1.1 PURPOSE

This report identifies and analyzes the economic impacts which are likely to result from the promulgation of effluent guidelines, limitations, and standards applicable to the canmaking subcategory of the coil coating category. These regulations include effluent limitations and standards based on Best Practicable Control Technology Currently Available (BPT), Best Available Technology Economically Achievable (BAT), New Source Performance Standards (NSPS), and Pretreatment Standards for New and Existing Sources (PSNS and PSES) which are being promulgated under authority of Sections 301, 304, 306, and 307 of the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (Public Law 92-500). The primary economic impact variables assessed in this study include the costs of the effluent regulations and the potential for these regulations to cause plant closures, price changes, job losses, changes in industry profitability, structure and competition, shifts in the balance of foreign trade, new source impacts, and impacts on small businesses.

1.2 INDUSTRY COVERAGE

The canmaking subcategory for purposes of this study includes facilities that manufacture and wash two-piece seamless cans. Two different manufacturing processes are used to fabricate two-piece cans:

- the draw and iron (D&I) process which involves drawing a metal disc into a cup and lengthening the sides through a series of ironing rings; and
- the draw/redraw (DRD) process where a metal disc is drawn one or several times depending on the desired depth of the container.

The manufacture of can tops, ends, seamed three-piece cans (which consist of a soldered-side-seam body), and seamless cans from coated stock are not included in this study. These segments of the canmaking industry employ dry manufacturing processes that do not require washing of the can bodies after forming. Since these segments do not generate process wastewater, they are not covered by this regulation.

1.3 METHODOLOGY

The approach used to assess the economic impacts likely to occur as a result of the costs of each regulatory option is to (1) develop an operational description of the price and output behavior of the industry and (2) assess the likely plant-specific responses to the incurrence of the compliance costs enumerated in the body of this report. Thus, industry conditions before and after compliance with the effluent regulations are compared. Supplemental analyses are used to assess linkages of the canmaking industry's conditions to other effects such as employment, community, and balance of trade impacts. These analyses were performed for four regulatory options considered by EPA. The methodology of the study includes nine major steps. Although each step is described independently, there is considerable interdependence among them.

Step 1: Description of Industry Characteristics

The first step in the analysis is to develop a description of basic industry characteristics such as the determinants of demand, market structure, the degree of intra-industry competition, and financial performance. The resulting observations indicated the type of analysis needed for the industry. The sources for this information include government reports, trade association data, discussions with various trade associations and industry personnel, and a plant- and firm-level survey conducted by EPA under authority of Section 308 of the Clean Water Act (the 308 survey).

For purposes of conducting the EIA, we have assumed that an average can manufacturing plant operates two can production lines at an average annual rate of 260 million cans per line (Church, 1982, p. 96). This distinction was made in order to determine the likelihood of potential closures which may occur in the baseline (closures in absence of this regulation) or those likely to occur due to this regulation. In some instances, a can manufacturing plant may produce other products on separate production lines which will not be affected by this regulation. However, because of a decline in revenues or annual production, the two-piece production line may be projected to close. Thus, the definition of a product line is necessary in order to estimate potential product line closures in addition to closures of plants which only manufacture two-piece cans.

Step 2: Supply-Demand Analysis

The supply-demand analysis provides an indication of the likely changes in the industry absent additional effluent guidelines. In this manner, potential baseline plant closures (closures that would have occurred in the absence of this regulation) can be predicted and compared to the plant closures estimated to result from each regulatory option. This analysis shows that given the industry's current excess capacity and moderate growth potential, by 1985 some eight commercial can manufacturing plants may close for reasons unrelated to this regulation.

Step 3: Cost of Compliance Estimates

The water treatment control systems, costs, and effluent limitations and pretreatment standards recommended for the canmaking industry were derived in a separate analysis. A comprehensive description of the methodology and the recommended technologies and costs are provided in the Development Document for Effluent Limitations Guidelines and Standards for the Coil Coating Point Source Category (Canmaking Subcategory). Several treatment and control options based on

BPT, BAT, NSPS, PSES, and PSNS for facilities within the canmaking subcategory are considered (refer to Section 1.7 of this chapter). A detailed description of these technologies and the development of their costs is in the Development Document. The costs of the pollution control options were developed by EPA's engineering staff and used to form the basis for the economic impact analysis. For this analysis, it was assumed that where the cost of complying with BAT was less than BPT, dischargers would install BAT instead of BPT technology.

Step 4: Plant-Level Profitability Analysis

The basic measure of financial performance used to assess the impact of the regulations on the profitability of individual plants is return on investment (ROI) (pre-tax profits as a percent of assets). The use of this technique involves a comparison of a canmaking facility's return on investment after compliance with a minimum required return on investment.

Plants with after-compliance ROI below a threshold value of 7% are considered potential plant closures. The 7% ROI threshold value corresponds to a 12% after-tax return on equity which is assumed to be the minimum return for a business to continue operation (see Appendix A for an explanation of how the 7% threshold was developed). Due to the unavailability of plant-specific baseline financial characteristics for the canmaking industry, average industry financial and operating ratios, such as profit margins and assets to sales ratios, were applied to each plant. Plant-specific information, however, was used to derive revenues and compliance cost estimates. Commercial and captive operations were treated the same in this analysis,[1] on the assumption that captive plants are treated as separate entities by their owners when making decisions concerning capital expenditures and financing.

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[1]Captive operations refer to plants operated by brewers and food processors that make cans for their own use, while commercial or "jobber" plants sell their products to outside customers.

Step 5: Capital Requirements Analysis

In addition to analyzing the potential for plant closures from a profitability perspective, the ability of firms to make the initial capital investment needed to construct and install the required treatment systems was also assessed. The analysis of capital availability was based on the ratio of "compliance capital investment requirements to plant annual revenues" (CCI/R). This ratio was calculated for each plant and compared to a threshold value to help determine the potential for significant plant-level impacts. This ratio was used to determine the magnitude of capital costs as a percent of revenues. For this analysis, the before-tax profit margin of a canmaking plant is estimated to be 5% of revenues (see Appendix B), and the corporate tax rate is assumed to be 40%; therefore 3% (60% of 5%) of revenues was taken to be the capital availability threshold. Plants with compliance capital investment costs greater than 3% of revenues are considered potential plant closures. Commercial and captive operations were treated the same in this analysis.

Step 6: Plant Closure Analysis

Plant closure estimates are based primarily on the quantitative estimates of after-compliance profitability and ability to raise capital, developed in Steps 4 and 5, respectively. Failure to meet either the profitability or capital requirements criteria specified in the two steps mentioned above indicates a potential closure for an individual plant.

The identification of potential closures in this step should be interpreted as an indication of the extent of plant impact rather than as a prediction of certain closure. The decision by a company to close a plant also involves consideration of other factors, many of which are highly uncertain and cannot be quantified. A summary of the results of the plant closure analysis may be found in Section 1.7 of this chapter.

Step 7: Other Economic Impacts

The substitution potential of other processes and materials, and possible community, employment, foreign trade, and industry structure implications, are addressed in this step.

Step 8: New Source Impacts

This step analyzes the effects of NSPS/PSNS guidelines upon new plant construction and/or substantial modifications to existing facilities in the canmaking industry. The analysis is based on model plants representing the canmaking industry and their corresponding compliance costs for the alternative treatment technologies.

Step 9: Small Business Analysis

The Regulatory Flexibility Act of 1980 requires Federal regulatory agencies to evaluate small entities throughout the regulatory process. This analysis identifies the economic impacts which are likely to result from the promulgation of the effluent regulations on small businesses in the canmaking industry. Most of the information and analytical techniques in the small business analysis are drawn from the general economic impact analysis. The specific conditions of small firms are evaluated against the background of general conditions in the canmaking markets.

For purposes of regulation development, the following alternative approaches were considered to provide alternative definitions of small canmaking operations:

- the Small Business Administration (SBA) definition;
- plant annual production;
- plant number of can lines; and
- plant wastewater flow rate.

For this regulation, plant annual production was used to define a small canmaking business. Plants producing 500 million cans or less per year were considered small. Other size categories included 500-750 million cans per year, 750-1,000 million cans per year, and greater than 1,000 million cans per year. The ratio of compliance capital investment to revenues was used to determine the impact on each size category.

The EPA has determined that small entities will not be disproportionately impacted by this regulation. This regulation is expected to cause only one two-piece product line closure. This product line is part of a three-piece canmaking plant.

1.4 INDUSTRY CHARACTERISTICS

EPA has identified 125 plants in the United States that manufacture seamless two-piece metal cans, of which, 86 generate process wastewater. The 86 include 80 indirect dischargers, 3 direct dischargers, and 3 plants that discharge wastewater by land application. Only the 83 direct and indirect dischargers are covered by this regulation. Plants which manufacture two-piece cans are dispersed throughout the country, with some concentration in populated areas such as California, Texas, and New York/New Jersey. Total employment by two-piece metal can plants is estimated to be about 31,500 people.

Technical data from 71 of the 83 canmaking plants that will be affected by this regulation were used to represent the industry for the economic impact analysis. These data included information on volume of production, discharge status, and treatment in place. Compliance costs were also estimated for 71 of the 83 two-piece canmaking plants. Approximately 80%, or 58, of these plants are aluminum two-piece seamless can plants. The data from these 71 plants were extrapolated to obtain estimated industry-wide impacts.

Most metal cans are produced by commercial can manufacturers (i.e., Continental Can; American Can; National Can; Crown, Cork & Seal; Reynolds Metals); however, in recent years, many breweries (i.e., Anheuser-Busch, Coors, Miller) and food processors (i.e., Carnation, Campbell, Del Monte, Van Camp) have increased their production of cans for their own use. Fourteen captive plants (canmaking operations owned by breweries or food processors) are included in the 71-plant sample.

Beverage containers, the largest users of seamless two-piece metal cans, accounted for 94% of total two-piece metal can shipments in 1982, and the food and general packaging markets represented the other 6%.

Competition is strong, however, in both markets. Glass and plastic bottles are the primary substitutes in the beverage container market; seamed three-piece cans, retort pouches, aseptic packaging, and composite cans are the primary substitutes in the food and general packaging markets.

Between 1976 and 1982 shipments of two-piece beverage cans increased at an average annual rate of 14%. However, despite the strong growth in shipments of two-piece cans, the industry reported excess capacity during 1982 of between 8-10 billion cans, as new, more efficient facilities were added to improve productivity, and as more captive plants were built by major beverage and food processing companies. This excess capacity is expected to diminish over the next several years.

Imports and exports of metal cans have been insignificant, since transportation costs for empty cans are high.

1.5 BASELINE PROJECTIONS

Baseline conditions in the canmaking industry were projected to 1990 to assess the industry's status in the absence of additional effluent regulations. These projections form the basic background for the economic impact conclusions. It was projected that shipments of seamless cans would increase from 61.5 billion cans in 1982 to 80.9 billion cans by 1990. It was also estimated that by 1985, 8 older and less efficient commercial plants would be shut down and 6 new captive plants would be built.

Growth in two-piece can shipments through the 1980s will be affected by several factors. Some of these factors are:

- competition among types of beverage containers;
- competition for new markets; and
- mandatory deposit legislation.

Projections show that two-piece beverage cans will continue to dominate the beverage packaging industry through 1990. New uses for two-piece cans are being developed in the food packaging and non-carbonated drink areas. Two-piece aluminum cans have also outperformed three-piece cans and glass bottles in states with mandatory deposit legislation. In New York, Massachusetts, and Delaware, cans are expected to maintain or improve their market share due to "lower handling costs, greater recycling value, and easy storage" (Bowe, 1983, p. 30). In spite of these competitive strengths, two-piece can shipments are expected to grow at an average annual rate of only 4.3% from 1982 to 1985 (Norton, 1982, p. 16) and at a rate of 3% from 1985 to 1990 (Predicasts, 1982, p. A-23). This contrasts sharply with an average annual growth rate of 14% for the years 1976 to 1982. These more moderate growth rates result from the fact that two-piece cans now dominate the beverage can market and new markets for two-piece cans are uncertain.

1.6 EFFLUENT GUIDELINE CONTROL OPTIONS AND COSTS

Based on the analysis of the potential pollutant parameters and treatment in place in the canmaking industry, EPA identified six treatment technologies that are most applicable for the canmaking industry:

- Treatment Level 1: Flow normalization and model end of pipe treatment technology consisting of oil removal by skimming, chemical emulsion breaking, dissolved air flotation, or a combination of these technologies; chromium reduction where necessary, and removal of other pollutants by precipitation and settle ("lime and settle");

- Treatment Level 2:[2] 60% flow reduction below normalized BPT flow, plus the Treatment Level 1 model end of pipe technology;

- Treatment Level 3: Treatment Level 2 plus polishing filtration;

- Treatment Level 4: Similar to Treatment Level 3, but substitutes ultrafiltration for polishing filtration;

- Treatment Level 5:[3] Flow reduction of about 30% below Treatment Level 2, in addition to the Treatment Level 1 model end of pipe technology; and

- Treatment Level 6: Similar to Treatment Level 5 plus polishing filtration.

Treatment Levels 5 and 6 are limited to new sources only. In addition, Treatment Levels 3 and 4 were rejected for reasons explained in the preamble to the final regulation and are not included for discussion in the Economic Impact Analysis.

Table 1-1 presents the estimated investment and annual compliance costs for the existing sources, and Table 1-2 summarizes the compliance cost estimates of the new source treatment alternatives.

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[2]Selected technology for BAT/PSES.

[3]Selected technology for NSPS/PSNS.

TABLE 1-1

ESTIMATED COMPLIANCE COSTS FOR CANMAKING EXISTING SOURCES

	All Discharging Plants	Indirect Dischargers	Direct Dischargers
Total for 71 Sample Plants			
Number of Plants	71	69	2
Compliance Capital Investment (Thousand Dollars)[a]			
Treatment Level 1	18,288	17,909	379
Treatment Level 2	18,588	18,209	379
Annual Compliance Costs (Thousand Dollars)[a]			
Treatment Level 1	14,873	14,493	380
Treatment Level 2	15,091	14,711	380
Projected Total for All Plants in Industry			
Number of Plants	83	80	3
Compliance Capital Investment (Thousand Dollars)[a]			
Treatment Level 1	21,551	20,907	644[b]
Treatment Level 2	21,970	21,324	646
Annual Compliance Costs (Thousand Dollars)[a]			
Treatment Level 1	17,472	16,881	591[b]
Treatment Level 2	17,742	17,148	594

SOURCE: Section VIII of the Development Document.

[a]First-quarter 1982 dollars.

[b]These costs are lower than those estimates presented in Section VIII of the Development Document. We believe facilities will choose the most economical means of complying with BPT and, if going directly to BAT is less expensive, will choose to install BAT technology with flow reduction in order to meet the BPT limits.

Note: Sampling data for 74 plants was received which included 3 plants that dispose wastewater by land application. Those three plants will have no compliance costs as a result of this regulation and, therefore, are not reflected in this table.

TABLE 1-2

NEW SOURCE MODEL PLANT COMPLIANCE COSTS

	Compliance Capital Investment (Thousand Dollars)[a]	Annual Compliance Costs (Thousand Dollars)[a]
Treatment Level 1[b]	--	--
Treatment Level 2	382.1	266.6
Treatment Level 3	399.1	277.6
Treatment Level 4[c]	--	--
Treatment Level 5	382.1	266.6
Treatment Level 6	396.1	275.6

SOURCE: Section VIII of the Development Document.

[a]First-quarter 1982 dollars.

[b]Treatment Level 1 costs are not provided since new source requirements must be at least as stringent as existing source requirements.

[c]Investment and Annual costs were not provided for Treatment Level 4. This treatment level was rejected as a viable option and will not be presented for discussion in the Economic Impact Analysis.

1.7 FINDINGS

Price and Quantity Changes

Because market competition is strong in the metal can industry, it is assumed that metal can manufacturers will attempt to absorb their compliance costs and will not adjust prices. Consequently, the price changes due to the regulation would be zero and the quantities demanded would not change from the baseline projections.

Plant Closure Potential

Treatment Levels 1 and 2 are expected to each cause a two-piece can production line in one plant to close. This one line's after-compliance ROI is estimated to be below the threshold value of 7% and its ratio of compliance capital investment to revenues exceeds 3%. This one line closure is projected to cause 26 job losses.

Substitution Effects

Because the two-piece metal cans face strong competition from other containers, price increases due to regulatory compliance costs probably would cause a switch to other types of containers. For this reason, the can manufacturers are expected to absorb their compliance costs, and no substitution effects are expected to result from the regulations.

Community and Employment Impacts

The one two-piece production line expected to close employs 26 employees. Thus, the community and employment impacts are expected to be small.

Foreign Trade Impacts

Since it was assumed that there would be no price increases due to the regulations, no foreign trade impacts are expected.

Industry Structure Effects

Treatment Levels 1 and 2 would have little effect on the structure of the canmaking industry, since the one line expected to close produces less than 50 million cans per year.

New Source Impacts

Costs of the new source treatment alternatives are low compared to expected revenues and are not expected to deter new entry or prevent major modifications to existing sources.

1.8 ORGANIZATION OF REPORT

The remainder of this report consists of seven chapters. Chapter 2 describes the analytical methodology employed; Chapter 3 provides the basic industry characteristics of interest; and Chapter 4 projects some of these key characteristics to the 1985-1990 time period, when the primary economic impacts of the effluent regulations will be felt. Chapter 5 describes the pollution control technologies considered by EPA and their associated costs; this information is derived primarily from the technical Development Document prepared by EPA's Effluent Guidelines Division. Chapter 6 describes the economic impacts projected to result from the cost estimates presented in Chapter 5. Chapter 7 presents an analysis of the effects of the effluent regulations on small businesses, and Chapter 8 outlines the major limitations of the analysis and discusses the possible effects of the limitations on the major study conclusions.

2. STUDY METHODOLOGY

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2.1 OVERVIEW

Figure 2-1 presents an overview of the analytical approach used to assess the economic impacts likely to occur as a result of the costs of each regulatory option. For the canmaking industry, four regulatory options (two for existing sources) are evaluated. The approach used in this study is to (1) develop an operational description of the price and output behavior of the industry and (2) assess the likely plant-specific responses to incurring the compliance costs enumerated in Chapter 5.

The operational description of the price and output behavior, in conjunction with compliance cost estimates supplied by EPA, is used to determine new post-compliance industry price and production levels for each regulatory option. Individual plants are then subjected to a financial analysis that uses capital budgeting techniques to determine potential plant closures. Effects on employment, community, foreign trade, and industry structure are also determined. Specifically, the study proceeded through the following steps:

- Description of industry characteristics;
- Industry supply and demand analysis;
- Analysis of cost of compliance estimates;
- Plant level profitability analysis;
- Plant level capital requirements analysis;
- Assessment of plant closure potential;
- Assessment of other impacts;
- New source impacts; and
- Small business analysis.

Although each of these steps is described separately in this section, it is important to realize that there are significant interactions between them, as shown in Figure 2-1.

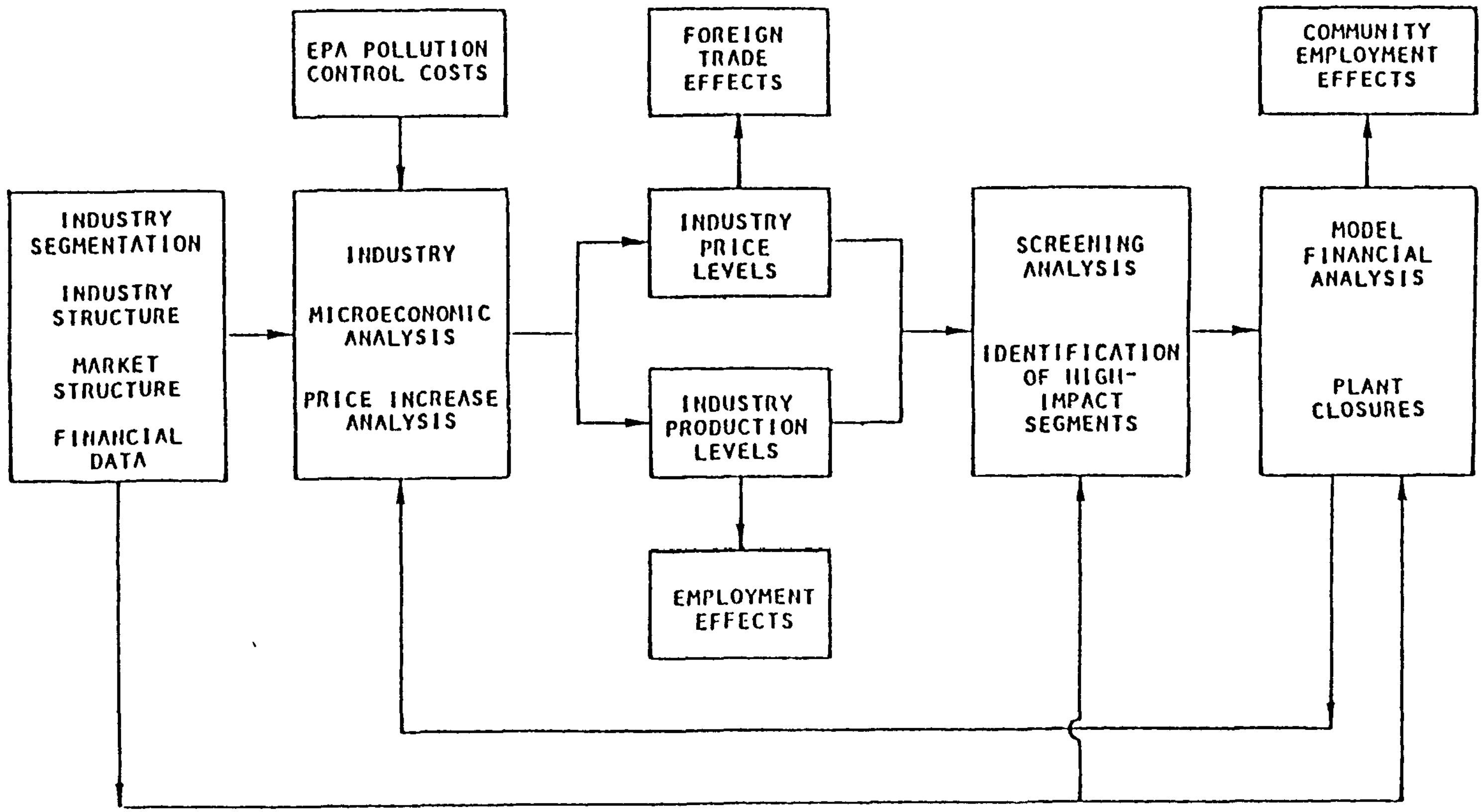


FIGURE 2-1. ECONOMIC ANALYSIS STUDY OVERVIEW

2.2 STEP 1: DESCRIPTION OF INDUSTRY CHARACTERISTICS

The first step in the analysis was to describe the basic industry characteristics. These characteristics, which include the determinants of demand and supply, market structure, the degree of intra-industry competition, and financial performance, are presented in Chapter 3 of this report.

The major sources of data used in this step are listed below:

- U.S. Environmental Protection Agency: EPA industry surveys conducted in 1978 and 1982 under Section 308 of the Clean Water Act (of particular importance are data on plant production volume);
- U.S. Department of Commerce: Census of Manufactures, U.S. Industrial Outlook, Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations;
- Trade and business publications: Metal Can Shipments Report (published by the Can Manufacturers Institute), American Metal Market, Modern Metals, Packaging Engineering, Food Engineering, Beverage World, Beverages, Robert Morris Associates' Statement Studies, Standard and Poor's Industry Surveys, and Moody's Industrial Manuals;
- Corporate annual reports; and
- Interviews with trade association and industry personnel.

2.3 STEP 2: SUPPLY-DEMAND ANALYSIS

The purpose of the supply-demand analysis was to project the likely changes in market prices and industry production levels resulting from each regulatory option. The estimates of post-compliance price and output levels are used in the plant-level analysis to determine post-compliance revenue and profit levels for specific plants. If prices are successfully raised without significantly reducing product demand and companies are able to maintain their current financial status, the potential for plant closings will be minimal. On the other hand, if prices cannot be raised to fully recover compliance costs because of the potential for a significant decline in product demand or because of significant intra-industry competition, the firms may attempt to maintain their financial status by closing higher cost, less efficient plants. The supply-demand analysis is divided into four basic components: description of industry structure, determination of industry pricing mechanism, projection of possible changes in industry structure to 1985, and determination of plant- and firm-specific operational parameters (e.g., production levels, compliance costs).

As described in Chapter 3, the metal can industry appears to be highly competitive. Competition is intense not only between can manufacturers but also between metal cans and other types of containers such as glass and plastic bottles. The highly competitive nature of the container market suggests that metal can producers would have difficulty raising the prices of their products. For this reason, it is assumed that metal can producers would attempt to absorb their compliance costs and would not raise their prices. This assumption represents a worst-case situation and, to the extent can prices could be increased to recover part of the compliance costs, tends to overestimate the potential impacts of the regulations.

It is also necessary to determine if the key parameters in industry structure would change significantly during the 1980s. Projections of industry conditions began with a demand forecast which is described in Chapter 4. The demand during the 1980s is estimated using trend analysis and market research analysis.

For purposes of conducting the EIA, we have assumed that an average can manufacturing plant operates two can product lines at an average annual rate of 260 million cans per line (Church, 1982, p. 96). This distinction was made in order to determine the likelihood of potential closures which may occur in the baseline (closures in absence of this regulation) or those likely to occur due to this regulation. In some instances, a can manufacturing plant may produce other products on separate three-piece product lines which will not be affected by this regulation. However, because of a decline in revenues or annual production, the two-piece product line may be projected to close. Thus, the definition of a product line is necessary in order to estimate potential product line closures in addition to closures of plants which only manufacture two-piece cans.

2.4 STEP 3: COST OF COMPLIANCE ESTIMATES

The estimated investment and annual compliance costs for the treatment options, summary descriptions of the control and treatment technologies, and assumptions for the compliance cost estimates are developed by EPA's Effluent Guidelines Division and may be found in Section VIII of the Development Document. These compliance costs also appear in Chapter 5. The costs are incremental costs above existing treatment in place for canmaking facilities.

2.5 STEP 4: PLANT-LEVEL PROFITABILITY ANALYSIS

The basic measure used to assess the impact of the effluent regulations on the profitability of individual plants is return on investment (ROI) (pre-tax profits as a percent of assets). The use of this technique involves a comparison of the return on investment after compliance with a minimum required return on investment.

The return on investment is defined as the ratio of annual profits before taxes to the total assets of a plant. This technique has the virtues of simplicity and common usage in comparative analyses of the profitability of financial entities. Plant-specific production information was used to derive revenues. Compliance costs were also calculated on a plant-by-plant basis. Average industry data were used to derive profit margins and assets to sales ratios, because plant-specific financial information was not available.

The profit impact assessment is determined by calculating the after-compliance ROI for each plant. The threshold value for ROI used in the analysis is 7%. Plants with after-compliance ROI less than 7% are considered potential closures. The 7% ROI threshold level is based on the condition that plants could not continue to operate as viable concerns if they are unable to generate for their owners/stockholders an after-tax return on their investments (i.e., stockholder's equity) equal to the opportunity cost of other lower-risk investment alternatives, which in this case is defined as the U.S. Treasury bond yield expected to be in effect when the regulation is implemented. In 1981, Data Resources, Inc. forecast that interest rates on long-term U.S. Treasury bonds will be about 12% in 1984-85, which is approximately the time when the plants will have to make investment decisions on the treatment facilities (DRI, 1981). More recent forecasts predict a bond yield of about 9% by 1985 (DRI, 1983). A 9% yield would produce a threshold of 5% ROI. However, the results of the analysis would not be changed even if the lower bond rate had been used. No potential closures are expected. It is determined that a before-tax ROI of 7% would yield a 12% after-tax return on the liquidation value of the equity, assuming:

- Stockholders' equity of canmaking firms represents about 50% of total assets (as discussed in Appendix B);
- The average corporate tax rate for the Fabricated Metal Products Industry in 1982 was 40% (U.S. Department of Commerce, 1983, p. 38);
- The average liquidation value of the plants is 85% of their book value.

Appendix A describes the methodology that led to this ROI threshold level.

The after-compliance ROI (ROI_{2i}) is estimated for each plant using the following equation:

$$ROI_{2i} = \frac{Profit_{1i} - ACC_i}{Assets_{1i} + CCI_i} \qquad \text{Equation (1)}$$

$$Profit_{1i} = P_1 \times Q_{1i} \times PM_1 \qquad \text{Equation (2)}$$

$$Assets_{1i} = P_1 \times Q_{1i} \times AS_1 \qquad \text{Equation (3)}$$

where:

- ROI_{2i} = after-compliance return on investment of plant i
- $Profit_{1i}$ = pre-compliance profit of plant i
- $Assets_{1i}$ = pre-compliance assets value of plant i
- ACC_i = annual compliance cost for plant i
- CCI_i = compliance capital investment for plant i
- P_1 = pre-compliance can body price
- Q_{1i} = pre-compliance production of plant i
- PM_1 = pre-compliance profit margin
- AS_1 = pre-compliance assets to sales ratio.

The values of Q_{1i} are obtained from industry 308 technical surveys conducted by EPA in 1978 and 1982. In the absence of industry financial surveys, plant-specific financial characteristics are not available, therefore, P_1, PM_1, and AS_1 are estimated based on discussions with industry representatives, analysis of industry-level data from Robert Morris Associates Statement Studies, and review of corporate annual reports. This analysis is somewhat conservative, for 1982 sales rather than 1985 sales are used. Increases in shipments and capacity utilization rates between now and 1985 will produce greater plant revenues. A more detailed discussion of industry projections may be found in Chapter 4 of this report.

Plants with after-compliance ROI below 7% are considered potential closures. However, a low ROI for a given plant does not, by itself, necessarily imply that the plant will certainly close. The profitability ratio (ROI) relates profits to plant total assets and provides a means of evaluating the attractiveness of the plant as an investment opportunity compared to other opportunities that may be available to stockholders and potential lenders. As discussed in Section 2.7, actual plant closure decisions made by individual companies are usually based on a variety of financial and non-financial factors.

2.6 STEP 5: CAPITAL REQUIREMENTS ANALYSIS

In addition to analyzing plant closure potential from a profitability perspective, it is also necessary to assess the firm's ability to make the initial capital investment needed to construct and install the required treatment systems. Some plants, which are not initially identified as potential closures in the profitability analysis, may encounter problems raising the amount of capital required to install the necessary treatment equipment. The limit on a given firm's ability to raise capital to finance investment expenditures is quite variable, depending upon factors such as the firm's capital structure, profitability, and future business prospects, the industry's business climate, the characteristics of the financial markets and the aggregate economy, and the firm management's relationships with the financial community. The precise limit, considering all these factors, is difficult to determine.

For this study, the analysis of capital availability is based on the ratio of "compliance capital investment requirements to plant annual revenues" (CCI/R). This ratio provides an indication of the relative magnitude of the compliance capital investment requirements.

The ratio CCI/R is calculated for each plant and compared to a threshold value. Assuming that reinvestment in plant and equipment equals depreciation, the plant's net after-tax profit margin is a measure of the internally generated funds available for pollution control investment. For this analysis, the before-tax profit margin of a canmaking plant is estimated to be 5% of revenues, and the corporate tax rate is assumed to be 40%; therefore, 3% (60% of 5%) of revenues was taken to be the capital availability threshold. If a plant's CCI/R ratio is less than the threshold value, the investment may be financed out of a single year's internally generated funds without additional debt. This is not to say that a plant would necessarily finance pollution control equipment out of retained earnings. The ultimate financing method is left to industry. A plant may elect to pay for the compliance equipment out of the current year's retained earnings, perhaps reducing dividend payments for that year, or the compliance equipment may be financed through the equity or debt markets. This test merely demonstrates whether or not a firm has sufficient after-tax profits to purchase the compliance equipment should it elect to do so.

Although the CCI/R ratio provides a good indication of the relative burden created by the compliance requirement, it does not provide precise or universal conclusions regarding a firm's ability to make the investments. For purposes of this analysis, a plant whose estimated compliance capital requirement exceeded 3% of its annual revenues is identified as a potential closure.

2.7 STEP 6: PLANT CLOSURE ANALYSIS

For this analysis, plant closure estimates are based primarily on the quantitative estimates of after-compliance profitability and the ability to raise capital developed in Steps 4 and 5, respectively. Failure to comply with either profitability or capital requirements criteria specified in the two steps mentioned above indicates a potential closure for an individual plant.

The identification of plants as potential closures in this step was interpreted as an indication of the extent of plant impact rather than as a prediction of certain closure. The decision by a company to close a plant also involves consideration of other factors, such as market and technological integration and the existence of specialty markets. Many of these factors are highly uncertain and could not be estimated.

2.8 STEP 7: OTHER IMPACTS

"Other impacts" include economic impacts which result from basic price, production, and plant-level profitability changes. These include impacts on substitution potential, employment, communities, industry structure, and balance of trade.

As indicated in Step 2, the can manufacturers are expected to absorb their compliance costs; thus, no substitution effects are expected to result from the regulations.

The community and employment impacts are the direct results of the plant closure analysis. Employment estimates for production facilities projected to close are based on individual plant production data obtained from the EPA 308 Surveys and an estimate of production per employee. Community impacts are assessed by comparing the number of job losses due to the regulations to total employment in the community.

The assessment of industry structure changes are based on examination of the following before and after compliance with the regulation:

- Numbers of parent companies and plants;
- Industry concentration ratios;
- Effects of plant closures on specialty markets; and
- Geographic areas likely to be impacted.

Impacts on imports and exports are primarily a function of the change in the relative prices charged by domestic versus foreign producers. In this study, it is estimated that there would be no price increase due to the regulations. Therefore, the regulations are expected to have no impact on the imports and exports of metal cans. The role of imports and exports is qualitatively evaluated in Chapter 3 of this report.

2.9 STEP 8: NEW SOURCE IMPACTS

New facilities and existing facilities that undergo substantial modifications will be subject to NSPS/PSNS guidelines. This step in the study analyzes the economic impacts of these guidelines on new sources.

The analysis is based on a model plant developed for a greenfield (new) site and the corresponding compliance costs of the treatment technologies. The treatment costs for major modifications to an existing facility will not be different than those for an equally-sized facility built on a greenfield (new) site. New source standards do not necessitate the use of technologies that require greater space than the technologies recommended for existing sources. For the purpose of evaluating new source impacts, compliance costs of new source standards are defined as incremental costs over the costs of selected standards for existing sources. The impacts of new source regulations are then determined by comparing compliance cost estimates to expected model plant revenues.

2.10 STEP 9: SMALL BUSINESS ANALYSIS

The Regulatory Flexibility Act (RFA) of 1980 (P.L. 96-354) amends the Administrative Procedures Act and requires Federal regulatory agencies to consider "small entities" throughout the regulatory process. The RFA requires that an initial screening analysis be performed to determine if a substantial number of small entities will be significantly affected. If so, regulatory alternatives that eliminate or mitigate the impacts must be considered. This step in the study addresses these objectives by identifying the economic impacts likely to result from the promulgation of regulations on small businesses in the canmaking industry. The primary economic variables covered are those analyzed in the general economic impact analysis such as compliance costs, plant financial performance, plant closures, and unemployment and community impacts. Most of the information and analytical techniques in the small business analysis are drawn from the general economic impact analysis which is described above and in the remainder of this report. The specific conditions of small firms are evaluated against the background of general conditions in the metal can markets and markets for substitute containers.

For this regulation, plant annual production of 500 million cans per year or less is used to define a small canmaking business. Information on plant annual production is readily available; and since the manufacturing technology in the seamless two-piece canmaking industry is very similar among the producers, plant annual production is indicative of relative size.

The impacts on small plants are assessed by examining the distribution by plant size of the number of canmaking plants and plant annual production. The objective of this analysis is to estimate if small plants would incur disproportional impacts. This was achieved by calculating the ratio of compliance capital investment to revenues for each size category. This analysis showed that all plants producing less than 1,000 million cans per year would be impacted equally by this regulation. Specifically, the compliance capital investment for these plants represents no more than 1% of plant revenues.

3. INDUSTRY CHARACTERISTICS

3. INDUSTRY CHARACTERISTICS

3.1 OVERVIEW

This chapter describes the characteristics of plants and companies in the canmaking industry, the determinants of demand and supply for metal cans, and the price determining behavior of the industry. The primary operational characteristics include the number, size, and location of plants and companies, trends in production technology, degree of integration and industry concentration, and financial performance. The primary determinants of demand are the nature of the end-use markets, the nature of competitive products, and the magnitude of imports and exports. The industry and market characteristics are pertinent to determining industry behavior, when faced with additional pollution control requirements. This information is used to estimate the expected baseline characteristics of the industry during the 1980s, which are described in Chapter 4, and to estimate the potential economic impacts of the effluent regulations, which are described in Chapter 6.

3.1.1 Industry Coverage

The canmaking industry, for purposes of this study, includes canmaking facilities which manufacture and wash seamless two-piece cans. EPA has identified 83 plants that will be affected by this regulation. These 83 plants include 3 direct dischargers and 80 indirect dischargers.

3.1.2 Product Characteristics and Manufacturing Processes

The seamless two-piece metal can was introduced in 1963 by Reynolds Metals, Inc. In the beginning, virtually all two-piece seamless cans were made from aluminum. However, due to fluctuations in aluminum prices in the late 1970s, manufacturers of seamless cans began looking for alternative materials. Thus, the shipments of two-piece seamless steel cans increased rapidly between 1977 and 1979. In recent years, however, aluminum has regained its dominance in the two-piece seamless can market. There are several reasons for this: aluminum chills beverages faster than steel; aluminum weighs less than steel; transportation costs are less for aluminum than for steel; recycling is more cost-effective for aluminum cans than for steel cans -- steel cans have aluminum tops which must be separated -- and because recycled steel cans produce a lower grade of steel. Although aluminum can prices are generally higher than seamless steel can prices, the net cost to customers after rebate for recycled aluminum cans is comparable to that for steel cans.

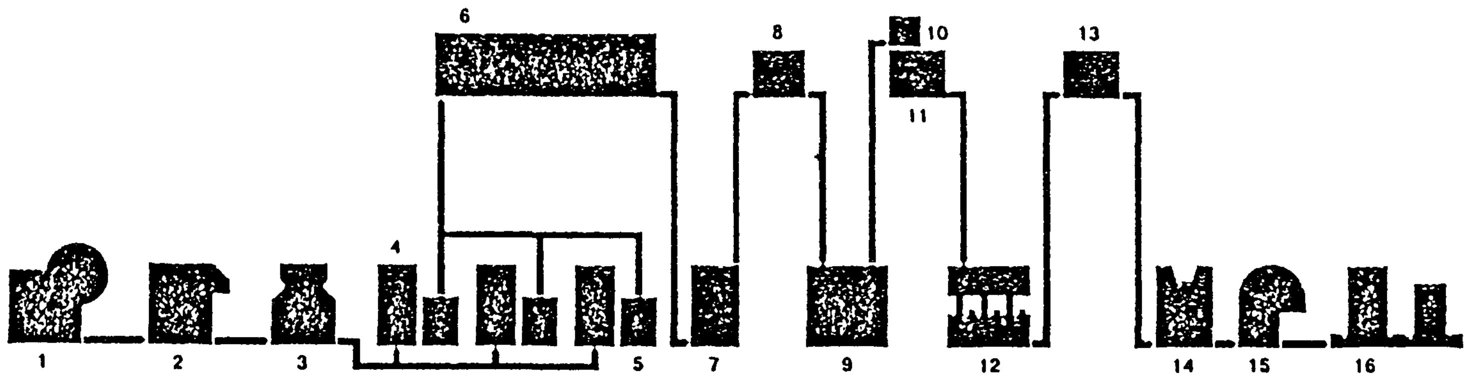
Two different processes are currently used to manufacture seamless two-piece cans:

- The "draw-iron" (D&I) process: In the D&I process, metal discs are cut and cupped in a press and then the walls of the cup are drawn or extruded to the desired height by forcing them through two or three progressively smaller diameter ironing rings. Cans made by this process are thinner and less rigid than seamed three-piece cans and are primarily used for beer and carbonated beverage cans. The carbonation pressure makes the can stronger and more rigid when it has been filled and sealed.

- The "draw-redraw" (DRD) process: In the DRD process, drawn cans are punched from a metal disc. Shallow cans may require one stamp, while deeper cans may require two or three. Beading may be added to further strengthen the sidewalls. Meats, spreads, snack foods, dog food, etc., are the major products contained in these cans.

EPA has determined that virtually all plants that wash can bodies use the D&I process. Figure 3-1 describes the D&I process employed by canmaking plants.

1 Uncoiler	9 Printer
2 Lubricator	10 Bottom Coater
3 Cupper	11 Printer Oven
4 Bodymaker	12 Internal Coater
5 Trimmer	13 Internal Coater Oven
6 Washer	14 Necker/Flanger
7 Basecoater	15 Tester
8 Basecoater Oven	16 Palletizer



SOURCE: Ball Corporation, 1978.

FIGURE 3-1 -- CANMAKING DRAW AND IRON (D&I) PROCESS

3.2 PLANT CHARACTERISTICS

As indicated in Table 3-1, the U.S. Department of Commerce's 1977 Census of Manufactures reported that there were 153 metal can companies operating 403 metal can plants (both seamless two-piece and seamed three-piece can plants) in 1977. These plants employed about 50,200 metal can production workers (10,800 aluminum can workers) and 59,800 employees overall (13,600 at aluminum can plants). Table 3-2 presents the distribution of the metal can plants by employment size. More than half of the plants have less than 100 employees but only account for 16.8% of total value of shipments. This table also indicates that metal can plants are highly specialized in the manufacture of cans (specialization ratio is 96%) and perform few other types of operations.

EPA has identified 125 plants in the United States which manufacture two-piece seamless metal cans. Eighty-three of the plants wash their cans and discharge process wastewater and are covered by this regulation. Table 3-3 presents a geographic distribution of these 83 plants. The plants are dispersed throughout the country, with some concentration in populated areas such as California, Texas, and New York/New Jersey. Total employment by seamless two-piece metal can plants is estimated to be about 31,500 people.[1]

Technical data obtained from EPA's 308 surveys for 71 of the 83 plants that will be affected by the final regulation are used to represent the industry for the economic impact analysis. These data include information on volume of annual production, discharge status, and treatment in place.[2] Fifty-eight of these plants are aluminum two-piece seamless can plants.

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[1]Based on total shipments of seamless two-piece metal cans of 61.5 billion cans in 1982 (see Table 3-7), and assuming a productivity of 1.95 million cans per employee (productivity of aluminum can plants as reported in the 1977 Census of Manufactures and shown in Table 3-1).

[2]EPA found 86 plants that discharge wastewater. EPA estimated compliance investment and annual costs for 83 of these discharging plants. However, production quantities were not available for 12 of these plants; thus, the 71-plant data set is used in the analysis.

TABLE 3-1

METAL CAN INDUSTRY CHARACTERISTICS, 1977

	SIC 3411 Metal Cans[a]	SIC 34113 Steel Cans[a]	SIC 34114 Aluminum Cans[b]
Number of Companies	153	73[c]	25[c]
Number of Establishments	403	253	52
Value of Shipments ($ millions)	8,142.8	5,576.9	1,915.6
Number of Cans Shipped (million cans)	88,311	61,761	26,550
Number of Employees (thousands)	59.8	42.3	13.6
Number of Production Workers (thousands)	50.2	36.1	10.8
Productivity (thousand cans per employee)	1,477	1,460	1,952

SOURCE: U.S. Department of Commerce, 1977 Census of Manufactures.

[a]Includes both seamless two-piece cans and seamed three-piece cans. Only seamless cans are covered by the effluent regulations.

[b]Our data indicate that SIC 34114 includes only seamless two-piece cans.

[c]Number of companies with shipments of $100,000 or more.

Note: In addition to "Steel Cans" and "Aluminum Cans," SIC 3411 includes the following 5-digit subgroupings:

- 34115 - metal can lids, ends, and parts for metal cans shipped separately; and
- 34110 - metal cans, not specified by kind.

These subgroupings were excluded from this table because it was intended to present data which will help characterize plants in the seamless can industry only.

TABLE 3-2

NUMBER OF METAL CAN PLANTS BY EMPLOYMENT SIZE, 1977[a]

(SIC 3411)

Plant Size	No. of Plants	% of Total Plants	Value of Shipments ($ Millions)	% of Total Value of Shipments
Establishments with:				
1 - 19 employees	103	25.6	117.8	1.4%
20 - 99 employees	117	29.0	1,255.2	15.4%
100 - 499 employees	165	40.9	5,345.1	65.6%
over 500 employees	18	4.5	1,424.8	17.5%
Total	403	100.0	8,142.8	100.0%
Coverage Ratio[b]				98%
Specialization Ratio[c]				96%

SOURCE: U.S. Department of Commerce, 1977 Census of Manufactures.

[a]Includes plants that manufacture steel cans (seamed and seamless), aluminum cans, metal can lids, ends, and parts. Only seamless cans are covered by the effluent regulations.

[b]Coverage ratio is ratio of a given industry's primary product shipments to total shipments of these products by all industries.

[c]Specialization ratio is ratio of primary product shipments to product shipments for primary plus secondary products.

Note: Detail may not add to totals because of rounding.

TABLE 3-3

GEOGRAPHIC LOCATION OF 83 SEAMLESS CAN PLANTS
WITH PROCESS WASTEWATER

State	Number of Plants
Arizona	1
California	9
Colorado	2
Connecticut	1
Florida	5
Georgia	4
Illinois	2
Indiana	1
Maine	1
Maryland	2
Minnesota	3
Missouri	4
New Jersey	6
New York	4
North Carolina	3
Ohio	6
Oklahoma	1
Pennsylvania	2
South Carolina	2
Texas	11
Virginia	1
Washington	3
Wisconsin	6
Wyoming	1
Puerto Rico	2
Total	83

SOURCE: 1978 and 1982 EPA 308 Surveys.

3.3 COMPANY CHARACTERISTICS

The Department of Commerce estimated that there were 153 companies that produced metal cans (both two-piece and three-piece cans) in 1977. The major producers of metal cans are Continental Can; American Can; National Can; Crown Cork and Seal; Reynolds Metals; Ball Container Corp.; Kaiser Aluminum and Chemical; and Diamond International. Table 3-4 indicates that the metal can industry is moderately concentrated with the four largest manufacturers accounting for over 50% of total industry shipments.

Most metal cans are produced for sale by commercial (who sell their products to outside customers) or jobber can manufacturers. However, in recent years, many breweries (e.g., Anheuser-Busch, Coors, and Miller) and food processors (e.g., Carnation, Campbell, Del Monte, and Van Camp) have increased their production of cans for their own use. This self-manufacture is known as captive production. Table 3-5 shows that captive beverage can manufacturers increased their production from 20% to 26% of total beverage can shipments between 1979 and 1982. Since beverage cans accounted for 94% of total two-piece can shipments in 1982, these figures are considered representative of total two-piece can shipments.

Table 3-6 presents selected financial ratios of 18 canmaking companies for which published financial data are available for the 1979-1982 period. The financial information pertains to the entire company, not just the segment engaged in manufacturing two-piece cans, because information is generally not provided by segment. There are 11 commercial or jobber manufacturers and 7 companies with captive canmaking operations in the group. These data show that the profit performance (measured by the firm's before-tax profit margin and return on equity) of most commercial can producers is, in general, below that of both the companies with captive operations and the All Manufacturing average. In terms of capital structure, the commercial can manu-

TABLE 3-4

CONCENTRATION RATIOS OF CANMAKING INDUSTRY, 1977

Class of Product	Percent of Value of Shipments Accounted for by		
	4 Largest Companies	8 Largest Companies	20 Largest Companies
Metal Cans (SIC 3411)[a]	56	71	89
Steel Cans (SIC 34113)[a]	62	79	92
Aluminum Cans (SIC 34114)[b]	55	79	99+

SOURCE: U.S. Department of Commerce, 1977 Census of Manufactures.

[a]Includes both seamless and seamed cans. Only seamless cans are covered by the effluent regulations.

[b]Our data indicate that SIC 34114 includes only seamless two-piece cans.

TABLE 3-5

TOTAL SHIPMENTS OF BEVERAGE CANS BY MARKET

(Billions of Cans)

Year	Total Shipments	For Sale[a]	Own Use[a]
1979	54.4	43.5 (80.0%)	11.0 (20.0%)
1980	55.2	42.9 (77.7%)	12.3 (22.3%)
1981	56.3	42.2 (75.0%)	14.1 (25.0%)
1982	57.9	42.7 (73.7%)	15.2 (26.3%)

SOURCE: Can Manufacturers Institute, Metal Can Shipments Report, 1982.

[a]Numbers in parentheses represent percent of total shipments.

Note: Detail may not add to totals because of rounding.

TABLE 3-6 - SELECTED FINANCIAL RATIOS FOR CANMAKING COMPANIES

Company	Before Taxes Profit Margin (%)				Stockholders Equity/Assets				Before Taxes Return on Equity (%)			
	1979	1980	1981	1982	1979	1980	1981	1982	1979	1980	1981	1982
Commercial												
American Can Co.	4.88	2.66	2.61	0.49	0.39	0.37	0.38	0.30	20.82	12.22	12.12	2.50
Ball Corp.	7.14	5.64	5.91	6.62	0.42	0.42	0.42	0.45	24.99	21.99	23.68	25.32
J.L. Clark Manufacturing Co.	20.44	20.08	18.49	16.57	0.77	0.81	0.55	0.64	46.14	43.03	38.78	38.92
Continental Group	3.42	3.93	5.04	4.36	0.35	0.36	0.38	0.39	11.79	13.49	16.63	13.33
Crown, Cork & Seal Co.	8.77	8.83	7.86	6.18	0.58	0.62	0.64	0.67	25.56	23.91	19.06	14.93
Diamond International Corp.	7.28	4.11	2.74	3.84	0.62	0.64	0.57	0.45	18.33	8.46	6.67	5.78
Kaiser Aluminum & Chemical Corp.	11.66	9.58	4.37	-3.32	0.41	0.43	0.39	0.37	28.01	23.54	9.41	-7.18
Metal Box, P.L.C.	6.31	5.60	2.71	NA	0.47	0.47	0.38	NA	19.19	19.34	9.86	NA
National Can Corp.	5.42	5.70	3.05	4.48	0.46	0.40	0.44	0.43	21.68	27.32	13.86	20.61
Reynolds Metals Co.	7.83	7.78	3.40	-2.81	0.42	0.43	0.41	0.41	23.60	21.49	8.68	-6.11
United Can Co. - a subsidiary of Norton Simon, Inc.	7.51	6.92	5.37	5.01	0.39	0.38	0.38	0.36	22.11	20.94	18.80	19.34
Number of Firms Below All Manufacturing Average	9	7	9	7	8	8	8	8	9	6	9	5
For Own Use												
Campbell Soup Co.	11.23	10.06	8.73	9.40	0.68	0.59	0.58	0.57	28.05	26.87	24.42	26.22
Carnation Co.	9.11	8.82	9.53	10.42	0.59	0.60	0.62	0.65	29.64	29.87	31.49	32.33
Coors Container Co.	14.56	10.99	7.75	6.31	0.79	0.80	0.79	0.78	16.41	13.70	9.57	8.32
Metal Container Corp. - a subsidiary of Anheuser-Busch Co., Inc.	9.40	9.27	9.12	9.14	0.47	0.42	0.42	0.39	28.85	29.61	29.06	31.06
Miller Brewing Co. - a subsidiary of Philip Morris, Inc.	10.91	9.87	10.15	11.12	0.39	0.39	0.36	0.38	36.64	33.99	33.35	35.55
Port Clyde Foods - a subsidiary of Zapata Corp.	18.58	22.10	31.46	30.40	0.27	0.36	0.39	0.35	19.24	21.44	36.89	40.20
Joseph Schlitz Brewing Co. - a subsidiary of Strohs Brewing Co.	-0.86	3.36	2.24	NA	0.49	0.51	0.50	NA	-2.58	9.24	6.46	NA
Number of Firms Below all Manufacturing Average	1	1	1	0	3	3	3	3	3	3	2	1
All Manufacturing Average	8.9	7.7	7.4	5.3	0.49	0.49	0.49	.48	25.8	21.9	21.4	14.1

SOURCE: Corporate annual reports; Moody's Industrial Manual 1980-1982; Moody's Industrial, New Reports, 1983; U.S. Department of Commerce, Quarterly Financial Report for Manufacturing, Mining and Trade Corporations, Fourth Quarter 1982.

NA = not available.

facturers are generally more leveraged and exhibit lower equity to asset ratios than the captive producers and the All Manufacturing average. "All Manufacturing" refers to those companies classified by the Bureau of Census as manufacturing establishments.

3.4 MARKET CHARACTERISTICS

3.4.1 Product Characteristics and Substitution

Table 3-7 summarizes the shipments of all metal cans and seamless two-piece cans by market in 1982. Beverage containers are the largest users of seamless metal cans and accounted for 94% of total two-piece seamless metal can shipments in 1982. Nearly 100% of all beverage can shipments in 1982 were two-piece seamless cans. The reasons for the popularity of the two-piece seamless can are that it uses less metal, can be made faster and cheaper, has high integrity (less prone to leakage), and is lighter to transport than the three-piece seamed can.

For beverage packaging, metal cans have the advantages of lighter weight and ease of shipping and handling over other containers such as glass and plastic bottles. However, competition from glass and plastic bottles is strong. Glass bottles enjoy advantages over metal cans such as quality image and lower cost (the manufacturing cost of producing a bottle is generally higher; however, unlike a metal can, a bottle can be reused many times). In 1981, glass bottles accounted for 51% of packaged beer and 41% of packaged soft drinks. Another advantage of glass as well as plastic bottles (also called PET -- polyethylene terephthalate) is that they are resealable. Plastic bottles are also capturing the large family-size (2-liter) container market. Plastic accounted for 17% of soft drink packaging in 1981 from practically zero in 1977 (Norton, 1982, p. 1). Although plastic's growth has been mainly at the expense of glass bottles, PET manufacturers are now marketing a ½-liter bottle which will compete with both glass bottles and metal cans.

TABLE 3-7

METAL CAN SHIPMENTS, 1982

	All Cans (Billion Cans)	Two-Piece Cans	
		Billion Cans	% of Total Two-Piece Cans
All Metal Cans Shipments by Market:			
Total	89.3	61.5	100.0
Beverage	57.9	57.7	93.8
Beer	31.7	31.6	51.4
Soft Drink	26.2	26.1	42.4
Food	27.6	3.6	5.9
General Packaging	3.8	0.2	0.3
Aluminum Cans Shipments by Market:			
Total	52.9	52.9	86.0
Beverage	51.7	51.7	84.1
Beer	31.1	31.1	50.6
Soft Drink	20.6	20.6	33.5
Food	1.2	1.2	2.0
General Packaging	*	*	0.1
Steel Cans Shipments by Market:			
Total	36.4	8.6	14.0
Beverage	6.2	6.0	9.8
Beer	0.6	0.5	1.0
Soft Drink	5.6	5.6	9.1
Food	26.4	2.4	3.9
General Packaging	3.7	0.1	0.2

SOURCE: Can Manufacturers Institute, Metal Can Shipments Report, 1982.

*Less than 0.05 billion cans.

Note: Detail may not add to totals because of rounding.

Shipments of two-piece seamless cans in the food and general packaging markets represent a relatively small portion of the market, accounting for 6% of all two-piece seamless cans shipped in 1982 and for 12% of 1982 total metal can shipments in these two markets. The reason for this low demand is that two-piece seamless cans lack the rigidity needed for food packaging and can only be made in small sizes; seamed three-piece cans are stronger and are made in many different sizes to meet the needs of food processors.

Competition for the food and general packaging markets also comes from other types of containers, such as:

- Retort pouch: a flexible, lightweight, sterile, laminated plastic and aluminum foil food package that does not require refrigeration or preservatives. Because it is easy to open, heat, transport, and dispose of, this food package is very attractive to a growing number of consumers. In addition, this container has advantages of storage space savings of 99% and weight savings of 86% over metal cans of the same capacity when empty and, therefore, is easier to ship and handle (Morris, 1981). The disadvantages of the retort pouch over metal cans are slow filling speeds and high costs.

- Aseptic package: a flexible, sterile, laminated container that is used to package juices and other liquids so that they do not need refrigeration.

- Composite can: a container that consists of many layers of paper or heavy paperboard wrapped around a mandrel to form a tube; foil or plastics are laminated to the paper to add strength and impermeability.

Until recently, two-piece seamless metal cans found only limited use in packaging noncarbonated beverages. This is because the carbonation, which is contained in beer and carbonated soft drinks, helps pressurize and strengthen the can which otherwise may collapse due to the thin sidewalls. A recent development by Reynolds Metals using liquid nitrogen allows the use of two-piece seamless metal cans for noncarbonated beverages such as wines, juices, and waters. In the new process, a drop of liquid nitrogen is put in the filled can before sealing; the nitrogen then expands and creates pressure against the sidewall (Church, 1981, p. 28).

Another recent technological development is the aluminum bottle (i.e., resealable can) developed by Continental Can. This container has a drawn and ironed body and a dome cap with a resealable plastic closure (referred to as a "clicker top"). This aluminum bottle may improve the two-piece can industry's competitive position as it combines the advantages of both metal cans (i.e., lightweight, ease of shipping and handling) and bottles (i.e., resealability) (Church, 1983, p. 76).

Finally, Alcoa Aluminum and Continental Can have announced a joint venture to develop a one pound seamless can. Alcoa and Continental believe they have a process to manufacture a can with strong side walls at a competitive price. The successful development of a large-size seamless can would open a new market for seamless two-piece cans (Church, 1983, p. 13).

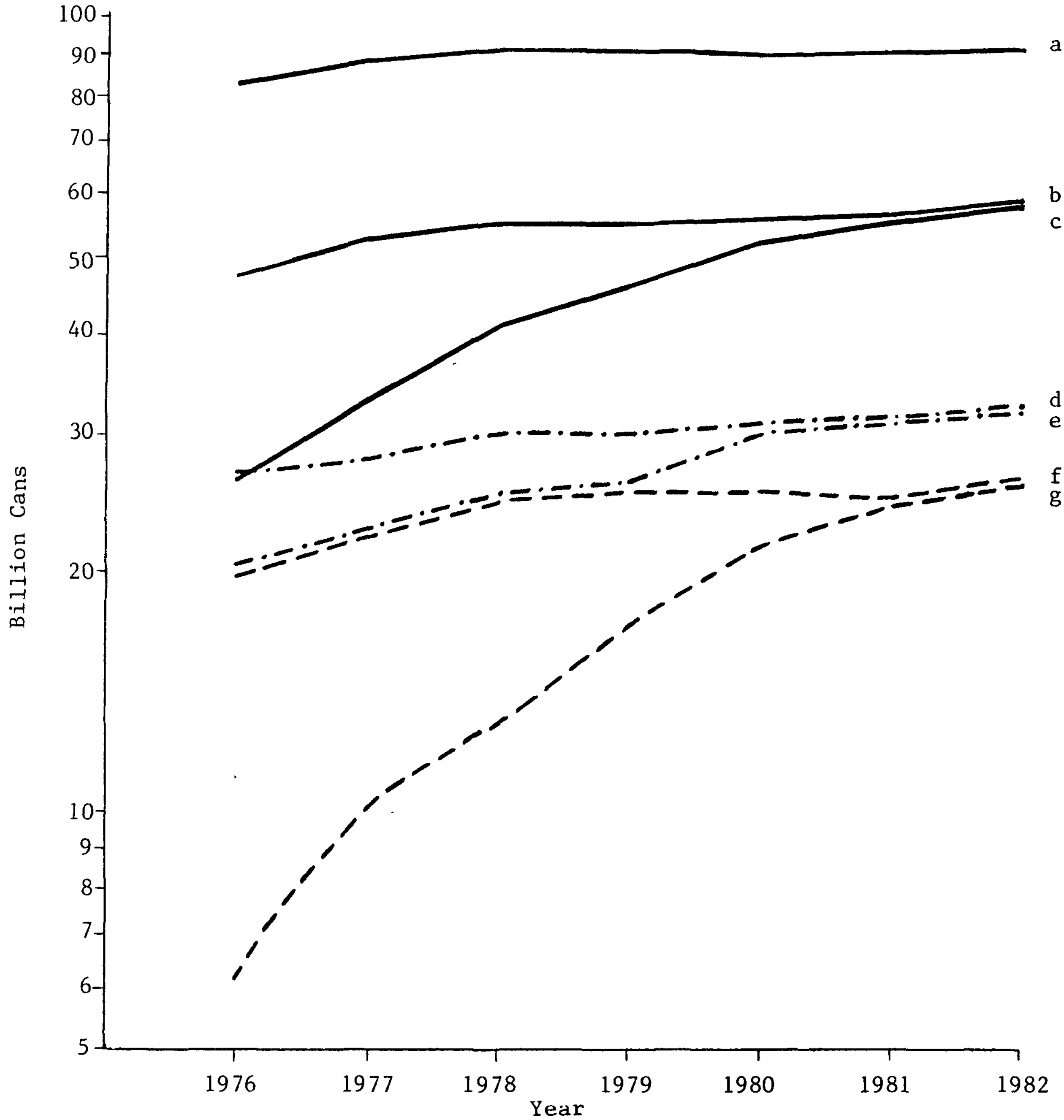
If any of the new technologies mentioned above gain wide consumer acceptance, future demand for two-piece cans could be much greater than expected. Forecasts of demand are presented in Chapter 4.

3.4.2 Shipment Trends

As illustrated in Figure 3-2 and Table 3-8, shipments of seamless two-piece beverage cans (which accounted for 94% of all seamless cans shipped in 1982) have experienced strong growth between 1976 and 1982, averaging a 14.1% increase per year. The increased demand for seamless cans has been mainly at the expense of the seamed cans, as shipments of total beverage cans grew at a more moderate average annual rate of 3.8% during that same period.

Despite the strong growth in shipments of two-piece seamless cans, the industry reported excess capacity of between 8 to 10 billion cans at the start of 1983 (Church, 1983, p. 70). New, more efficient facilities were added in recent years to improve productivity, and more captive plants were built by major beverage and food processing companies. This

FIGURE 3-2 -- METAL CAN SHIPMENTS, 1976-1982



SOURCE: Can Manufacturers Institute, Metal Can Shipments Report, 1977 and 1982.

[a]Total Metal Cans.

[b]Beverage Cans.

[c]Two-piece Beverage Cans.

[d]Beer Cans.

[e]Two-piece Beer Cans.

[f]Soft Drink Cans.

[g]Two-piece Soft Drink Cans.

TABLE 3-8

METAL CAN SHIPMENTS, 1976-1982

	1976	1977	1978	1979	1980	1981	1982	1976-1982 Average Annual Growth Rate (%)
Total Metal Cans								
Billion Cans	82.6	86.9	89.8	89.3	87.9	88.8	89.3	
% Change		5.2	3.3	(0.6)	(1.6)	1.0	0.6	1.3
Beverage Cans								
Total								
Billion Cans	46.4	51.2	54.4	54.4	55.2	56.3	57.9	
% Change		10.3	6.3	0	1.5	2.0	2.8	3.8
Two-Piece Cans								
Billion Cans	26.4	33.1	39.9	44.7	50.8	55.2	57.7	
% of Total	56.9	64.6	73.3	82.2	92.0	98.0	99.6	
% Change		25.4	20.5	12.0	13.6	8.7	4.6	14.1
Beer Cans								
Total								
Billion Cans	26.9	27.9	28.9	28.7	29.5	30.9	31.7	
% Change		3.7	3.6	(0.7)	2.8	4.7	2.6	2.8
Two-Piece Cans								
Billion Cans	20.3	23.6	26.4	27.0	28.9	30.6	31.6	
% of Total	75.5	84.6	91.3	94.1	99.0	99.0	99.7	
% Change		16.3	11.9	2.3	7.0	5.9	3.3	7.8
Soft Drink Cans								
Total								
Billion Cans	19.5	23.3	25.5	25.7	25.7	25.4	26.2	
% Change		19.5	9.4	0.8	0	(1.2)	3.1	5.3
Two-Piece Cans								
Billion Cans	6.1	9.5	13.5	17.6	21.9	24.5	26.1	
% of Total	31.3	40.8	52.9	68.5	85.2	96.5	99.6	
% Change		55.7	42.1	30.4	24.4	11.9	6.5	28.5

SOURCE: Can Manufacturers Institute, Metal Can Shipments Report, 1977 and 1982.

Note: Detail may not add to totals because of rounding.

excess capacity has put pressure on the industry's prices and profitability and has also forced the shutdown of some older, less efficient operations. The industry is expected to retire even more excess capacity by 1985, thus bolstering prices and profitability. This is explained more fully in Chapter 4.

3.4.3 Foreign Trade

Imports and exports of metal cans have been insignificant, since transportation costs for empty cans are high. Table 3-9 shows that U.S. exports of metal cans have always been less than 1% of total industry value of shipments. Statistics on imports of cans are not available; however, industry sources indicate that they are also insignificant due to high transportation costs.

TABLE 3-9

U.S. EXPORTS OF METAL CANS, 1977-1982

Year	Value of Shipments ($ Million)	Value of Exports ($ Million)	Export/ Shipment (%)
1977	8,242.8	45.0	0.6
1978	8,972.3	36.7	0.5
1979	9,892.3	52.1	0.6
1980	10,087.0	85.9	0.9
1981	10,560.0	84.7	0.9
1982	10,900.0	89.3	0.9

SOURCE: U.S. Department of Commerce, 1982 and 1983 U.S. Industrial Outlook.

4. BASELINE PROJECTIONS OF INDUSTRY CONDITIONS

4. BASELINE PROJECTIONS OF INDUSTRY CONDITIONS

This section provides projections of conditions in the canmaking industry to 1990 in the absence of the effluent limitations and standards that are being promulgated. These projections will be used together with estimated compliance costs and other information to assess the effects of the requirements of this regulation on future industry conditions.

The basic approach followed in developing the projections began with a demand forecast. Then, using the resulting initial volume estimates, industry supply factors are assessed to determine if there would be any significant changes in the level of capital requirements and anticipated growth in terms of the number of plants and quantity of production.

4.1 DEMAND FORECASTS

The primary reason for beginning the baseline projections with the demand analysis is based on the hypothesis that the canmaking industry supply factors will adjust to demand conditions. This results from two factors: (1) the canmaking industry group is very small compared to the total economic activity in the U.S. and is, therefore, more likely to react to general trends rather than influence them and (2) the demand for metal cans is a derived demand, depending on the demand for beverage, food, and other consumer goods.

As indicated in Chapter 3, annual shipments of seamless two-piece cans grew rapidly between 1976 and 1982, and by the end of 1982 nearly 70% of total shipments were seamless cans. This rapid growth can be explained by the preference of seamless cans over the seamed three-piece cans for beverage packaging. Beverage cans have always been, by far, the largest market for seamless cans, accounting for 94% of all seamless cans shipped in 1982 (see Table 3-7). Since there is no clear evidence that the above demand patterns would change substantially during the 1980s, it is, therefore, assumed that further growth of seamless can shipments between 1983 and 1990 would approximate that of beverage cans.

For this study, projections of seamless can shipments between 1982 and 1985 are based on industry forecasts of beverage can shipments published in Beverage Industry Magazine (Norton, 1982, p. 16). These projections are shown in Table 4-1 and indicate that beverage can shipments are expected to grow at an average annual rate of 4.3% to reach almost 66 billion cans in 1985. It is therefore projected that seamless two-piece cans will grow at the same 4.3% rate and reach almost 70 billion cans by 1985. Between 1985 and 1990, it is again assumed that shipments of seamless two-piece cans will grow at the same rate as beverage shipments, which are projected to increase 3% a year during that time period (Predicasts, 1982, p. A-23).

Table 3-8 shows that the average annual growth in two-piece can shipments between 1976 and 1982 was 14%. This rate was achieved as two-piece cans replaced three-piece cans in the beverage can market. Two-piece cans now account for practically all beverage can shipments. Therefore, it is reasonable to assume that future growth in two-piece can shipments will be close to that of all beverage cans.

The 4.3% average annual growth rate expected for all two-piece can shipments is a combined rate for both captive and commercial shipments. Captive shipments are expected to grow at 6.3% per year from 1982 to 1985 and commercial shipments at 3.7% during that period (see Table 4-4). The rate for captive shipments reflects the continuing trend toward self-manufacture by brewers and food processors. The more modest rate for commercial shipments is in line with expected growth in GNP (see below).

Figure 4-1 illustrates how the growth in shipments of all beverage cans has generally outperformed the growth in the real GNP since 1972.

TABLE 4-1

ACTUAL SHIPMENTS AND PROJECTED SHIPMENTS OF TWO-PIECE METAL CANS

(Billion Cans)

Year	Beverage Can Shipments[a]			Seamless Two-Piece Can Shipments
	Beer	Soft Drink	Total	
1976	26.9	19.5	46.4	NA
1977	27.9	23.3	51.2	NA
1978	28.9	25.5	54.4	NA
1979	28.7	25.7	54.4	46.5
1980	29.5	25.7	55.2	52.6
1981	30.9	25.4	56.3	58.1
1982	31.7	26.2	57.9	61.5
Projected				
1983	32.9[b]	27.3[b]	60.2	63.9
1984	33.9[b]	29.0[b]	62.9	66.8
1985	35.0[b]	30.7[b]	65.7	69.8
1990			76.1	80.9
Annual Growth Rate (%)				
1976-1980	2.3	7.1	4.4	NA
1979-1980	2.8	0	1.5	13.1
1980-1982	3.7	1.0	2.4	8.1
Projected Annual Growth Rate (%)				
1982-1985	3.4	5.4	4.3	4.3[d]
1985-1990	NA	NA	3.0[c]	3.0[d]

SOURCES: Can Manufacturers Institute, Metal Can Shipments Reports, 1979, 1980, 1981, and 1982, and Policy Planning & Evaluation, Inc. estimates.

[a]Includes both seamed and seamless cans.

[b]Industry forecasts (Norton, 1982, p. 16).

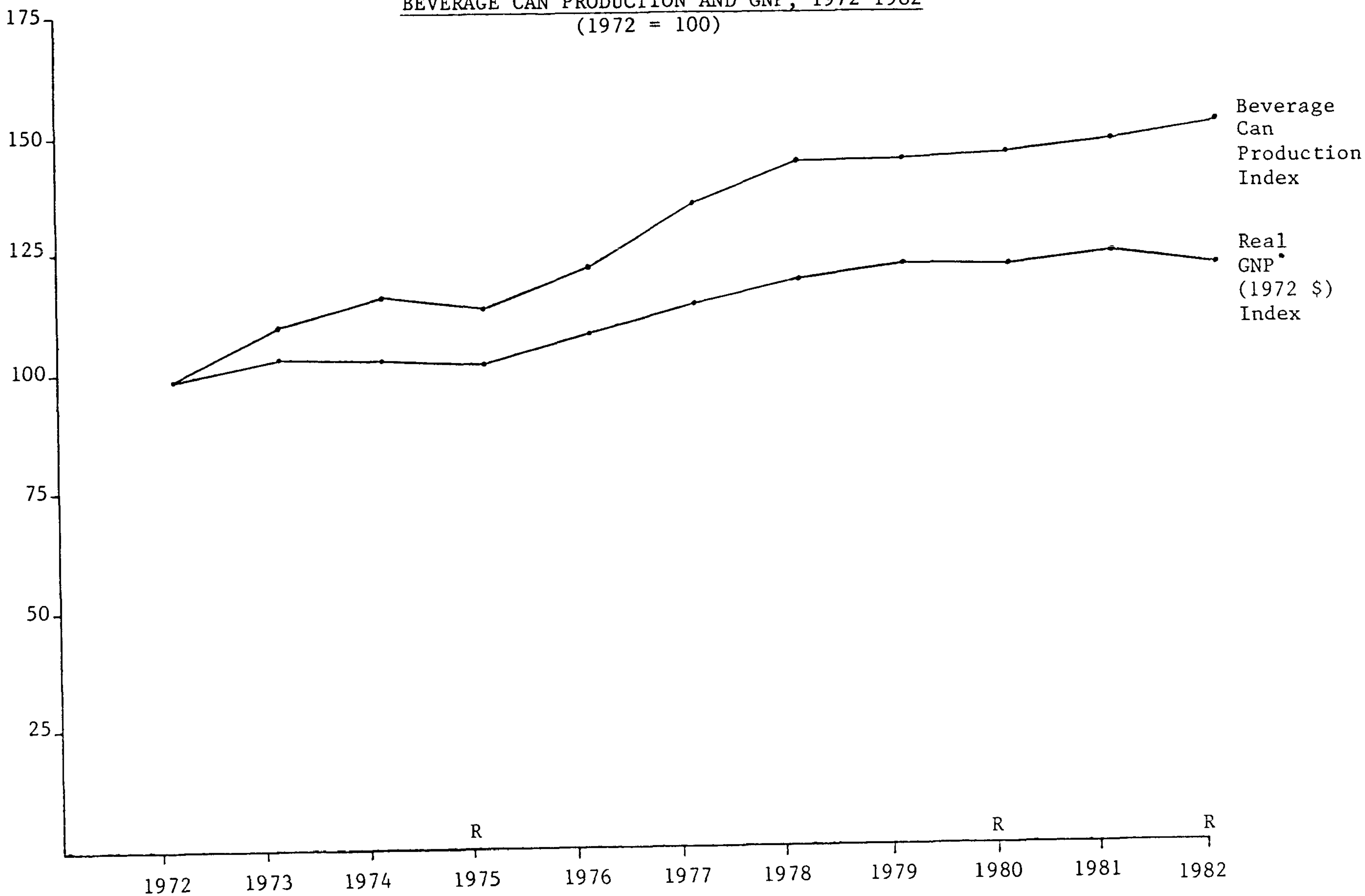
[c]Predicast's forecast for beverage shipments (Predicasts, 1982, p. A-23).

[d]Projected growth rates for all seamless cans are assumed to be the same as projected growth rates for beverage cans.

NA = not available.

FIGURE 4-1

BEVERAGE CAN PRODUCTION AND GNP, 1972-1982
(1972 = 100)



SOURCE: Data Resources, Inc., U.S. Long-Term Review, winter 1982-1983, and Can Manufacturers Institute, Metal Can Shipments Report, 1977 and 1982.

R = recession year.

The average growth rate for all beverage cans was 4.5% during the years 1972-1982 while the real GNP averaged a growth rate of only 2.2%. In particular, beverage can shipments have grown more quickly than GNP after recession years. Beverage can shipments exhibited rapid growth after the 1975 recession and even sustained growth after the 1980 recession through the 1982 downturn in the economy. Given this performance it seems reasonable to assume that beverage cans and seamless two-piece cans will outgain the growth in GNP in the 1980s. The growth in the GNP has been predicted to be 3.6% between 1982 and 1985, and 2.4% from 1985 to 1990 (DRI, 1983, p. 1.3). Thus, the beverage and two-piece can growth rates discussed above (4.3% and 3.0%) appear to be in line with previous years and are perhaps somewhat conservative given the history of post-recession growth for beverage cans.

Growth in beverage and two-piece can shipments through the 1980s will be affected by several factors. Some of these factors are:

- Competition among types of beverage containers;
- Competition for new markets; and
- Mandatory deposit legislation.

The degree to which two-piece cans maintain or increase their market share in the face of these impacts will determine if the projected growth rates for 1985 and 1990 can be met. The following sections examine the outlook for two-piece cans in each of these areas. The results tend to indicate that shipments of two-piece cans will continue to grow. Thus the projected growth rates used in this analysis appear to be accurate.

4.1.1 Competition Among Types of Beverage Containers

The beverage market has traditionally been the major end-use of two-piece cans. Although competition remains high among the three most popular types of beverage containers (metal cans, glass, and plastic), estimates are that metal cans will continue to dominate the field through 1990. Table 4-2 shows the results of a study conducted by Chase Econometrics and Sabre Associates. In spite of the inroads made by plastic bottles, the market share held by cans is expected to remain stable and the share for aluminum two-piece cans (which accounted for almost 90% of beverage can shipments in 1982) will grow from 63% to 73.2% of all beverage packaging containers. This demonstrates the preference for metal cans, particularly seamless aluminum cans, in the beverage packaging industry.

The U.S. Brewers Association (USBA) has stated that packaged beer sales declined by 0.6% in 1982 while draught beer sales increased by 3.7%. The USBA suggests that the decline in packaged sales may lead to a reversal of a long established trend favoring packaged beer over draught beer. Although packaged beer sales may have dropped in 1982, this was the first decline in recent years. Furthermore, the decline coincided with a severe recession, with declines recorded by many major industries and services. The can manufacturing industry, on the other hand, realized a gain in sales over 1981. Shipments of all beverage cans increased 2.8% and shipments of two-piece beer cans increased 3.3%. It appears unreasonable, therefore, to form the basis of a trend on one year's data. The fact remains that two-piece can shipments have increased steadily in recent years and this trend is expected to continue. In addition to the Beverage Industry Magazine forecast, the Agency obtained forecasts of beverage can market shares for 1990 from Chase Econometrics/Sabre Associates. The results shown in Table 4-2 illustrate that the market share for two-piece aluminum cans is expected to increase from 63% of all beverage packaging in 1981 to 73% in 1990.

4.1.2 Competition for New Markets

In Chapter 3, several innovations in packaging were discussed that demonstrate how highly competitive the packaging industry is. For example, although fruit juices and other non-carbonated drinks have traditionally been packaged in three-piece cans, new aseptic containers

TABLE 4-2

PROJECTED MARKET SHARES FOR SELECTED CONTAINERS

	1981 % Share	1990 % Share
Cans	74.4	73.2
Aluminum	63.0	73.2
Steel	11.4	--
Glass	22.6	19.7
Beer bottles	16.5	14.0
Softdrink bottles	6.1	5.7
Plastic	3.0	7.1
0.5 Liter	0.3	4.0
2.0 Liter	2.7	3.1
Total	100	100

SOURCE: Chase Econometrics and Sabre Associates, presented in Packaging Engineering, December 1982.

are quickly gaining consumer acceptance. Now two-piece can manufacturers are attempting to enter this market with the development of liquid nitrogen injection. One drop of liquid nitrogen injected prior to sealing provides suitable pressure on the can's sidewalls, thereby adding the strength necessary to withstand shipping and handling stresses.

Another area in which competition is great is the 16 oz. or 1/2 liter beverage container market. This market has been dominated by glass bottles, but plastic bottles and Continental Can's new resealable aluminum two-piece can may soon compete successfully with glass. Aluminum cans have definite advantages over plastic and glass. For example, the 16 oz. metal bottle has a longer shelf life than its plastic counterpart; cans have a shelf life of up to one year while the shelf life of 1/2 liter plastic bottles is measured in weeks. Another advantage over both glass and plastic is greater recyclability; the end of the new aluminum bottle is made of the same material as the body -- on a typical 12 oz. can the end is high magnesium alloy -- thus enhancing the can's scrap value (Church, 1983, p. 70). In light of these developments, if the new products are accepted by consumers, two-piece can manufacturers may realize gains in new packaging markets, and demand could exceed the projections used in this analysis.

4.1.3 Mandatory Deposit Legislation

Mandatory deposit legislation has been enacted by nine states. The impact of deposit laws on cans and other one-way containers, such as non-returnable glass bottles and plastic bottles, has been mixed. While some studies show market shares for some containers drop immediately after enactment and take several years to regain pre-law levels (Stupay, 1983, p. 11), aluminum two-piece cans have outperformed three-piece cans and glass bottles in deposit law states. For example, in Connecticut and Iowa, aluminum cans are replacing glass returnable bottles due to "lower handling costs, greater recycling value, and easy storage" (Bowe, 1983, p. 30).

Three states have enacted deposit legislation since Beverage Industry Magazine made its forecast of beverage can shipments for 1985. They are: Massachusetts (effective 1982), Delaware (1982), and New York (late 1983). Prospects are good that two-piece aluminum beverage cans will maintain or improve their market share in each of these states. Table 4-3 shows the beverage container mix between glass and cans for New York in 1981. The New York legislation could have a significant impact on this packaging mix because New York retailers have indicated that they prefer not to handle glass after implementation of the law (Bowe, 1983, p. 30). This may result in a positive impact for two-piece cans because aluminum cans stand to gain a significant portion of the 3 billion unit share held by glass bottles. Aluminum's light weight and high scrap value have kept it in a good competitive position in other deposit law states and should help cans maintain their market share in New York.

In Massachusetts and Delaware, the effects of mandatory deposit laws also favor two-piece cans. As a result of the deposit laws, four grocery chains in Massachusetts have stopped selling bottles. In Delaware, aluminum cans are exempt from the deposit laws until 1984 and the exemption may continue pending a recommendation of a state commission. Due to a clause in a contract with a waste recycling company, the state would default if aluminum cans are eliminated from municipal waste. The exemption gives cans a 30¢ savings over other packages at the retail level (Bowe, 1983, p. 34).

In light of these events, mandatory deposit legislation is not expected to adversely impact the forecasts of two-piece can shipments used in this analysis. In addition, the drive for new deposit laws has been slowed by the defeat last year of such laws in California, Colorado, Arizona, and Washington (Bowe, 1983, p. 34).

4.2 SUPPLY FORECASTS

This section addresses the number of baseline closures and new sources that might be expected during the 1980s. The increase in demand

TABLE 4-3

PACKAGING MIX IN NEW YORK STATE, 1981

(In Millions of Equivalent 12 oz. Units)

Product	Container	
	One-Way Glass	Cans
Beer	2,080	1,350
Soft Drinks	936	2,023
Total	3,016	3,373
U.S. Total Shipments	29,117	56,326
New York as a % of U.S.	10.4%	6.0%

SOURCE: Stupay, Arthur, 1983: Containers and Packaging Annual Review and Outlook Report, Prescott Ball & Turben, Inc., April, 1983.

through the 1980s forecast in Section 4.1 can be supplied by (a) increasing capacity utilization at current plants, (b) modifying current plants to increase their capacity, (c) constructing new plants, and (d) increasing imports.

Production capacity in 1982 is calculated to be approximately 67 billion cans. This is based on actual 1982 production of 58 billion cans, published by the Can Manufacturers Institute (CMI, 1982, p. 6), and an estimate of unused capacity of 8-10 billion cans published in Modern Metals Magazine (Church, 1983, p. 70). This is shown in Table 4-4. Total capacity shown in Table 4-4 for 1982 is assumed to be the industry's optimal capacity utilization rate rather than maximum capacity. Also, the additions and subtractions from capacity forecasted for 1985 are assumed to be implemented to attain the industry's optimal capacity utilization. It is assumed that plants run as captive operations will operate at full capacity. This is based on the fact that shipments from captive plants grew at an average annual rate of 11% from 1979 to 1982 (see Table 3-5). Therefore, 1982 shipments for captive plants of 15 billion cans (published by CMI) represents total production capacity as well.

Production from captive plants is expected to continue to increase by 1 billion cans per year or the same as the 1981-1982 rate (see Table 3-5). This is a conservative estimate, since increases in prior years have been greater than 1 billion cans per year. Since total shipments are projected to be 66 billion cans for 1985 (see Table 4-1), and captive production will increase to 18 billion, commercial production is estimated to be 48 billion cans.

The number of potential baseline closures is then calculated by comparing production capacity to 1985 projected production. For commercial manufacturers, the estimated capacity of 52 billion cans exceeds 1985 production by 4 billion cans. Captive operations will require an additional 3 billion cans of capacity by 1985 to meet the

TABLE 4-4

SUMMARY OF FORECASTS FOR BEVERAGE CANS INDUSTRY

	All Producers	Commercial Manufacturers	Captive Operations
1982 (Actual)			
Shipments (Billion Cans)	58	43	15
Excess Capacity (Billion Cans)	9[a]	9	--
Production Capacity (Billion Cans)	67	52	15[b]
Number of Plants[c]	125	97	28
1985 Forecasts			
Shipments (Billion Cans)	66	48	18[d]
Additional Capacity Needed Between 1981-1985 (Billion Cans)	-1	-4	3
Number of Potential Baseline Plant Closures[e]	8	8	--
Number of Additional New Plants[e]	6	--	6
Capital Requirements for New Plants ($ Million)[f]	120-180	--	120-180
Total Number of Plants	123	89	34

SOURCE: Policy Planning & Evaluation, Inc. estimates.

[a]Estimate of beverage can oversupply (Church, 1983, p. 70).

[b]It is expected that the beverage companies will operate their captive canmaking facilities at full capacity.

[c]Assume the number of plants identified as two-piece can plants (125) is the same as that for beverage cans, and the number of commercial and captive plants is proportional to capacity.

[d]Assume shipments of beverage cans by captive plants will continue to grow at the 1981-1982 rate of 1 billion cans a year (see Table 3-5).

[e]Assume average capacity per can line to be 260 million cans (Church, 1982, p. 96) and an average of 2 lines per plant:

$$\frac{\text{67 billion capacity}}{\text{.260 billion per line}} = \text{258 lines} \quad \text{125 plants = 2 lines per plant}$$

[f]Assume average investment cost of $10-$15 million per line (Gere, 1982).

expected production levels. The 4 billion can excess for commercial plants represents eight potential plant closures, while the 3 billion can deficit for captives means six new captive plants will be needed by 1985 (assuming two can lines per plant and 260 cans per line). The additional captive plants will cost between $120 and $180 million.

Because capacity for commercial producers far exceeded demand in 1982, companies are expected to close excess capacity in the near future. This will enhance their ability to increase prices and, therefore, strengthen their profitability.

As discussed in Section 3.4, imports and exports of metal cans have always been insignificant because transportation costs for empty cans are high. This situation is not expected to change in the future.

5. EFFLUENT GUIDELINE CONTROL OPTIONS AND COSTS

5. EFFLUENT GUIDELINE CONTROL OPTIONS AND COSTS

5.1 OVERVIEW

The alternative water treatment control systems, costs, and effluent limitations for the Canmaking subcategory of the Coil Coating Point Source Category are enumerated in the Development Document. The Development Document also identifies various characteristics of the industry, including manufacturing processes; products manufactured; volume of output; raw waste characteristics; supply, volume, and discharge destination of water used in the production processes; sources of waste and wastewaters; and the constituents of wastewaters. Using these data, pollutant parameters requiring limitations or standards of performance were selected by EPA.

The EPA Development Document also identifies and assesses the range of control and treatment technologies for the industry. This involved an evaluation of both in-plant and end-of-pipe technologies. This information is then evaluated for existing surface water industrial dischargers to determine the effluent limitations required for the Best Practicable Control Technology Currently Available (BPT), and the Best Available Technology Economically Achievable (BAT). Existing and new dischargers to Publicly Owned Treatment Works (POTWs) are required to comply with Pretreatment Standards for Existing Sources (PSES) and Pretreatment Standards for New Sources (PSNS), and new direct dischargers are required to comply with New Source Performance Standards (NSPS), which require Best Available Demonstrated Control Technology (BDT). The identified technologies are analyzed to calculate cost above treatment in place and performance. Cost data are expressed in terms of investment, operating and maintenance costs plus depreciation, and interest expense.

5.2 CONTROL AND TREATMENT TECHNOLOGY

EPA identified six treatment technologies that are most applicable for the canmaking industry:

- Treatment Level 1: Flow normalization and model end of pipe technology consisting of oil removal by skimming, chemical emulsion breaking, dissolved air flotation, or a combination of these technologies; chromium reduction where necessary, and removal of other pollutants by precipitation and settle ("lime and settle");
- Treatment Level 2:[1] 60% flow reduction below BPT normalized flow plus the Treatment Level 1 model end of pipe technology;
- Treatment Level 3: Treatment Level 2 plus polishing filtration;
- Treatment Level 4: Similar to Treatment Level 3, but substitutes ultrafiltration for polishing filtration;
- Treatment Level 5:[2] Flow reduction of about 30% beyond Treatment Level 2, in addition to the Treatment Level 1 model end of pipe technology; and
- Treatment Level 6: Similar to Treatment Level 5 plus polishing filtration.

Treatment Levels 5 and 6 are limited to new sources only. In addition, Treatment Levels 3 and 4 were rejected for reasons explained in the preamble to the final regulation and are not included for discussion in the Economic Impact Analysis.

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[1]Selected technology for BAT/PSES.

[2]Selected technology for NSPS/PSNS.

5.3 COMPLIANCE COST ESTIMATES

5.3.1 Critical Assumptions

The assumptions made to estimate compliance costs are outlined in the Development Document. Some of the critical assumptions are summarized below:

- All costs are expressed in first-quarter 1982 dollars.
- Plant compliance costs are functions of actual production volume.
- Provisions are made for equipment-in-place in estimating compliance costs for existing sources.
- Capital costs are amortized at 10 years and 12% interest. The annual cost of depreciation was calculated on a straight line basis over a 10-year period.

The compliance costs of Treatment Level 1 are in many cases greater than those of Treatment Level 2 which includes substantial flow reduction and allows for smaller-sized end-of-pipe treatment. In such cases, in this report, it was assumed that dischargers would install Treatment Level 2 instead of Level 1 in order to meet BPT and would incur no incremental cost meeting BAT or PSES.

5.3.2 Compliance Costs of Existing Sources

Table 5-1 presents the total compliance capital investment and total annual compliance cost estimates of Treatment Levels 1 and 2 for existing sources in the canmaking industry. Costs were not developed for Treatment Levels 3 and 4 for existing sources. Total annual compliance costs for the 71 sample discharging plants for which production and compliance cost data are available are $14.9 million for Treatment Level 1 and $15.1 million for Treatment Level 2. Total annual compliance costs projected for the 83 discharging plants in the industry are $17.5 million for Treatment Level 1 and $17.7 million for Treatment Level 2. Investment and annual costs for the 83 plants in the industry

TABLE 5-1

ESTIMATED COMPLIANCE COSTS FOR CANMAKING EXISTING SOURCES

	All Discharging Plants	Indirect Dischargers	Direct Dischargers
Total for 71 Sample Plants			
Number of Plants	71	69	2
Compliance Capital Investment (Thousand Dollars)[a]			
Treatment Level 1	18,288	17,909	379
Treatment Level 2	18,588	18,209	379
Annual Compliance Costs (Thousand Dollars)[a]			
Treatment Level 1	14,873	14,493	380
Treatment Level 2	15,091	14,711	380
Projected Total for All Plants in Industry			
Number of Plants	83	80	3
Compliance Capital Investment (Thousand Dollars)[a]			
Treatment Level 1	21,551	20,907	644[b]
Treatment Level 2	21,970	21,324	646
Annual Compliance Costs (Thousand Dollars)[a]			
Treatment Level 1	17,472	16,881	591[b]
Treatment Level 2	17,742	17,148	594

SOURCE: Section VIII of the Development Document.

[a]First-quarter 1982 dollars.

[b]These costs are lower than those estimates presented in Section VIII of the Development Document. We believe facilities will choose the most economical means of complying with BPT and, if going directly to BAT is less expensive, will choose to install BAT technology with flow reduction in order to meet the BPT limits.

Note: Sampling data for 74 plants was received which included 3 plants that dispose wastewater by land application. Those three plants will have no compliance costs as a result of this regulation and, therefore, are not reflected in this table.

are estimated by (1) calculating costs for 71 plants based on their individual production levels and treatment in place; and (2) determining the average compliance costs for the 71 sample plants and assigning the average costs to the remaining twelve plants. Aluminum and steel plants are treated separately.

Table 5-2 shows the results of an analysis comparing the annual compliance costs to total plant revenues. This table illustrates the relative magnitude of the annual costs. Only 10 plants would experience annual compliance costs between 1%-2% of revenues for Treatment Levels 1 and 2. Only one two-piece product line within a plant would experience annual costs in excess of 2% of revenues.

5.3.3 Compliance Costs of New Sources

As indicated in Section 5.2, two treatment technologies (Treatment Levels 5 and 6) are considered for new sources. It is estimated that a new source plant will have production equal to the industry average and a water flow of 63.6 l/1,000 cans. Table 5-3 summarizes the compliance cost estimates of these treatment technologies for model plants. These costs apply to existing facilities that are substantially modified and to greenfield (new) plants.

TABLE 5-2

IMPACT OF ANNUAL COMPLIANCE COSTS ON REVENUES FOR EXISTING SOURCES

	Treatment Level 1	Treatment Level 2
Number of Sample Plants With Annual Compliance Costs to Revenues between:		
0 - 0.25 percent	6	6
0.25 - 0.50 percent	24	24
0.50 - 0.75 percent	22	22
0.75 - 1.00 percent	8	8
1.00 - 2.00 percent	10	10
Over 2.00 percent	1[a]	1[a]

SOURCE: Policy Planning & Evaluation, Inc. estimates.

[a]Represents a single two-piece product line within a plant.

TABLE 5-3

NEW SOURCE MODEL PLANT COMPLIANCE COSTS

	Compliance Capital Investment (Thousand Dollars)[a]	Annual Compliance Costs (Thousand Dollars)[a]
Treatment Level 1[b]	--	--
Treatment Level 2	382.1	266.6
Treatment Level 3	399.1	277.6
Treatment Level 4[c]	--	--
Treatment Level 5	382.1	266.6
Treatment Level 6	396.1	275.6

SOURCE: Section VIII of the Development Document.

[a]First-quarter 1982 dollars.

[b]Treatment Level 1 costs are not provided since new source requirements must be at least as stringent as existing source requirements.

[c]Investment and Annual costs were not provided for Treatment Level 4. This treatment level was rejected as a viable option and will not be presented for discussion in the Economic Impact Analysis.

6. ECONOMIC IMPACT ANALYSIS

6. ECONOMIC IMPACT ANALYSIS

This chapter provides an estimate of the economic impacts associated with the costs of the effluent treatment technologies described in Chapter 5. The analysis was based upon an examination of the estimated compliance costs and other economic, technical, and financial characteristics of the 71 canmaking plants for which production and compliance costs data were available, and used the methodology described in Chapter 2. The economic impacts examined include changes in industry profitability, plant closures, substitution effects, changes in employment, shifts in imports and exports, and industry structure effects.

The 71-plant sample represents approximately 86% of the discharging plants in the industry and contains a wide range of both large and small plants. Therefore, the sample appears to represent adequately the technical characterization of the industry for the purposes of this study.

6.1 PRICE AND QUANTITY CHANGES

As described in Chapters 2 and 3, market competition is strong in the metal can industry. For this reason, it was assumed that metal can manufacturers would attempt to absorb their compliance costs and would not adjust prices. Consequently, the price changes due to the regulation would be zero. It follows, also, that quantities demanded would not change because of the regulations.

6.2 PROFIT IMPACT ANALYSIS

As described in Section 2.5, the assessment of the impact of compliance on plant profitability was based on the plants' after-compliance return on investment (ROI) ratios, investment being defined as total plant assets (i.e., current assets plus net property, plant and equipment). In addition to per plant production levels, compliance costs, and capital investments (developed by EPA's Effluent Guidelines Division), the methodology for the profit impact test requires the use of average industry can prices, profit margins, and assets to sales ratios. In order to arrive at values for the profit margin and assets to sales ratio, a five-year average (1977-1981) of industry data from Robert Morris Associates' Statement Studies was used. The results are shown in Appendix B. Since both good and bad business years are included in the series, these averages represent the long-term profitability for the industry. The average industry profit margin is estimated to be 5% and the assets to sales ratio is 0.52. A 5% industry profit margin appears obtainable by 1985 despite low capacity utilization rates in 1982. It is expected that industry will close unused capacity by 1985, thereby increasing utilization rates and profitability.

The final data element required to perform the profitability test is the price of the can. The price used in this analysis is $60 per 1,000 cans. This price represents the price of only the can body, as the manufacture of lids does not generate process wastewater and is not regulated. The $60 price is based on a consensus of can manufacturers that are members of the Can Manufacturers Institute, a trade association of metal can manufacturers. Chase Econometrics reported a target price for 1982 of $68 per 1,000 cans in a 1982 study of the beverage packaging industry (Chase, 1982, p. 2.23). However, due to severe price cutting caused by high competition, $60 is used as an approximation of the actual market price.

To perform the profitability test, the average before-tax ROI for the industry must be estimated. This is calculated to be 10% by using the following equation:

$$(\text{Average PM})\ (\text{Average TO}) = \text{Average BTROI}$$
$$(.05)\quad (2) = .10$$

where: BTROI = before-tax ROI
PM = profit margin (from Appendix B)
TO = asset turnover ratio (from Appendix B)

The threshold for the profitability test is an after-compliance ROI of 7% (see Appendix A). Therefore, plants with an ROI of less than 7% after compliance would be potential closures. Table 6-1 presents the distribution of ROIs for the 71 sample plants. This table indicates that a two-piece product line in one of these plants was found to be a potential closure at Treatment Levels 1 and 2. The same product line closes at both treatment levels.

6.3 CAPITAL REQUIREMENTS ANALYSIS

As presented in Chapter 2, the ratio of "compliance capital investment to revenues" (CCI/R) was used to evaluate a firm's ability to raise the capital necessary to install the pollution control systems. Although the CCI/R ratio does not precisely indicate whether or not plants can afford to make the required investments, it provides a good indication of the relative magnitude of the compliance capital investment requirements. The ratio CCI/R was calculated for each of the 71 sample plants and compared to the plants' respective capital availability threshold value. Assuming that reinvestment in plant and equipment equals depreciation, the plant's net after-tax profit margin is a measure of the internally generated funds available for pollution control investment. For this analysis, the before-tax profit margin of a canmaking plant is estimated to be 5% of revenues, and the corporate tax rate is assumed to be 40%; therefore, 3% (60% of 5%) of revenues was taken to be the capital availability threshold.

Table 6-2 presents the results of the capital requirements analysis. A two-piece product line in one of the plants was found to have a CCI/R ratio greater than the threshold value for Treatment Levels 1 and 2. The same product line closes at both treatment levels.

TABLE 6-1

SUMMARY OF PROFIT IMPACT ANALYSIS

	Treatment Level 1	Treatment Level 2
Number of Sample Plants With After-Compliance ROI Between:		
9.5 - 10.0 percent	4	3
9.0 - 9.5 percent	19	20
8.0 - 9.0 percent	37	35
7.0 - 8.0 percent	10	12
under 7.0 percent[a]	1[b]	1[b]

SOURCE: Policy Planning & Evaluation, Inc. estimates.

[a]Plants with ROI less than 7% are considered potential closures.

[b]Represents a single two-piece product line within a plant.

TABLE 6-2

SUMMARY OF CAPITAL REQUIREMENTS ANALYSIS

	Treatment Level 1	Treatment Level 2
Number of Sample Plants With Compliance Capital Investment to Annual Revenues Ratios between:		
0 - 0.5 percent	19	19
0.5 - 1.0 percent	38	38
1.0 - 2.0 percent	13	13
2.0 - 3.0 percent	0	0
over 3 percent[a]	1[b]	1[b]

SOURCE: Policy Planning & Evaluation, Inc. estimates.

[a]Plants with ratios of compliance capital investment to annual revenues greater than 3% are considered potential closures.

[b]Represents the same single two-piece product line that failed the ROI test.

6.4 PLANT CLOSURE POTENTIAL

As indicated in the profit impact and capital requirements analyses, Treatment Levels 1 and 2 are expected to cause one product line closure. This product line produces less than 50 million cans per year. Since the 71-plant sample represents a major portion of the regulated industry, no additional plant closures are expected at the 83-plant level.

It should be noted that the baseline projections developed in Chapter 4 showed closures of 8 can plants by 1985 in the absence of additional regulations. However, the identity of the plants that would close in the baseline could not be determined because plant specific financial data were not available. It is possible that one of these plants contains the plant product line projected to close due to the regulations.

6.5 OTHER ECONOMIC IMPACTS

The effluent regulations examined in this report may have economic impacts other than the plant closure potentials discussed above. The substitution potential of other processes and materials, and possible community, employment, foreign trade, and industry structure implications, will be addressed in the following sections.

6.5.1 Substitution Effects

As indicated in Chapter 3, seamless two-piece metal cans face strong competition from other types of containers. Price increases due to regulatory compliance costs would likely cause a switch to other types of containers such as glass and plastic bottles. However, as described in Chapter 2, compliance costs are expected to be absorbed by the can manufacturers. For this reason, no substitution effects are expected to result from the regulations.

6.5.2 Community and Employment Impacts

The one two-piece can product line expected to close at Treatment Levels 1 and 2 employs 26 employees. The plant is located in a metropolitan area where the employees account for a very small portion of the total labor force. Thus, the impact on local employment will not be significant.

6.5.3 Foreign Trade Impacts

As stated in Chapter 3, foreign trade competition in the canmaking industry is not significant. U.S. exports of metal cans have always been less than 1% of total industry value of shipments. Although statistics for imports are not available, industry sources indicate that they are insignificant due to high transportation costs. In addition, it is assumed that there will be no price increases resulting from the regulations. Thus, no foreign trade impacts are expected.

6.5.4 Industry Structure Effects

The potential product line closure represents a small fraction of the total industry capacity. The market share of the expected product line closure is also quite small and will probably be captured by other existing producers. Therefore, there will be no change in market structure as a result of this regulation.

6.6 NEW SOURCE IMPACTS

As reported in Section 5.2, two treatment alternatives (Treatment Level 5 and Level 6) are considered for canmaking new sources. Total system compliance costs of these two alternatives for typical new sources are summarized in Table 5-3.

For the purpose of evaluating the new source impacts, compliance costs of new source standards were defined as incremental costs over the costs of selected standards for existing sources. Table 6-3 presents the results of the new source impact analysis assuming the selected treatment technology for existing sources is Treatment Level 2. This table shows that there is no incremental capital or annual compliance costs for new sources under the selected option (Treatment Level 5), since the recommended technology for reducing flow beyond BAT/PSES flows is the same as the technology for achieving BAT/PSES flows (counterflow rinsing). Even if a sensitivity analysis had been conducted for Treatment Level 6, the incremental investment and annual costs are less than 0.05% of revenues. New entry into the industry, therefore, should not be deterred by these compliance costs.

TABLE 6-3

SUMMARY OF NEW SOURCE IMPACT ANALYSIS

Annual Production of a New Model Can Plant (million cans)[a]	600
Plant Costs ($ million)	30
Plant Revenues ($ million)	36
Treatment Level 5 Costs[b]	
Incremental investment cost - $000	0
Incremental annual cost - $000	0
Treatment Level 6 Costs[b]	
Incremental investment cost - $000	14
% of Annual Revenues	0.04
Incremental annual cost - $000	9
- % of Annual Revenues	0.03

SOURCE: Policy Planning & Evaluation, Inc. estimates.

[a]Assume average capacity of 300 million cans per line (Gere, 1982) and 2 lines per plant.

[b]Incremental from Treatment Level 2.

7. SMALL BUSINESS ANALYSIS

7. SMALL BUSINESS ANALYSIS

The Regulatory Flexibility Act (RFA) of 1980 (P.L. 96-354), which amends the Administrative Procedures Act, requires Federal regulatory agencies to consider "small entities" throughout the regulatory process. The RFA requires an initial screening analysis to be performed to determine if a substantial number of small entities will be significantly affected. If so, regulatory alternatives that eliminate or mitigate the impacts must be considered. This chapter addresses these objectives by identifying and evaluating the economic impacts of the aforementioned regulations on small metal can producers. As described in Chapter 2, the small business analysis was developed as an integral part of the general economic impact analysis and was based on the examination of the distribution by plant size of the number of can plants, plant production, and compliance costs from the regulations. Based on this analysis, EPA has determined that small entities will not be disproportionately impacted by this regulation.

For purposes of regulation development, the following alternative approaches were considered to provide alternative definitions of small canmaking operations:

- the Small Business Administration (SBA) definition;
- plant annual production;
- plant number of can lines; and
- plant wastewater flow rate.

Of these, plant annual production was chosen. This is because the manufacturing technology in the seamless canmaking industry is very similar among producers, so plant annual production is indicative of relative size. For this regulation, plant annual production of 500 million cans or less was used as the definition of a small canmaking business.

Table 7-1 shows the distribution of production, sales, and compliance capital investment costs, by size of annual production, for the plants affected by this regulation. The size breakdown is as follows:

- 500 million cans per year or less
- 500-750 million cans per year
- 750-1,000 million cans per year
- More than 1,000 million cans per year.

A plant which manufactures 500 million cans per year or less is considered to be a small producer for this analysis.

The table shows that small producers account for only 16% of the industry's production and sales, while the largest producers (1,000 million cans and more per year) represent almost 35%. In spite of the wide difference in the share of production and sales among the smallest and largest plants, the impact of compliance costs for Treatment Level 2 is more closely distributed among the size categories. The comparison of compliance capital investment to revenues was used in the small business analysis because, as discussed elsewhere in this report, the ratio provides a reasonable measure of the magnitude of the compliance costs. An explanation of the methodology for this test is presented in Chapter 2. The ratio of compliance capital investment to revenues is the same for small producers as it is for the industry as a whole (1%). Therefore this regulation will not disproportionately impact small companies.

TABLE 7-1

SMALL BUSINESS IMPACTS

	Size of Plant (millions of cans per year)				
	≤ 500	500-750	750-1,000	>1,000	Total
Total Production (millions of cans)	7,681	15,969	8,528	17,036	49,214
Total Sales ($ 000)	460,860	958,140	511,680	1,022,160	2,952,840
% of Total	16	33	17	35	100
Total Compliance Capital Investment for Treatment Level 2 ($ 000)	5,277	6,364	3,053	3,895	18,589
% of Sales	1	1	1	0.4	1

8. LIMITATIONS OF THE ANALYSIS

8. LIMITATIONS OF THE ANALYSIS

This section discusses the major limitations of the economic impact analysis. It focuses on the limitations of the data, methodology, assumptions, and estimations made in this report.

8.1 DATA LIMITATIONS

In the absence of complete plant-specific financial data for two-piece canmaking plants, a financial profile of the canmaking industry was developed based on extensive review of trade literature and published financial reports. This financial profile is subject to the following major assumptions and limitations:

- The economic impact analysis was based on a sample of 71 discharging plants for which both annual production data (obtained from EPA 308 industry surveys) and compliance cost estimates were available. This 71-plant sample contains a wide range of plants of all sizes and appears to be representative of the two-piece canmaking subcategory. The sample was then extrapolated to the industry total of 83 canmaking plants.

- Production data for most plants were reported in terms of the number of cans produced. For several plants production data were reported in pounds and were converted to number of cans assuming 34 aluminum cans per pound and 13 steel cans per pound.

- An average industry price of $60 per thousand cans was used to derive sales revenue estimates, from production data for each sample plant.

- Financial information is not available for the two-piece canmaking segment of companies manufacturing metal cans. Therefore, industry averages for operating ratios such as profit margin and assets to sales were used. The methodology for estimating these financial variables is explained in Chapter 2 and Appendix B.

8.2 METHODOLOGY LIMITATIONS

In addition to the data limitations described above, this study is also subject to limitations of the methodology used. These limitations are related to critical assumptions on price increase, profit impact, and capital availability analyses.

8.2.1 Price Increase Assumptions

Because of strong competition within the canmaking industry and with other types of packaging, it was assumed that the can manufacturers would attempt to absorb their compliance costs and would not raise their prices. If prices could be raised without significantly affecting demand, the impacts on canmaking firms would be lower than those estimated in Chapter 6.

8.2.2 Profit Impact Assumptions

In studies where detailed, plant-specific data are available, potential plant closures can be identified by using discounted cash flow analyses. Using this approach, a judgment can be made about the ability of a plant to continue in business after compliance with effluent regulations, by comparing the discounted value of the plant's cash flow with the plant's estimated salvage value. The application of this approach requires plant-specific data on cash flows and salvage values, and since data at this level of specificity are not available for this study, this approach was not deemed to be practical. As an alternative method, profitability impacts were measured through the use of return on investment (assets) analysis. Although this financial ratio analysis is based upon accounting data and does not account for the time value of money, it is widely used in comparative financial analyses and is simple to apply. Moreover, in a situation such as the analysis conducted in this study, both methods are likely to indicate the same impact (i.e., plant closure) conclusions.

Industry-wide estimates of long-term profit margins and total assets to sales ratios were applied to plant-specific sales figures to arrive at estimates of profit and investment (for the return on investment test). The long-term operating ratios represent the average value over the past five years. Long-term profitability estimates were used to project closures since major investment decisions are made primarily on the basis of long-run expectations. Economic analysis generally distinguishes between long-run and short-run outcomes. Decisions regarding variable costs and relatively small amounts of resources are generally made on short-run criteria. On the other hand, decisions regarding large investment in fixed assets are made on the basis of long-run expectations. This means that large capital expenditures are generally made based on the expected return on the investment over a period of years. Cyclical fluctuations in the general economic conditions usually do not affect the outcome of these decisions but do affect their timing.

8.2.3 Capital Availability Assumptions

The capital investment requirements analysis was assessed through an evaluation of investment compliance costs in comparison to total revenues. Although this technique does not provide a precise conclusion on a firm's ability to make the investment, it does provide a good indication of the relative magnitude of the capital requirement. In performing this test, an assumption was made that reinvestment equals depreciation. This assumption does not limit the usefulness of the test and, in fact, is widely used in the financial analysis literature.

8.3 SUMMARY OF LIMITATIONS

Although the above factors may affect the quantitative accuracy of the impact assessments on specific canmaking plants, it is believed that the results of this study represent a valid industry-wide assessment of the economic impacts likely to be associated with effluent guideline control costs.

8.4 SENSITIVITY ANALYSIS

8.4.1 Counterflow Rinsing vs. Countercurrent Cascade Rinsing

Table 8-1 shows the results of a sensitivity analysis performed for a new source model plant with counterflow rinsing and three additional stages of countercurrent cascade rinsing. The analysis was performed to compare the investment and annual costs between the two technologies, since some plants may elect to install countercurrent cascade rinsing to achieve new source standards. The analysis shows that even with the additional equipment needed for countercurrent cascade rinsing, incremental investment and annual costs represent less than 0.5% of annual plant revenues. Because both these technologies are only slightly more stringent than Treatment Level 2, there will be no barrier to entry caused by this regulation.

8.4.2 Monitoring

A sensitivity analysis was performed to estimate additional impacts imposed by monitoring requirements. If all plants are required to monitor ten days per month, total annual costs for the 71 sample plants for Treatment Level 2 would increase from $15.1 million to $15.8 million. This increase would be expected to cause only one additional closure over that shown in Chapter 6, or a total of two plant closures (one of which is a two-piece can line within a three-piece canmaking plant).

TABLE 8-1

SENSITIVITY ANALYSIS OF NEW SOURCE IMPACTS

Annual Production of a New Model Plant (million cans)[a]	600
Plant Costs ($ million)	30
Plant Revenues ($ million)	36
Treatment Level 5 Costs (counterflow rinsing)[b]	
Incremental investment cost - $000	0
Incremental annual cost - $000	0
Treatment Level 6 Costs (counterflow rinsing)[b]	
Incremental investment cost - $000	14
- % of Annual Revenues	0.04
Incremental annual cost - $000	9
- % of Annual Revenues	0.03
Treatment Level 5 Costs (3 additional stages of countercurrent rinsing)[b]	
Incremental investment cost - $000	111
- % of Annual Revenues	0.31
Incremental annual cost - $000	35
- % of Annual Revenues	0.10
Treatment Level 6 Costs (3 additional stages of countercurrent rinsing)[b]	
Incremental investment cost - $000	146
- % of Annual Revenues	0.41
Incremental annual cost - $000	55
- % of Annual Revenues	0.15

SOURCE: Policy Planning & Evaluation, Inc. estimates.

[a]Assume average capacity of 300 million cans per line (Gere, 1982) and 2 lines per plant.

[b]Incremental from Treatment Level 2.

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APPENDIX A

CALCULATION OF PROFIT IMPACT THRESHOLD VALUE

APPENDIX A

CALCULATION OF PROFIT IMPACT THRESHOLD VALUE

To assess the impact of compliance on plant profitability, the plants' after-compliance returns on assets (ROI) ratios were calculated and compared to a threshold value. The threshold value was set at a level that would generate to the stockholders/owners a return on the liquidation value of their investment (after taxes return on their equity) equal to the opportunity cost of other investment alternatives, which in this case is defined as the U.S. Treasury bond yield. It is assumed that plants must generate an after-compliance return on assets at least as great as the threshold value or the plants would be closed.

The first step in relating the ROI threshold value and the opportunity return is the following equation:

$$
\begin{aligned}
\text{BTROI} &= \frac{\text{NPBT}}{\text{Assets}} = \frac{\text{NPBT}}{\text{Equity}} \times \frac{\text{Equity}}{\text{Assets}} \\
&= \text{BTROE} \times \frac{\text{Equity}}{\text{Assets}} \\
&= \text{ATROE} \times \frac{1}{(1-t)} \times \frac{\text{Equity}}{\text{Assets}}
\end{aligned}
$$

where:
- BTROI = minimum acceptable before-taxes return on assets
- NPBT = net profit before taxes
- Assets = asset book value
- Equity = equity book value
- BTROE = minimum acceptable before-taxes return on equity
- ATROE = minimum acceptable target after-taxes return on equity
- t = average corporate tax rate.

Using the above equation, a projected U.S. Treasury bond yield (or minimum acceptable after-taxes ROE) of 12% (DRI, 1981), corporate tax rate of 40% (U.S. Department of Commerce, 1983, p. 38), and equity-to-assets ratio of 50% (see Appendix B), the before-taxes ROI threshold value would be 10%.

However, the gross cash value of a plant (liquidation value) is generally a fraction of its book value. It is assumed that the gross cash value is 85% of the book value. Given a debt/equity share of 50-50, the net cash value of the plant after obligations would be:

$$\text{Net Cash Value} = (.85 \text{ Book Value}) - (.50 \text{ Book Value})$$
$$= .35 \text{ Book Value}$$

The 12% U.S. T-bond rate represents the return on the net cash value of plants assets that could be expected if the owners chose to liquidate the plant. Therefore, the after tax return would be:

$$\text{After Tax Return} = (.12) \left[(.35) \text{ Book Value}\right]$$
$$= .04 \text{ Book Value}$$

Accounting for taxes produces a before tax return of:

$$\text{Before Tax Return} = \frac{.04 \text{ Book Value}}{(1 - .4)}$$
$$= .07 \text{ Book Value or a } 7\% \text{ return}$$

The owners' expected before-tax return on the liquidated value of equity (7%) equals the opportunity cost of a comparable investment alternative; namely the U.S. Treasury bond yield. Since the liquidation value of equity represents the owners' retrievable investment:

$$\text{Before Tax Return on Equity} = \text{Before Tax Return on Investment}$$
$$\text{BTROE} = \text{BTROI} = 7\%$$

Table A-1 presents estimates of profit impact threshold values based on various assumptions on assets liquidation value and equity-to-assets ratio.

TABLE A-1

ESTIMATED ROI THRESHOLD VALUES THAT GENERATE 12% ROE

ASSUMING VARIOUS ASSETS LIQUIDATION VALUES AND EQUITY TO ASSETS RATIOS

	Corporate Tax Rate: 40% Assets Liquidation Value (% of Book Value)						
Equity/Assets Ratio	**60%**	**70%**	**75%**	**80%**	**85%**	**90%**	**100%**
0.30	*	*	1.0	2.0	3.0	4.0	6.0
0.35	*	1.0	2.0	3.0	4.0	5.0	7.0
0.40	*	2.0	3.0	4.0	5.0	6.0	8.0
0.45	1.0	3.0	4.0	5.0	6.0	7.0	9.0
0.50	2.0	4.0	5.0	6.0	7.0	8.0	10.0
0.55	3.0	5.0	6.0	7.0	8.0	9.0	11.0
0.60	4.0	6.0	7.0	8.0	9.0	10.0	12.0
0.65	5.0	7.0	8.0	9.0	10.0	11.0	13.0
0.70	6.0	8.0	9.0	10.0	11.0	12.0	14.0
	Corporate Tax Rate: 35% Assets Liquidation Value (% of Book Value)						
Equity/Assets Ratio	**60%**	**70%**	**75%**	**80%**	**85%**	**90%**	**100%**
0.60	4.3	6.0	6.8	7.7	8.5	9.4	11.1
0.65	4.6	6.5	7.4	8.3	9.2	10.2	12.0
0.70	5.0	7.0	8.0	8.9	9.9	10.9	12.9

APPENDIX B

ESTIMATION OF KEY FINANCIAL PARAMETERS OF CANMAKING INDUSTRY

APPENDIX B

ESTIMATION OF KEY FINANCIAL PARAMETERS OF CANMAKING INDUSTRY

Table B-1 presents the methodology for estimating three key financial ratios used in the economic impact analysis: plant baseline return on sales (profit margin), total assets to sales, and stockholders' equity to sales ratios. Since plant-specific financial characteristics are not available, data used to estimate these three ratios are obtained from Robert Morris Associates' (RMA) Statement Studies, 1982 edition.

In order to corroborate the results in Table B-1 and determine whether adding 1982 data would significantly affect the industry averages, an analysis of financial information for four of the largest commercial manufacturers of cans was performed. The following companies show business segment information on their annual reports for predominantly can operations:

- American Can Co. (Segment: Container and Packaging)
- Continental Group (Segment: Cans)
- Crown, Cork, and Seal Co., Inc. (Segment: Metal Products)
- National Can Corp. (Segment: Metal Container)

These four companies account for almost 60% of the production of all metal containers. Information on the before tax return on sales (profit margin) for the years 1978 to 1982 was compiled for each company's can segment. Table B-2 shows that the profit margin for these companies averaged 5.1% over the 1978-1982 time period. This tends to indicate that the 5% profit margin represents the long-term profitability of the can manufacturing industry.

TABLE B-1

SELECTED FINANCIAL RATIOS FOR CANMAKING INDUSTRY

	1977	1978	1979	1980	1981	Estimated Industry[a] Average
Profit Before Taxes (% of Sales)	5.2	4.8	6.9	5.1	4.6	5.0
Assets to Sales	0.57	0.58	0.45	0.41	0.53	0.52[b]
Stockholders' Equity (% of Total Assets)	47.3	49.1	44.7	53.4	51.2	49.2

SOURCE: Policy Planning & Evaluation, Inc. estimates based on published financial data for Metal Cans industry (SIC 3411) from Robert Morris Associates' Statement Studies, 1982 edition.

[a]Average of 1977-1981 ratios, excluding the lowest and the highest years.

[b]The inverse of the assets to sales ratio is the asset turnover ratio (sales to assets). Therefore, the turnover ratio for this industry is estimated to be 2.

TABLE B-2

AVERAGE PROFIT MARGIN CALCULATED FROM
ANNUAL REPORTS, 1978-1982
(percents)

Year	Company				Average
	Crown	National	Continental	American	
1978	8.7	2.9	5.9	5.5	5.8
1979	8.0	7.6	5.1	5.2	6.5
1980	8.2	6.8	3.2	3.1	5.3
1981	7.0	4.2	2.3	3.7	4.3
1982	5.7	5.0	4.0	-0.1	3.7
				5-year average	5.1[a]

SOURCE: Corporate Annual Reports.

[a]Average of 1978-1982 ratios, excluding the lowest and the highest years.

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16. Abstract (Limit: 200 words)

This report represents the results of the economic impact analysis for the Canmaking subcategory of the Coil Coating industry which is noticed in the Federal Register on November 17, 1983. The report presents an industry profile, cost estimates for the options considered by the Agency, and the analyses of the projected plant or product line closures, price changes, unemployment and other effects. Using revised compliance costs for each plant, EPA performed a capital requirements analysis and a profitability analysis to determine the likelihood of potential closures.

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