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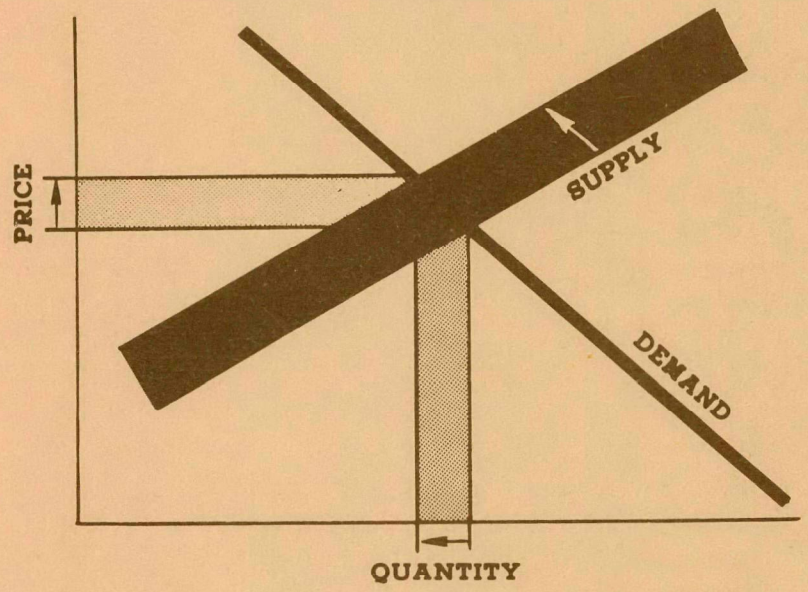
ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES
Miscellaneous Foods And Beverages Industry

VOLUME II: BEVERAGE INDUSTRIES



U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Planning and Evaluation
Washington, D.C. 20460

ECONOMIC IMPACT OF PROPOSED EFFLUENT GUIDELINES
MISCELLANEOUS FOODS AND BEVERAGE INDUSTRY
VOLUME II - THE BEVERAGE INDUSTRIES

Prepared for

Environmental Protection Agency

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PREFACE

The attached document is a contractors' study prepared for the Office of Planning and Standards of the Environmental Protection Agency ("EPA"). The purpose of the study is to analyze the economic impact which could result from the application of alternative effluent limitation guidelines and standards of performance to be established under sections 304(b) and 306 of the Federal Water Pollution Control Act, as amended. Some of the costs contained in this document are currently being revised and will be amended within this report before regulations are proposed.

The study supplements the technical study ("EPA Development Document") supporting the issuance of proposed regulations under sections 304(b) and 306. The Development Document surveys existing and potential waste treatment control methods and technology within particular industrial source categories and supports proposal of certain effluent limitation guidelines and standards of performance based upon an analysis of the feasibility of these guidelines and standards in accordance with the requirements of sections 304(b) and 306 of the Act. Presented in the Development Document are the investment and operating costs associated with various alternative control and treatment technologies. The attached document supplements this analysis by estimating the broader economic effects which might result from the required application of various control methods and technologies. This study investigates the effect of alternative approaches in terms of product price increases, effects upon employment and the continued viability of affected plants, effects upon foreign trade and other competitive effects.

The study has been prepared with the supervision and review of the Office of Water Planning and Standards of the EPA. This report was submitted in fulfillment of Contract No. 80A 68-01-1533, Task Order No. 21 by Development Planning and Research Associates, Inc. This report reflects work completed as of March, 1977.

The study has not been reviewed by EPA and is not an official EPA publication. The study will be considered along with the information contained in the Development Document and any comments received by EPA on either document before or during proposed rule making proceedings necessary to establish final regulations. Prior to final promulgation of regulations, the accompany study shall have standing in any EPA proceeding or court proceeding only to the extent that it represents the views of the contractor who studied the subject industry. It cannot be cited, referenced, or represented in any respect in any such proceeding as a statement of EPA's views regarding the subject industry.

This is Volume II in a series of four volumes for selected miscellaneous food and beverage industries. The full series of volumes and industries covered in this study are shown in Exhibit 1.

Exhibit 1. Miscellaneous Foods and Beverages Industries includes in this study by volume

Volume	Industry	SIC
Vol. I	Edible Oil Industries	
	Cottonseed Oil	2074
	Soybean Oil	2075
	Vegetable Oil	2076
	Edible Fats and Oils	2079
Vol. II	Beverage Industries	
	Malt beverages	2082
	Malt	2083
	Wine and brandy	2084
	Distilled spirits	2085
	Bottling and blending of distilled spirits	5182
	Soft drinks	2086
	Flavoring and extracts	2087
Vol III.	Confectionery and Bakeries Industries	
	Blended and prepared flour	2045
	Bakery products	2051
	Cookies and crackers	2052
	Confectionery products	2065
	Chocolate and cocoa	2066
	Chewing gum	2067
Vol. IV.	Special Products Industries	
	Egg processing	20172
	Shell eggs	5144
	Dehydrated soups	20342
	Frozen specialties	2038
	Pet foods	2047
	Coffee and tea (instant)	2095
	Yeast	20994
	Pectin	*
	Vinegar	20996
	Hydrolyzate	*
	Chili pepper and paprika	*
	Baking powder	20994
	Bread crumbs	*
	Chicory	*
	Almond paste	*
	Bouillon	*
	Desserts, ready to mix	*
	Honey	20991
	Macaroni, spaghetti	20993
	Molasses	*
	Non-dairy coffee creamer	*
	Peanut butter	*
	Popcorn	*
	Spices	*
	Tea, packaged	*
	Prepared sandwiches	*
	Manufactured ice	2097

EXECUTIVE SUMMARY DRAFT

ECONOMIC IMPACT OF PROPOSED EFFLUENT GUIDELINES

MISCELLANEOUS FOODS AND BEVERAGE INDUSTRY

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ECONOMIC ANALYSIS OF PROPOSED EFFLUENT GUIDELINES: THE BEVERAGES INDUSTRIES

EXECUTIVE SUMMARY

I. INTRODUCTION AND METHODOLOGY

A. Introduction

This study analyzes the economic impact of the proposed EPA effluent control standards on the beverage industries. Specifically, it examines the economic effect of those standards primarily engaged in the manufacturing of malt beverages (SIC 2082); malt (SIC 2083); wines, brandy and brandy spirits (SIC 2084); distilled spirits (SIC 2085); soft drinks (SIC 2086); and flavoring extracts and syrups (SIC 2087). Each beverage industry was initially analyzed separately and as such this summary will discuss the respective industries in a similar fashion.

B. Methodology

The economic impact analysis utilizes the basic data developed on the industries and their respective segments, financial profiles and price effects, together with pollution abatement technology and costs developed by EPA. Impacts analyzed include: Price Effects, Financial Effects, Production Effects, Employment Effects and Community Effects.

The effluent control system requirements and costs utilized by this analysis were furnished by the EPA and were developed specifically for the models described. Three effluent guideline standards were considered:

BPT - Best Practicable Control Technology Currently Available, to be achieved by July, 1977.

BAT - Best Available Pollution Control Technology Economically Achievable, to be achieved by July, 1983.

NSPS - New Source Performance Standards are recommended to be equal to one half the BAT control level and to apply to any source for which construction starts after the publication of the proposed guidelines.

Costs furnished included investment requirements, operating costs and total yearly costs (operating costs, interest and depreciation).

II. MALT BEVERAGES

A. Industry Structure

The Malt Beverage Industry is defined as an industry comprised of establishments primarily engaged in the manufacture of a variety of types of malt beverages but which is usually lager beer.

1. Characteristics of the Industry

According to the Bureau of Alcohol, Tobacco and Firearms, as of January 1, 1976, there were 54 brewing companies which were authorized to operate 94 breweries. Historically, the trend has been for the number of breweries to decline. In 1935, 750 breweries operated but this has been reduced to the 94 authorized in 1976. Generally those breweries leaving the industry have been the smaller operations with the existing firm's market share being acquired by the larger, more powerful remaining breweries. In 1974, the five largest companies produced over 63 percent of the total industry's barrelage.

Estimates of the industry's 1975 value of shipments are expected to total nearly $5.4 billion. This estimate represents an increase over the 1974 shipments of 11.2 percent. Since 1958, the value of shipments has had an annual increase averaging 6.1 percent per year. Due to the bulkiness of beer and the corresponding high costs of transportation, breweries tend to be located in or near primary market areas.

Integration within the brewing industry is highly varied and backward integration ranges from those which are vertically non-integrated to those which manufacture their own malt, cans and bottles and contract with farmers to grow specific types of grains. Most brewers are not highly forwardly integrated as most brewery responsibilities do not go beyond their sale of beer to distributors.

Brewing firms are not highly diversified and as such most efforts concentrate on the production and sale of beer. Technologically most breweries are relatively advanced. While several breweries are over 100 years old, throughout their useful life new equipment has been added or used to replace that which is worn out or obsolete. This has resulted in a mixture of both old and new equipment which has enabled many of the older breweries to maintain comparable plant efficiencies as those obtained by the newer modern breweries.

2. Employment Characteristics

Total employment within the industry decreased by over 28 percent in the 14 year period from 71,700 employees in 1958 to 51,500 in 1972. Estimates for 1975 indicate that the industry employs approximately 50,000 persons. Production workers represent approximately 65 percent of

all employees and are characterized as predominately union and semi-skilled. Production workers averaged nearly 2000 hours per year (50 - 40 hour weeks) and were paid an average of $6.11 per hour in 1972. This wage rate represents over twice the hourly wage in 1958, a time during which the value added per production worker doubled and the value of shipments per worker tripled.

3. Segment Portions of the Total Industry

Because of their differing economic characteristics, the breweries in this study were categorized into older and modern breweries. These categories then were segmented into various size segments. The number of breweries in each segment and each segment's respective portion of the industry's total barrelage are depicted below.

Segment	Corresponding Breweries	Percent of all Breweries	Percent of Industry Barrelage
Older			
Small	64	68	28
Medium	9	10	16
Large	6	6	22
Modern	15	16	34

4. Significant Impacts to Industry Segments

The industry contains only 3 breweries which are considered direct dischargers and according to EPA all of these meet BPT and one meets BAT. Accordingly, industry impacts on existing breweries should be limited. Some existent breweries have incurred significant increases municipal treatment charges and may consider private treatment. These potential new source dischargers as well as new breweries yet to be constructed could be affected by control standards, and thus all the industry segments potentially could be impacted.

B. Financial Profile of the Industry

The industry is characterized by rising value of shipments: $2,180 million in 1960; $3,833 million in 1970; and an estimated $5,361 million in 1975. Consumer expenditures for malt beverages, however, are considerably higher with the 1974 estimate being $13,800 million. This reflected an 12 percent increase over expenditures in 1973. Breweries also generate substantial tax revenues for federal, state and local governments. In 1974, these taxes amounted to $1,973 million, which represented 41 percent of the industry's value of shipments and 14 percent of consumer expenditures for malt beverages.

The industry has experienced a deterioration in profits during the past few years. Hardest hit have been the small regional brewers. In a recent FTC survey, utilizing quarterly data from July, 1972, through March, 1975, after-tax profits on sales were estimated 0.8 percent for those brewers with less than $50 million in total assets and 4.3 percent for those brewers with assets of $50 million or more.

The ability of a firm to internally or externally generate new investment funds to finance pollution control facilities is a reflection of the firm's past earning record, present financial condition, future earning potential, industry position and the state of the overall economic conditions of the industry and the nation. The industry production and financial characteristics previously discussed indicate that pollution control investment funds may not be readily generated by some establishments. This is especially true for smaller, less diversified brewers whose recent earnings suggest unprofitable potential.

The cost of capital, utilized as a measure of expected performance is defined as the weighted average of the cost of each type of capital employed by the firm. Utilizing performance measures of the industry the after tax cost of capital was estimated to be 8.8 percent.

C. Model Plants

The industry is comprised of several breweries which utilize slight variations of a basic process to produce differentiated types of beer. Breweries were categorized according to their age and technological state and models developed which best represented the various sizes of operations.

1. Types and Sizes of Model Breweries

This analysis developed models representing the following segments of the industry.

Model	Barrels/Year	Comments
Older		
Small	621,000	Built many years ago and through remodeling and expansion have maintained their place in the industry
Medium	2,530,000	
Large	5,060,000	
Modern	3,222,000	Built within the last 15 to 20 years and are technically considered modern.
New Source		
Small	1,725,000	Yet to be constructed and represent the type of facilities which would be built
Large	5,750,000	

2. Investment

Model brewery data included for each model its estimated book value, salvage value and operating capital requirements. Book values for the models' assets were determined based on a derived estimate of asset value per annual barrels produced. The values per annual barrel were $12.00, $13.33, $15.00, $25.00 and $45.00 for the older small, medium and large; existing modern; and new source models respectively. Salvage values will vary widely from plant to plant depending on the overall location and condition of the facility. For purposes of this analysis, salvage value was estimated to be 10 percent of the plants' book value. This relatively low percentage represents the fact that there exist few markets for used breweries or their equipment. Operating capital values assume current assets at 17 percent of sales for the small model breweries, 19 percent for the medium brewery and 21 percent for the remaining models. Current liabilities utilized a current ratio of 1.8 for the older small model, 1.6 for the older medium model and 1.4 for the remaining models.

3. Model Breweries' Financial Characteristics

Cost structure of the models included development of costs for raw materials, labor, supplies, and other, depreciation and interest. Material costs ranged from 49.6 percent of total sales for the older large, existing modern and new source models to 53 percent for the older small model. Labor represented the greatest percentage for the older large model, being 17.1 percent. The other two older models labor costs represented approximately 16 percent and the existing modern and new source models' labor costs were 10.1 and 7.0 percent of sales respectively. Finally, expenditures for supplies and other costs were not widely spread with all brewery models ranging between 22.9 and 26.6 percent. Depreciation was derived from IRS data and expressed as a percent of assets. Book values were determined to be 4 percent for the older small model, 5 percent for the older medium model and 6 percent for the remaining models. Interest was estimated to be one percent of the annual sales.

Annual profits and annual cash flows were based on average 1973-74 conditions and are depicted below (after-tax):

	Return on Sales (%)	Return on Total Invested Capital (%)	Annual Cash Flow as Percent of Sales (%)
Older Small	0.8	1.7	2.4
Medium	1.8	3.5	4.1
Large	3.1	5.6	6.1
Modern	4.2	4.7	9.1
New Source Small	5.0	3.2	13.9
Large	5.5	3.5	14.4

D. Pricing Patterns

Historically the price of beer has shown a constant annual increase. This trend is attributable to several factors with the more significant being strong consumer demand and increasing ingredient costs. Determination of actual beer prices involves a complex interaction of consumer demand and attitudes, the available supply and to some extent, government taxes. The market structure of the industry can be basically characterized as oligopolistic with a few large brewers dominating the market and to some degree acting as price leaders.

E. Economic Impact Analysis

The resulting direct impacts from the imposition of effluent controls on the Malt Beverage Industry for existing breweries are expected to be negligible as all but three of the industry's breweries discharge their effluent to municipal treatment systems. The impacts on the three direct dischargers are expected to be slight as according to EPA all the plants presently meet the proposed BPT standards and one meets BAT. Thus the potential direct impacts will primarily be limited to those plants which are yet to be constructed and will discharge their effluent to navigable waters (hereafter referred to as New Source). While the direct impacts are limited primarily to the new source breweries, there exists the possibility that existing breweries may be indirectly impacted due to the imposition of effluent controls. These indirect impacts stem from existing breweries' experiences of increasing changes for municipal waste treatment which have instigated some breweries to explore the alternative of constructing their own treatment system and breaking their dependence on the municipal system. As municipal charges increase, in some cases, this may become a viable alternative.

1. Price Effects

An implicit indication of the expected price effects is the amount of sales price increase necessary to offset effluent control expenditures such that the breweries' profitability remains the same. These were estimated and ranged from 0.8 to 3.4 percent. However, due to the market structure and since all but three breweries presently utilize municipal systems it is doubtful impacted breweries could pass these required increases on to the consumer. If sufficient number of breweries incur increases in municipal treatment charges then the industry as a whole might increase prices and those direct discharging breweries could recover some of their required price increase but the portion which they could recover would be dependent upon the magnitude of the municipal charge increases.

2. Financial Effects

The financial impacts of effluent controls were measured by analyzing various financial ratios for the model breweries both before and after the installation of the controls.

The analysis of control cost effects on after-tax income and return on sales basically follow the same pattern. The effects of BPT on the older small brewery cause it's income to become negative. The older medium model's income is reduced by 72 percent, the older large by 43 percent and the existing modern by 19 percent. The effects of BAT requirements results in an additional small reduction for each model. The effects of NSPS on the new source models result in a reduction of 33 percent for the small and 11 percent for the large new source model.

Returns on invested capital, after taxes, are affected by the impact of control costs such that the returns are reduced from 1.0 to 4.8 percent with the most significant impact occurring on the small brewery. For the new source models the imposition of NSPS results in reduction of 0.9 percent for the small new source model and 0.3 percent for the large.

Annual cash flow are similarly impacted by control costs: small breweries (both old and new source) are more significantly impacted than the other breweries and the impacts become even more significant under BAT requirements.

Net present values were calculated under baseline and subsequent treatment levels as the final step in the financial. Under baseline conditions the values are all positive for the existing model breweries and negative for both new source models. Under BPT guideline impacts, the older small and medium models fall below the zero value and results in a 60 percent reduction in the older large value and a 27 percent reduction in the value of the modern model. BAT requirements result in a further deterioration of the respective model's net present values. The impacts of NSPS on the net present values of both new source models indicate that these standards make it increasingly difficult to warrant new brewery investment.

3. Other Effects

Other types of economic impact such as production, employment, community and balance of payments deficit effects are normally assessed when there are plant closures due to pollution controls. However, these other effects are not meaningful nor quantifiable in a report in which no closures are projected. Although employment is an important consideration to a potential new firm and increases in employment and local business are important to surrounding communities of a potential new plant, these effects are more related to the decision to construct a new plant. Thus, in this report, these related effects were not pursued.

III. MALT

A. Industry Structure

The Malt Industry is defined as an industry comprised of establishments primarily engaged in manufacturing malt or malt by-products from barley or other grains.

1. Characteristics of the Industry

The Census of Manufactures states that in 1972 there were 30 firms in the industry operating some 40 establishments. Historically the number of establishments has been relatively constant with 46 operations in 1958, 43 in 1967 and then 40 in 1972. Maltsters are primarily concentrated in the north central region of the United States as this area produces the majority of the barley.

These 40 operations, had shipments which were valued at $226.3 million in 1972. Estimates for 1975, indicated shipments for the industry should be valued at $530.0 million. Since 1958, the industry's value of shipments has increased at an estimated rate of 6.9 percent per year.

The industry is characterized as containing varying degrees of integration with the most common integration being forward as some firms are owned by breweries (the largest purchaser of malt products). Most malt operations are not highly diversified as their facilities do not lend themselves to production of other non-associated products.

2. Employment Characteristics

Total employment within the industry decreased by 29 percent from 2,400 employees in 1958 to 1,700 in 1972. Production workers have consistently represented approximately 75 percent of all employees and are characterized as predominately semi-skilled. Production workers averaged 1923 hours each in 1972 with the average hourly wage being $5.92. This wage rate represents nearly twice the rate in 1958; a time period during which the value of shipment per worker increased by 60 percent and the value added per worker increased by 45 percent.

3. Other Considerations

As only one maltster in the industry is known to discharge to other than municipal treatment, the aggregated effects of effluent controls are expected to be small. However, some effects may be encountered by the yet-to-be constructed new source plants. Also, other Federal, State and local regulations may affect maltsters and change the operating environment of the industry.

B. Financial Profile of the Industry

Sales of malt, in terms of the Census' value of shipments, have fluctuated during the 1967 to 1971 period and then in 1973 and 1974 substantial increases occurred. These values, however, when adjusted by the wholesale price index for malt to reflect real dollars, show a more constant trend with average annual sales being $221.6 million.

The ability of a firm to internally or externally generate new investment funds to finance pollution controls is a reflection of the firm's past earning record, present financial condition, future earning potential, industry position and the state of the overall economic conditions of the industry and the nation. While financial data are limited, it is anticipated the overall industry will not have difficulty in generating funds. In many instances plants are owned by larger conglomerates with adequate abilities to finance new investments.

Finally the cost of capital, utilized as a measure of expected performance, is defined as the weighted average of the cost of each type of capital employed by the firm. Utilizing performance measures of the industry the after tax cost of capital was estimated to be 8.8 percent.

C. Model Plants

Maltsters can vary in the procedures they use to produce malt to differentiate their product (to the extent that it is passable); but, yet the basic process is the same for most plants. As all but one current maltsters utilize municipal systems only the new source model plant was developed. It was determined to consume 16,000 bushels of barley daily for 300 days per year. The model requires approximately $27.6 million in total invested capital and yields an after tax return on invested capital of 1.8 percent. Its after tax return on sales was determined to be 2.6 percent.

D. Pricing Patterns

Historically, the price for malt remained relatively stable between 1967 and 1972. After 1972, however, malt prices increased rather substantially (29 percent increase in 1973 and 113 percent increase in 1974). The market structure can basically be depicted as oligopolistic and as such price leadership occurs. The recent price increases are attributable to several factors with the most significant being increased prices of materials inputs (barley).

E. Economic Impact Analysis

The resulting impact from the imposition of effluent controls for existing malsters is expected to be negligible as all known plants but one discharge to municipal systems. The effects of NSPS on the new source plants results in a required price increase of 1.5 percent such that the plant can maintain the same profitability as before the installation of controls.

However, due to the market structure of the industry and the fact that all but one existing firm thus are on municipal systems, it is extremely doubtful new source impacted plants can increase prices to offset control costs.

The financial impacts were measured by analyzing various financial ratios for the model both before and after the installation of controls. The imposition of NSPS controls results in a decrease in the models return on sales from a baseline condition (before controls) of 2.6 percent to an after NSPS condition of 2.0 percent. After-tax return on invested capital declines from 1.0 to 1.4 percent and cash flow as a percent of invested capital declines from 6.8 to 6.6 percent. The baseline net present value (NPV) for the model plant was determined to $-16,591,000 After consideration for controls, the NPV drops to $-18,017,000. While the baseline negative NPV indicates few new firms would enter the industry, the NPV after NSPS controls is reduced such that it is doubtful any firms would enter unless they could utilize municipal treatment.

Due to the fact that existing malsters will not be impacted, it is doubtful the industry will incur production, employment, community or other impacts.

IV. WINES, BRANDY AND BRANDY SPIRITS

A. Industry Structure

The wine industry is defined as those establishments primarily engaged in the manufacture of wines, brandy and brandy spirits. Also included are those establishments which are bonded storerooms and which blend and bottle wines. The industry is comprised of three basic types of operations including wineries with stills, wineries without stills and the bonded storerooms engaged in blending and bottling.

1. Characteristics of the Industry

No precise estimates for the number of wineries are known to exist. For purposes of this analysis, it was estimated 369 wineries were in operation during 1973. Also it was estimated an additional 52 wineries had stills and there were 33 tax-paid bottling houses (bonded storerooms). In recent years all sources indicate that the number of wineries has been relatively stable. The majority of the wineries are located in the west coast region of the U.S., with 60 percent being located in California. The majority of the remainder of the industry are concentrated in New York, Ohio and New Jersey.

In 1972, the industry's value of shipments totaled $865 million. Estimates for 1975, indicated shipments should be valued at $1,182 million, an increase of nearly 37 percent over the 1972 shipments. Since 1958, the industry's value of shipments has increased at an estimated rate of 9.4 percent per year.

Most wineries maintain limited backward integration in that they own some vineyards, however, often wineries require additional grapes which they contract with from local farmers. Wineries generally are not highly diversified as their facilities do not lend themselves to the production of non-related products. The wineries are highly specialized operations which technologically consist of a mixture of both old and new procedures and equipment. Most operations are limited by the quantity of grapes they can crush and store during the season (10 to 14 weeks). For the remainder of the year they usually bottle that which was crushed.

2. Employment Characteristics

Total employment within the industry increased by nearly 58 percent from 5,900 employees in 1958 to 9,300 in 1972. In 1972 production workers represented approximately 60 percent of all employees and are characterized as predominately union and semi-skilled. Production workers averaged 2,107 hours each in 1972 with the average hourly wage being $4.08. This wage rate represents nearly twice the rate in 1958; a time period during which the value added per worker also doubled.

3. Other Considerations

Wineries were categorized into three operational categories and two locational categories. Locationally, wineries are categorized as eastern and western. Information from industry sources indicate that the western wineries already meet the proposed guidelines via land application and as such were excluded from further analysis. In terms of operational categories, all known wineries with stills are located in California; thus they too were eliminated. Bonded storerooms generate little if any effluent and were also excluded. Finally, during the latter phases of the study, it was learned from the EPA that a recent EPA survey revealed only one eastern winery which could be classified as a direct discharger. This determination was based on the acceptance of septic tanks and land application as an effective means of disposing eastern wineries' effluent. While much of the analysis included consideration for the existing eastern wineries, the final impact analysis was limited to only new source wineries. Accordingly, this summary will consider only a discussion of new source operations.

B. Financial Profile of the Industry

The Wine Industry can be characterized by using values of shipments; $279 million in 1960; $591 million in 1970 and $1,182 million in 1975. Consumer expenditures for wine products, however, were considerably higher with the 1974 estimate being $2.6 billion. Wineries also generate substantial tax revenues for federal, state and local governments. In 1973 these taxes amounted to $193 million which represented approximately 20 percent to industry's value of shipments.

Until 1973, the industry's earnings achieved impressive progress which was primarily attributable to volume growth. However, due to consumer resistance, earnings since have declined and remain unstable. At the present the outlook is not predictable and will depend upon the general economic environment.

The ability of a firm to internally or externally generate new investment funds to finance effluent controls is a reflection of the firm's past earning record, present financial condition, future earning potential, industry position and the state of the overall economic conditions of the industry and the nation. It is anticipated that the larger wineries will not have significant problems generating the required funds. Small firms, however, may face some difficulties.

Finally, the cost of capital, utilized as a measure of expected performance, is defined as the weighted average of the cost of each type of capital employed by the firm. Utilizing performance measures of the industry, the after-tax cost of capital was estimated to be 7.9 percent.

C. Model Plants

Wineries utilize slight variations of a basic process as well as different varieties of grapes to produce differentiated types of wines. Nearly all of the existing wineries already meet the proposed guidelines; thus only the new source model plants were utilized for the impact analysis. Two new source models were developed with the medium sized model producing 194,000 wine gallons per year and the large model producing 2,511,400 wine gallons per year. The medium model requires $1.8 million in total invested capital and yields an after-tax return on sales (ROS) of 8.9 percent and a return on invested capital (ROI) of 2.9 percent. The large model requires $21.9 million in invested capital and has a ROS and ROI of 8.9 and 3.1 percent respectively.

D. Pricing Patterns

The price of wines have historically remained relatively stable until 1970. However, after 1970, consumer demand increased significantly and accordingly, wineries increased prices to offset higher production and raw material costs. Basically the industry can be characterized as competitive but wineries are subject to numerous state and federal regulations which sometimes limit competition within a particular state.

E. Economic Impact Analysis

The resulting impact from the imposition of effluent controls for existing wineries is expected to be negligible as nearly all wineries already meet the proposed guidelines. The effects of NSPS on the new source models result in a required price increase of 1.4 percent for the medium winery and 2.0 percent for the large winery such that the wineries can maintain the same profitability as before the installation of controls. However, the existing wineries will not be affected by the guidelines and it is doubtful that any new source winery will be able to pass on the required price increase and as such will have to absorbe any effluent control costs.

The resultant financial impacts were measured by analyzing various financial ratios for the models both before and after the installation of controls. The results are summarized below.

	Medium New Source		Large New Source	
After Tax Return on Sales	Before Controls	After Controls	Before Controls	After Controls
After Tax Return on Sales (%)	8.9	8.3	8.9	8.0
After Tax Return on Invested Capital (%)	2.9	2.6	3.1	2.7
Cash Flow as a Percent of Invested Capital (%)	8.3	8.3	9.6	9.4
Net Present Value ($000)	-795	-838	-8,493	-9,291

As can be seen from the above ratios, the imposition of NSPS results in the medium winery's income becoming negative and results in a 13 percent reduction in the large model winery's income. The wineries' cash flows however remain positive. The net present values (NPV) both before and after controls are negative. Negative NPV's indicate that it is doubtful the new facilities would be built in the first place. After NSPS, the NPV's are even more negative which indicates NSPS standards will make it increasingly difficult to warrant new winery investments.

Due to the fact that existing wineries will not be impacted it is not foreseen that production, employment, community or other impacts will occur.

V. DISTILLED SPIRITS

A. Industry Structure

The Distilled Spirits Industry is defined as an industry comprised of establishments primarily engaged in the manufacturing of alcoholic liquors by distillation and rectification, and in manufacturing cordials and alcoholic cocktails by blending processes or by mixing liquors and other ingredients.

1. Characteristics of the Industry

According to the Bureau of Alcohol, Tobacco and Firearms, as of July 1, 1975, there were 63 distilleries and 80 rectifiers authorized to operate in the United States. Distilleries tend to be located in the central eastern and southeastern regions of the United States. Kentucky alone accounts for 46 percent of all distilleries.

In 1972, the industry's shipments were valued at $1,798 million. Estimates for 1975 indicate shipments are expected to total $1,932 million, an increase of 7.5 percent above the 1972 shipments. Since 1958, the industry's value of shipments has increased at an annual rate of 3.8 percent.

The industry is characterized as containing varying degrees of integration with backwards integration being the most common. This integration is usually limited to the production of grain and/or barrels. By requirements of governmental regulation most distilleries are not diversified; they produce only distilled spirits. However, many distilleries are owned by highly diversified conglomerates. Most distilleries are relatively old but throughout their useful life new equipment has been added or used to replace that which is worn out or technologically absolete. As a result, most distilleries represent a combination of both old and new procedures and equipment.

2. Employment Characteristics

Total employment in the industry decreased by 10 percent from 20,500 employees in 1958 to 18,400 employees in 1972. Production workers represent approximately 80 percent of all employees and are characterized as predominately union and semi-skilled. Production workers averaged 1972 hours each in 1972 with the average hourly wage being $4.63. This wage rate represents twice the rate in 1958; a time period during which the value added per worker also doubled.

3. Other Considerations

Distilleries were categorized into two separate categories - rectifiers and distillers. The rectifiers typically purchase distilled alcohol and rectify, blend and/or bottle it to produce the desired beverage. These operations generate very little effluent and none are known to be direct

dischargers. The second category of operation are those which have a still and produce distilled spirits for either further processing which leads to bottling or for sale to a rectifier and/or bottler. These distilleries can be further classified as either grain or citrus molasses distilleries. Grain distilleries commonly produce the traditional distilled spirits (i.e., vodka, whiskey) and molasses distilleries primarily produce rum. Presently of the 60 grain distilleries and 3 citrus molasses distilleries, known direct dischargers number 18 and 2 respectively. Thus, the major effort of this analysis will concentrate on these direct dischargers as well as yet to be constructed new source distilleries.

B. Financial Profile of the Industry

Sales of distilled spirits, in terms of the Census' value of shipments have shown a steady gain since 1960; in 1960 the industry's shipments were valued at $927 million, in 1970 shipments were $1,757.5 million and in 1974; $1,868 million. Besides generating annual sales, distilleries also generate substantial revenues for the federal, state and local governments. In 1974, these tax revenues amounted to over 3 times the industry's value of shipments, $6.1 billion.

Earnings within the industry have varied, with a few firms attaining consistent, though moderate, growth but yet the majority experiencing a deterioration in earnings. Some of this deterioration is attributable to sub-par consumption growth and the few firms achieving earnings growth are doing so utilizing diversification and proof cutting. The outlook at this time is considered unpredictable.

The ability of a distillery to internally or externally generate new investment funds to finance effluent controls is a reflection of the firm's past earning record, present financial condition, future earning potential, industry position and the state of the overall economic conditions of the industry and the nation. Considering the situation experienced by the industry it is anticipated large, highly diversified firms will not have significant difficulties generating the required funds. Smaller, less diversified firms, however, may encounter some difficulties.

Finally, the cost of capital, utilized as a measure of expected performance, is defined as the weight average of the cost of each type of capital employed by the firm. Utilizing performance measures of the industry the after-tax cost of capital was estimated to be 7.9 percent.

C. Model Plants

Distilleries utilize many different techniques to produce a wide variety of alcoholic beverages. Even so, the basic processes for most distillery operations are similar. Economic models were developed to represent the various sizes of grain distilleries which presently are in operation as well as new source models (those which reflect new distilleries to be built).

1. Type and Sizes of Model Distilleries

The existing model grain distilleries were depicted as small, medium and large operations and determined to process daily 1,000, 5,000, and 15,000 respectively, bushels of grain. Two new source grain models were developed which corresponded to the medium and large existing models.

2. Investment

Model distillery data included for each model show its estimated book value, salvage value and operating capital requirements. The book values for the grain distilleries were based on the asset value per proof gallon of annual capacity of each model. These values were $.31, $.30 and $.29 for the small, medium and large existing grain models respectively and $1.00 and $.75 for the medium and large new source models respectively.

Salvage values will vary widely from plant to plant depending on the location and condition of the facilities. For purposes of this analysis, salvage values were estimated at 30 percent of the model's assets.

Operating capital values assume current assets as a percentage of sales and were 35, 45 and 55 percent of sales for the small, medium and large (both existing and new source) grain distilleries.

Current liabilities were estimated utilizing a current ratio (current assets divided by current liabilities) of 1.8 for the small grain model, 1.6 for the medium grain models, and 1.4 for the large model grain distilleries.

3. Model Distilleries' Financial Characteristics

For the existing grain distillery models, ingredient costs ranged from 19.0 percent of the sales dollar for the medium and large distilleries to 20.4 percent for the small distillery. Labor costs represented the greatest percentage for the small distillery, being 33.4 percent. Labor

for the medium distillery represented 29.1 percent of the sales dollar and for the large distillery model, labor represented 25.8 percent. Finally, the expense for supplies and other costs was relatively equal proportionately for each of the models, being between 42 and 45 percent.

Thus for the existing model grain distilleries, total costs for the small model were estimated to represent 96.4 percent of its sales dollars. For the medium and large distilleries, total costs were estimated to be 91.5 percent and 89.6 percent respectively. For the NSPS models, total costs represented 87.4 percent of sales for the medium NSPS model and 87.3 percent for the large NSPS model. Annual profits and annual cash flows are depicted below (after-tax):

Grain Distilleries	Return on Sales (%)	Return on Total Invested Capital (%)	Annual cash flow as % of sales (%)
Existing Small	1.0	2.7	2.3
Existing Medium	3.5	11.7	4.4
Existing Large	4.6	17.7	5.3
New Source Medium	4.9	9.9	7.2
New Source Large	5.1	11.3	7.2

D. Pricing Patterns

The prices of distilled spirits have remained relatively stable in recent years. This stability may be attributable to only a small increase in consumer demand in recent years plus the fact that many distilleries are reducing the proof of their products in lieu of increasing prices. Basically, the industry can be characterized as competitive but distilleries are subject to numerous state and federal regulations which often limit competition in one aspect or another.

E. Economic Impact Analysis

As both molasses distilleries in the U. S. presently meet the proposed standards, the molasses distillery models were excluded from the impact analysis. Thus, only the grain distilleries will be discussed in this impact analysis. Of the 60 grain distilleries authorized to operate 18 are known to discharge effluents directly to navigable waters. However,

12 of these direct dischargers already meet the proposed BPT standards, and one meets BAT. The remaining 5 direct dischargers have some form of treatment currently in place and subsequently will not incur the full financial impact depicted below.

1. Price Effects

The required price increases necessary to offset the expense of the installation of effluent controls for distilleries with no treatment currently in place for the existing grain models range from 0.6 percent to 22. percent. As would be expected the larger distillery models required smaller price increases than the smaller models. Also going from BPT to BAT resulting in only a small (less than 0.2 percent) increase in the required price adjustments. For the new source models, the requirements fo NSPS resulted in the medium new source model requiring 1.1 percent price increase while the large new source model required an increase of only 0.7 percent.

While some of the distilleries will be affected by the control requirements it is not anticipated the distilled spirit prices as a whole will increase due to the guidelines. This is due to the market structure of the industry and the fact that only a few distilleries will actually incur impacts.

2. Financial Effects

The financial impacts of effluent controls were measured analyzing various financial ratios for the model grain distilleries both before and after the installation of controls. The analysis of control costs effects on after-tax income and return on sales basically follow the same pattern. The effects of BPT on the small model cause its income to become negative. The medium models' income is reduced by 15 percent and the large models' income by 6 percent. The effects of BAT result in an additional small reduction for each model. The effects of NSPS on the new source models' result in a reduction of 9 percent for the medium model and 5 percent for the large new source model.

After tax return on invested capital (ROI) after BPT impacts become negative for the small existing model and are reduced from 11.7 and 17.7 percent for the medium and large models to 9.4 and 16.1 percent respectively. BAT requirements reduce the ROI's by an additional 0.1 percent. For the new source models, the imposition of NSPS results in a reduction from 9.9 and 11.3 percent for the medium and large new source models to 8.7 and 10.4 percent respectively.

Cash flows, after the imposition of controls will remain positive and follow the same pattern as described previously (i.e., the smaller incurring more significant impacts than the larger models).

Net present values (NPV) were calculated under baseline and subsequent treatment levels as the final step in the financial analysis. Under baseline conditions all NPV's except the existing small were positive. The negative small models' NPV indicates that under the assumed financial conditions it would be doubtful if such a firm would remain in operation. According to industry sources this is exactly the case. After the imposition of BPT standards on the existing models, the small models NPV become more negative, the medium model's was reduced by 25 percent and the large existing model's NPV declined by 8 percent. BAT requirements result in a further decline in the NPV's, however, the significance is much smaller. The impacts NSPS on the new source models result in the medium new source models NPV declining by 54 percent and the large model's NPV by 20 percent.

3. Other Effects

BPT and BAT guidelines are not anticipated to result in any other severe impacts on the industry. Due to the small number of direct dischargers not meeting either standard and the fact that all of these operations already have aerated lagoons in place it is not projected that any closures will occur. With regard to new source distilleries, while returns are lowered, the magnitude of these reductions are not sizable enough to restrict entry to the industry. Accordingly, it is not anticipated that the imposition of effluent guidelines will result in any employment, community or other impacts.

VI. SOFT DRINKS

A. Industry Structure

The Soft Drink Industry is defined as an industry comprised of establishments primarily engaged in the manufacture of soft drink (non alcoholic beverages) and carbonated waters.

1. Characteristics of the Industry

In 1975, the National Soft Drink Association estimated the industry was comprised of 2,317 establishments. Historically, the number of operations in the industry has declined with a reduction of 39 percent between the years 1958 and 1972. While the majority of the operations in the industry have less than 50 employees (in 1972, 73 percent) those with more than 50 employees account for a significant portion of the industry's value of shipments (83 percent in 1972).

Estimates of the value of shipments for the industry are expected to total $7.2 billion in 1975, 10 percent above estimated shipments of $6.5 billion in 1974, and 31 percent above the shipments in 1972. Historically, the value of shipments have increased by an average of 9.5 percent per year since 1958. Most soft drink plants tend to be located near concentrated population areas and in the warmer climate areas. Plants normally are not highly integrated and most firms are not diversified.

2. Employment Characteristics

Total employment within the industry has increased by 27 percent from 97,100 employees in 1958 to 123,427 in 1973. As the total number of plants has decreased during this period, this increase in employees reflects a trend for fewer but larger plants. Production workers represent only 40 percent of all employees in 1972 and this low percentage is explained by the fact that most plants employ several driver/salesmen which are not considered production workers. Basically workers are semi-skilled and in 1972 production workers averaged 2,013 hours each at an average wage of $3.24 per hour. This wage rate represents approximately twice the rate in 1958; a time period during which the value added per worker also doubled.

3. Other Considerations

Soft drink operations can be classified in three different classifications. First, the traditional type of operation consists of plants which only bottle soft drinks for sale to their customers. Second, due to changing consumer demands, the above traditional plants may have been modified such that they are also able to can soft drinks. Finally, there are those operations which only can soft drinks. This last type of operation may can only its own brands (typically local or regional brands). Furthermore, some soft drink canners may actually be a fruit and/or vegetable canner, who can soft drinks during the off season.

For purposes of this analysis, those operations which bottle soft drinks and those which both bottle and can soft drinks are considered to be very closely related in terms of operating characteristics. The primary differences being that the canning operation will require a separate production line and does not require the bottle wash. Typically, operations which do both bottling and canning will tend to be the larger more modern facilities.

The industry can be predominately characterized as discharging its effluent to municipal treatment facilities. At the present only 20 plants have been identified which can be considered direct dischargers. It is recognized that the impact of substantially increased user charges, now and in the future, to plants discharging to or planning to discharge to municipal sewers is extremely critical to the industry, local business communities and to consumers. However, the scope and the economic impacts in this report pertain to those plants directly discharging to navigable surface waters and plants that are constructed after the promulgation of the guidelines which will be direct dischargers.

B. Financial Profile of the Industry

Total sales of the soft drink industry were estimated to be $7.8 billion in 1974. This compares to $4.8 billion in 1970 and $1.7 billion in 1960. The increase in total sales has resulted from both an expansion of production facilities, an increase in per capita consumption, and an increase in the overall price level. During the past two decades, the total soft drink production has increased from 1.18 billion 192-ounce cases in 1954 to 3.80 billion cases in 1974, an increase of over 200 percent.

The Soft Drink Industry has historically been considered to be strong in terms of growth in both sales and earnings. However, in recent years while sales have continued to grow, earnings have deteriorated. This deterioration has been reflective of increased costs associated with the switch from returnable bottles to the less profitable disposable containers.

The ability of a firm to internally or externally generate new investment funds to finance pollution controls is a reflection of the firm's past earning record, present financial condition, future earning potential, industry position and the state of the overall economic conditions of the industry and the nation. As this industry has historically maintained reasonably strong growth and return and although it has recently experienced a slight decline, it is anticipated the overall industry will not have difficulty generating funds.

Finally the cost of capital, utilized as a measure of expected performance is defined as the weighted average of the cost of each type of capital employed by the firm. Utilizing performance measures of the industry the after tax cost of capital was estimated to be 7.5 percent.

C. Model Plants

As mentioned previously, the 3 classifications of plants are closely related and as such the representative model plants developed for this analysis were assumed to at least bottle soft drinks and some may also can soft drinks. Relevant summary data for the model plants are depicted in Table VI-1.

D. Pricing Patterns

The price of soft drinks is based primarily on the cost of inputs and the demand for soft drinks by the consuming public. In the past, consumer demand has been the more influential factor affecting prices; however, recent significant increases in materials costs have caused the cost of inputs to gain in influence of prices and as material costs have increased, the prices of soft drinks have also increased. Basically the market structure facing bottlers is highly competitive and consumers are considered

Table VI-1. The Soft Drink Industry - Model Plant Data

	Existing				New Source	
	Small	Medium	Large	X-Large	Large	X-Large
Annual Production (1,000/192 ounce cases)	105	720	3,000	11,000	3,000	11,000
Number Corresponding Establishments	596	1,108	706	58	-	-
Total Invested Capital ($000)	82.4	521.8	2,351.6	10,614.0	4,390.1	16,709.2
Gross Sales ($000)	178.5	1,224	5,100	18,700	5,100	18,700
After Tax Return on Sales (%)	0.9	2.3	2.1	1.0	3.7	3.5
After Tax Return on Invested Capital (%)	1.8	5.3	4.4	1.7	4.4	3.9
Cash Flow as Percent of Sales	3.7	5.1	5.5	5.2	11.4	11.4

price conscious. Thus the ability of a single bottler to set his own prices is limited.

E. Economic Impact Analysis

The resulting impacts from the imposition of effluent controls on the Soft Drink Industry for existing soft drink plants are expected to nominal as only 20 plants discharge their wastewaters to navigable waters. Furthermore, the overall impacts are expected to be limited because of the 20 known direct dischargers, 11 plants presently meet the proposed BPT standards and 5 of these 11 plants meet proposed BAT standards. Of the plants not meeting either BPT or BAT standards, 2 have some form of treatment already in place and only the remaining 7 plants have no form of treatment systems. Thus, of the 2,317 plants operating at the end of 1975, 99.1 percent utilize municipal treatment systems, 0.5 percent meet either BPT or BAT, 0.1 percent have some form of treatment and 0.7 percent have no treatment whatsoever.

For those plants which do not meet standards, expenditures for controls will be required. However, no plant closures are anticipated as discussions with the respective managements of these operations by the EPA resulted in the determination that all 9 operations not meeting the proposed standards will make the required investments and do expect to remain in operation.

New source plants, if not utilizing municipal treatment systems, are also expected to incur financial impacts such that it is doubtful if direct discharging new source plants would be constructed.

VII. SOFT DRINK SYRUPS AND CONCENTRATES (Non-synthetic Flavoring Extracts and Syrups)

A. Industry Structure

The Flavoring Extract and Syrup Industry is defined as an industry comprised of establishments primarily engaged in the manufacture of flavoring extracts, syrups and fruit juices, not elsewhere classified, for soda fountain use or for the manufacture of soft drinks and colors for bakers' and confectioners' use. Emphasis in this industry analysis is primarily directed toward the Soft Drink Syrup and Concentrate Segment of the aggregate industry. This narrowing of the analysis was resultant of the fact that the remaining segments of the SIC 2087 industry were not included in the Miscellaneous Foods and Beverages' Development Document but rather in another EPA document. However due to limitations of available disaggregated data much of the actual industry description concerns itself with the entire SIC 2087 industry.

1. Characteristics of the Industry

The Census of Manufactures states in 1972 there were 350 firms in the industry operating some 400 establishments. Historically the number of establishments has declined with 534 establishments in operation in 1958, 431 in 1967 and 400 in 1972. Plants tend to be located either near a major metropolitan area or near a source of raw materials. For the latter case this location is usually near a port. From a regional point of view the northwest region contains the largest portion of the plants (35 percent).

Estimates of the 1975 value of shipments for the industry are expected to total $1,803 million, 8 percent above the estimated shipments for 1974 and 22.5 percent above the 1972 value of shipments. Historically, the value of shipments increased by an annual average rate of 8.3 percent between the years 1958 and 1975. During this period, the actual rate has fluctuated between minus 2.2 to 18.2 but for most years the range has been relatively near the 17 year average of 8.3 percent.

2. Employment Characteristics

Total employment in the industry has increased by nearly 10 percent from 9,300 employees in 1958 to 10,200 in 1972. Production workers have consistantly represented between 55 to 60 percent of the total work force and can be characterized as semi-skilled. Production workers averaged 2,067 hours in 1972 with an average hourly rate of $3.98. This wage rate represents nearly twice the rate of 1958; a period during which the value added per worker tripled.

3. Other Considerations

No known plants in the industry discharge waste waters to other than municipal treatment systems. For this reason, aggregated effects of effluent guidelines are expected to be small. However, some effects may be encountered by the yet-to-be constructed new source plants. Also, other Federal, State and local regulations may affect firms and change the operating environment of the industry.

B. Financial Profile of the Industry

Sales, in terms of the Census' value of shipments, have shown a steady trend to increase from year to year. Between 1958 and 1975, the average increase amounted to 8.3 percent per year.

The ability of a firm to internally or externally generate new investment funds to finance pollution controls is a reflection of the firm's past earning record, present financial condition, future earning potential, industry position and the state of the overall economic conditions of the industry and the nation. While financial data are limited, it is anticipated the overall industry will not have difficulty in generating funds. In many instances plants are owned by larger conglomerates with adequate abilities to finance new investments.

Finally the cost of capital, utilized as a measure of expected performance, is defined as the weighted average of the cost of each type of capital employed by the firm. Utilizing performance measures of the industry the after tax cost of capital was estimated to be 8.1 percent.

C. Model Plants

As the industry presently discharges waste waters to municipal systems only a new source model plant was developed.

Based on information provided in the Development Document, the new source model plant (that is, the plant which has yet to be constructed and will be required to meet new source performance standards if it will be a direct discharger) was determined to be a facility which primarily produces beverage bases and which manufactures approximately 80,000 gallons per day. The model plant is based on a total invested capital requirement of $25 million with annual sales of $44 million. The model yields 2.2 percent after tax return on sales and 3.9 percent return on invested capital.

D. Pricing Patterns

Historically the prices for flavoring syrups have remained relatively stable. However, in 1974 prices increased significantly with the December 1974 price being 139 percent higher than the average 1973 price. As much of the materials input are of a sugar basis, much of these price increases can be attributable to increased material costs.

The market structure of the industry is highly varied and ranges from a somewhat competitive environment to ologopolistic to near monopolistic.

E. Economic Impact Analysis

The resulting impact from the imposition of effluent controls for existing plants is expected to be negligible as all known plants discharge to municipal systems. The effects of NSPS on the new source plants results in a required price increase of 0.5 percent such that the plant can maintain the same profitability as before the installation of controls.

However, due to the market structure of the industry and the fact that all existing firms are on municipal systems, it is extremely doubtful new source impacted plants can increase prices to offset control costs.

The financial impacts were measured by analyzing various financial ratios for the model both before and after the installation of controls. The imposition of NSPS controls results in a decrease in the models return on sales from a baseline condition (before controls) of 2.2 percent to an after NSPS condition of 2.0 percent. After-tax return on invested capital declines from 3.9 to 3.5 percent and cash flow as a percent of invested capital declines from 13.3 to 13.0 percent. The baseline net present value (NPV) for the model plant was determined to be $-10,781,000. After consideration for controls, the NPV drops to $-11,813,000. While the baseline negative NPV indicates few new firms would enter the industry, the NPV after NSPS controls is reduced such that it is doubtful any firms would enter unless they could utilize municipal treatment.

Due to the fact that existing plants will not be impacted, it is doubtful the industry will incur production, employment, community or other impacts.

PART I

GENERAL BEVERAGE INTRODUCTION

AND

METHODOLOGY

PART I. INTRODUCTION AND METHODOLOGY

I. INTRODUCTION

A. Scope

This study for the Environmental Protection Agency was designed to analyze the economic impact of the costs of pollution abatement requirements under the Federal Water Pollution Control Act Amendments of 1972 on selected miscellaneous foods and beverages industries as listed in the Preface.

Specifically, the following types of economic impacts were analyzed and, to the extent thay they were found to be significant, are described in this report.

1. Price and production effects - including effect upon industry's suppliers and consumers

2. Financial effects - profitability, growth, and capital availability

3. Number, size and location of plants that can be expected to close or curtail production

4. Changes in employment

5. Community impacts

6. Balance of payments consequences, and

7. Any other impacts.

Three levels of waste water treatment or control for plants discharging directly to navigable waters are considered in this study. These are:

1. Best practicable control technology currently available (Level I or BPT) - to be met by July, 1977.

2. Best available technology economically achievable (Level II or BAT) - to be met by July, 1983.

3. New source performance standards (Level III or NSPS) - to be applied to all new facilities (that discharge to navigable waters) commencing construction after promulgation of guidelines.

In total direct dischargers represent only a small portion of the beverage industry. However, some plants do exist in the Malt Beverage, Wines, Distilled Spirits and Soft Drink Industries which discharge their effluent to navigable waters. As such, these four industries will be analyzed for potential economic impacts due to Levels I and II controls.

Level III controls or New Source Performance Standards (NSPS) apply to establishments that discharge directly to navigable waters which commence construction after promulgation of guidelines. The possibility exists that companies may decide in favor of constructing a new plant, treating their effluent and discharging directly to navigable waters. Volume II, then, is also concerned with assessing the economic impact of NSPS on plants commencing construction after promulgation of guidelines in the beverage industries.

B. Organization of This Report

This volume, Beverage Industries, is organized as follows:

Part I	Introduction
Part II	SIC 2082 Malt Beverages
Part III	SIC 2083 Malt
Part IV	SIC 2084 Wines, Brandy and Brandy Spirits and SIC 5182 Bottling and Blending of Distilled Spirits
Part V	SIC 2085 Distilled Spirits
Part VI	SIC 2086 Soft Drinks
Part VII	SIC 2087 Flavoring Extracts and Syrups

In general, the analysis of Parts II through VII are organized as follows:

I	Industry Structure;
II	Financial Profile of the Industry;
III	Model Plants;
IV	Pricing Patterns;
V	Effluent Control Costs;
VI	Economic Impact Analysis; and
VII	Limits to the Analysis

C. Data Sources

Both primary (unpublished) and secondary (published) sources of information were used in the analysis.

1. Major Primary Sources

a. Data from the Distrilled Spirits Council of the United States, Puerto Rican Rum Producers, Finger Lake Wine Growers Association and the Flavor and Extracts Manufacturers' Association. Cooperative arrangements were developed with these associations to survey their members to provide information on final disposition of effluent, capital and operating costs of regulatory controls and product mixes.

b. In addition to the above associations, contacts with the following associations were established in efforts to gain insight to the characteristics of their respective industries: United States Brewers Association, Barley and Malt Institute, Wine Institute and the National Soft Drink Association.

c. Model plant information was developed through trade associations and industry contacts agreeing to cooperate.

d. Pollution control information - the Environmental Protection Agency, Effluent Guidelines Division provided investment and annual costs of effluent treatment systems as prepared by Environmental Science and Engineering of Gainesville, Florida. Status of final disposition of effluent discharge was also provided by the Effluent Guidelines Division.

e. Other primary information was developed through numerous personal contacts and telephone discussions with industry trade associations, firms in the industry and other specialists in state and federal government agencies, universities, and private engineering and consulting firms.

2. Major Secondary Sources

a. Census of Manufactures, Bureau of the Census, U.S. Department of Commerce, Washington, D. C.

b. Price and Profit Trends in Four Food Manufacturing Industries, Staff report to Federal Trade Commission, July 1975.

c. Brewers Almanac, United States Brewers Association, 1975.

d. Industry Surveys - Liquor, Standard and Poors, October 16, 1975.

e. Distilled Spirits, Wine, Beer, Tobacco, Firearms, Enforcement, Taxes, Summary Statistics, Department of the Treasury, Bureau of Alcohol, Tobacco, and Firearms, FY 1974.

f. U.S. Industrial Outlook, 1975, U.S. Department of Commerce, Domestic and International Business Administration, 1975.

g. Almanac of Business and Industrial Financial Ratios, Leo Troy, 1975.

h. Annual Statement Studies, R. J. Morris Associates, 1975.

i. Source Book of Statistics of Income, Internal Revenue Service, U.S. Department of the Treasury (1968-1971).

j. Financial Survey of the Soft Drink Industry, National Soft Drink Association, 1973.

k. 1974 Sales Survey of the Soft Drink Industry, National Soft Drink Association, 1974.

l. Statistical Profile, the Soft Drink Industry, National Soft Drink Association, 1974.

m. Wine Industry Statistical Report, Economic Research Report, Wine Advisory Board, 1975.

n. Wines and Vines, the Hiaring Company, December, 1973.

o. Public Revenues from Alcoholic Beverages, Distilled Spirits Council of the United States, 1973.

p. Distilled Spirits Industry, Annual Statistical Review, Distilled Spirits Council of the United States, 1974.

II. METHODOLOGY

The methodological approach utilized to assess the likely economic impact of proposed effluent limitation requirements pursuant to the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) on selected miscellaneous foods and beverages industries is summarized in this chapter.

In this study, economic impact is defined as the comparison between (1) the projections of the likely effects on plant, local area, U.S. and foreign activity which would result from an industry's compliance with a given level of effluent controls and (2) projection of industrial activity and changes which would likely occur in the absence of the Act (baseline).

In particular, the principal economic variables of interest in this study are:

1. Price effects - including effects upon industry's suppliers and consumers.

2. Profitability, growth and capital availability

3. Number, size, and location of plants that can be expected to close or curtail productions

4. Changes in employment

5. Community impacts

6. Balance of payments consequences

7. Any other impacts.

Economic impacts were evaluated for the following levels of effluent limitation requirement.

1. Best practicable control technology currently available (Level I) - to be met by industrial dischargers by July, 1977.

2. Best available technology economically achievable (Level II) - to be met by July, 1983.

3. New source effluent standards (Level III) - to be applied to all new facilities (that discharge directly to navigable waters) constructed after the promulgation of these guidelines.

Effluent limitation requirements for miscellaneous foods and beverages industries are described in detail in the Development Document. [1]

In the case of best practicable and best available technology, the analyses focus on price increases, plant closings, curtailments of production, dislocations of production, unemployment, community impacts, and balance of payment effects. In the case of new source performance standards, economic impacts are assessed in terms of effects on industry growth, prices, plant locations (i.e., domestic or foreign production) and balance of payments.

Several interrelated analyses are used to evaluate likely economic impacts resulting from various levels of water pollution controls on the miscellaneous foods and beverages industries. These in-depth analyses [2] include: (1) characterization and subcategorization of the technical and economic structure of each industry; (2) description of the financial profile of each industry; (3) construction of representative model plants; (4) evaluation of pricing patterns within each industry; (5) determination of technological options for meeting designated levels of effluent control and the costs associated with each option; (6) analysis of economic impacts.

The analysis, however, is not a simple sequential analysis; rather it employs interacting feedback steps. The schematic of the analytical approach is shown in Exhibit II-1. Due to the fundamental causal relationships among the financial and production effects and other impacts, a greater emphasis is devoted to plant closure analysis.

A. Industry Structure and Subcategorization

The industry structure and subcategorization phase of the methodology primarily involves describing and segmenting the respective industries in terms of past and current economic characteristics. The purpose of this phase of the analysis is to provide an information base to be used in subsequent analysis. In particular, the information on industry characteristics is useful in determining an appropriate disaggregation design for industry subcategorization.

Subcategorization involves segmenting the plants within each industry into relatively homogenous classes with respect to plant size, regional differences, technology employed, number of products, existing level of pollution, scale of technological processes, level of output, or other relevant factors important for assessing the impact of pollution controls. The delineation of industry subcategories developed in the early stages of the analysis serves as the basis for the definition and construction of representative model plants and the determination of waste treatment technological options and costs.

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[1] Environmental Science and Engineering, Inc., et al., Development Document for Effluent Limitations Guidelines and New Source Performance Standards - Miscellaneous Foods and Beverages, Point Source Category, EPA, Part 1-5.

[2] For those industries determined to have only negligibel potential impacts resulting from effluent controls, detailed in-depth analysis was abbreviated and consisting primarily of the characterization of the technical and economic structure of the industry.

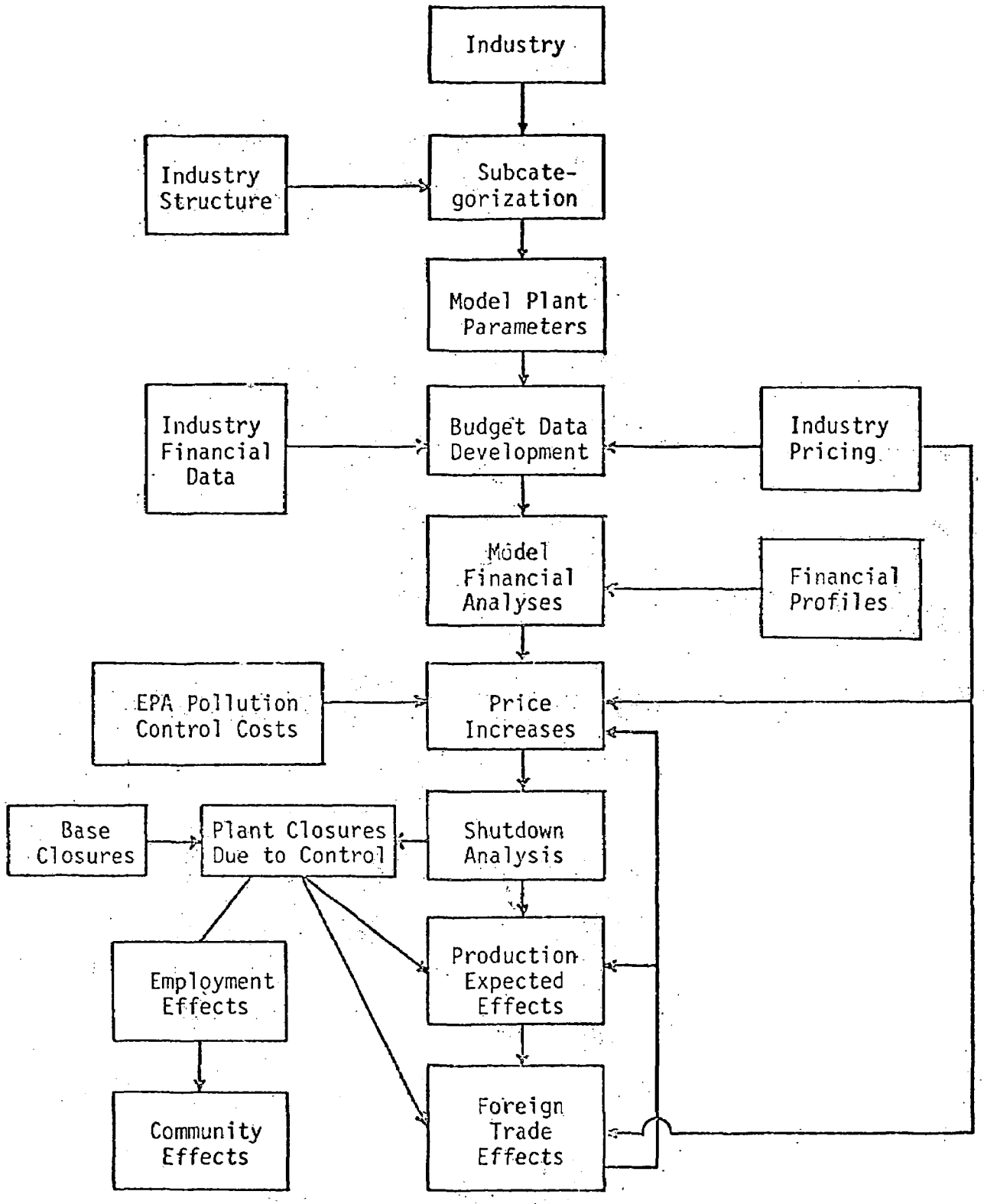

Exhibit II-1. Schematic of economic impact analysis of effluent control guidelines.

B. Financial Profile of the Industry

The ability of firms within an industry to finance investment for pollution control is determined in part by past and expected financial conditions of those firms. Under the heading "financial profile of the industry," various factors are studied to develop insight into the financial characteristics of actual plants in the industry. Much of the data compiled in this section is also useful in determining financial profiles of representative model plants.

Key financial statistics include after-tax profit as a percent of sales, after-tax profit as a percent of invested capital, sales to total assets ratios, sales per employee, assets per employee, and after-tax profit to net worth. Other financial factors are studied with respect to the ability of firms to generate funds to finance investment for effluent management, either internally through cash flow or externally through new debt or equity issues. The data compiled in this phase of the analysis provide an information base useful for projecting key technical and economic factors and for carrying out subsequent economic impact analysis.

C. Model Plants

The model plant concept represents a systematic framework from which to assess likely economic impacts on individual types and sizes of actual plants within the industries. Usually more than one model plant is required for an industry in order to represent various types and sizes of existing plants or plants which are likely to be constructed after the promulgation of the guidelines.

Model plants represent a variety of financial, economic, and technical variables such as sales, investment, fixed and variable costs, profits, size, type of process, etc. Model plant profiles are constructed from data and information gathered in the industry characteristics and subcategorization and financial profile phases of the analysis. Additional data, as required, are generally obtained from industry representatives, trade publications, and from engineering cost-synthesis methods.

The applicability of utilizing model plant data for assessing expected economic impacts of water effluent controls rests principally on the representativeness of the selected model plant(s). For example, the economic concept of "economies-of-scale" in production is often present in processing plants, e.g., average unit costs of production are usually lower in large plants as compared with medium or small plants of the same type. Furthermore, there are expected economies-of-scale in waste treatment, which, in effect, will compound the economies-of-scale relationships among differing sizes of plants.

In general, economies-of-scale realtionships in pollution control costs have been demonstrated; and this alone would necessitate multiple model plant analyses to evaluate differential economic effects. Other processing factors, e.g., type of manufacturing process employed (technology) may also affect processing costs and/or wasteflows. This again may necessitate further segmentation of an industry and the inclusion of additional model plants for more comprehensive analysis.

D. Pricing Patterns

The analysis of pricing patterns in each respective industry focuses on factors determining supply and demand. Where available, appropriate elasticites are noted and their significance to pricing patterns is discussed. Market structure and the nature of competition are evaluated and the ability of impacted plants to recover increased costs of pollution control is assessed.

E. Waste Treatment Technological Options and Costs

Waste treatment options and associated costs are obviously instrumental in the assessment of economic impacts of water pollution controls. In general, basic technical and cost data are developed specifically for the types and sizes of model plants which are identified as direct effluent dischargers, including new facilities which, in our judgment, are most likely to be constructed after the promulgation of the guidelines. In determining appropriate options and costs, it is necessary to specify (1) points of final disposition of discharge in each segment of an industry, and (2) types and proportions of effluent systems in place. This information is partly in the Development Document and, in part, obtained from EPA, Effluent Guidelines Division through the technical contractor.

Cost data from the technical contractor normally include estimated incremental investment costs for each model plant and for each abatement level (I, II and III), plus the estimated annual operating and maintenance costs based upon normal operating rates or annual production.

F. Analysis of Economic Impacts

In carrying out an economic impact analysis, it is important to establish a baseline of industry conditions that are expected without pollution controls and to estimate the impact in terms of the change from this baseline attributable to the imposition of pollution controls. Thus, in this study a "dynamic baseline", namely a projection of the industry structure in terms of number of plants, production, employment and other parameters over time is used as opposed to a "static" baseline which assumes a baseline condition equivalent to that currently present.

Fundamentally, the impact analysis is similar to that usually required for any capital budgeting study of new investments. The problem is one of deciding whether a commitment of time or money to a project is worthwhile in terms of the expected benefits. The analysis is complicated by the fact that benefits and investments will accrue over a period of time and that, in practice, the analyst can not reflect all of the required imponderables, which by definition must deal with future projections. In the face of imperfect and incomplete information and of time constraints, the industry segments are described in the form of financial budgets of model plants. Key non-quantifiable factors were considered in the interpretation of the quantified data. Actual financial results will deviate from the model results, and these variances will be considered in interpreting the findings based on model plants.

The analysis of anticipated economic impacts of water pollution controls are described as follows.

1. Fundamental Core Methodology

The fundamentals for analysis are basic to all impact studies. The core methodology is described here as a unit with the specific impact analyses discussed under the appropriate headings following this section.

The core analysis for this study was based upon synthesizing the physical and financial characteristics of the various industry segments through representative model plant projections. Estimated financial profiles and cash flows are presented in the industry reports. The primary factors involved in assessing the financial and production impact of pollution control are profitability changes, which are a function of the cost of pollution control, and the ability to pass along these costs in the form of higher prices. In reality, closure decisions are seldom made on a set of well-defined and documented economic rules. They include a wide range of personal values, external forces such as the inability to obtain financing, or the relationship between a dependent production unit and its larger cost center whose total costs must be considered.

Such circumstances include but are not limited to the following factors:

1. Inadequate accounting systems or procedures. This is especially likely to occur in small, independent plants which do not have effective cost accounting systems.

2. Insufficient production units. This is especially true of plants where the equipment is old and fully depreciated and the owner has no intention of replacing or modernizing them. Production continues as long as labor and materials costs are covered and/or until the equipment fails entirely.

3. Personal values and goals associated with business ownership that override or constrain rational economic rules. This complex of factors may be referred to as the value of psychic income.

4. Production dependence. This is characteristic of a plant that is a part of a larger integrated entity which either uses raw materials being produced profitably in another of the firm's operating units or supplies raw materials to another of the firm's operations where the source of supply is critical. When the profitability of the second operation more than offsets the losses in the first plant, the unprofitable operation may continue indefinitely because the total enterprise is profitable.

5. Temporary unprofitability. This may be found whenever an owner-operator expects that losses are temporary and that adverse conditions will change. His ability to absorb short-term losses depends upon his access to funds through credit or personal resources not presently utilized.

6. Low (approaching zero) opportunity costs for the fixed assets and for the owner-operator's managerial skills and/or labor. As long as the operator can meet labor and materials costs, he will continue to operate. He may even operate with gross revenues below variable costs until he has exhausted his working capital and credit.

7. Plant site appreciation. This factor is important in those situations where the value of the land on which the plant is located is appreciating at a rate sufficient to offset short-term losses.

These factors are generally associated with proprietorships and closely held enterprises rather than publicly held corporations.

While the above factors are present in and relevant to business decisions, it is argued that common economic rules are sufficient to provide useful and reliable insight into potential business responses to required investment and operating costs in pollution control facilities.

In the simplest case, a plant will be closed when variable costs (Vc) are greater than revenues (R) since by closing the plant, losses can be avoided.

In a more probable situation, the variable costs are less than revenues but revenues are less than variable costs plus cash overhead expenses (TCc) which are fixed in the short-run. In this situation a plant would likely continue to operate as contributions are being made toward covering a portion

of these fixed cash overhead expenses. The firm cannot operate indefinitely under this condition, but the length of this period is uncertain. Basic to this strategy of continuing operations is the firm's expectations that revenues will increase to cover cash outlay. Identification of plants where variable costs plus cash overhead expenses are greater than revenues, but variable costs are less than revenues leads to an estimate of plants that should be closed over some period of time if revenues do not increase. However, the timing of such closures is difficult to predict.

In another situation the variable costs plus cash overhead expenses are less than revenues. In this case, it is likely that plant operations will continue if the net present value (NPV_k) of the cash flow 1/ at the firm's (industry) cost of capital (k) is greater than zero. If the net present value is less than zero, the firm could liquidate, realizing salvage value (S) 2/ in cash, and reinvest and be financially better off, assuming reinvesting at least at the firm's (industry) cost of capital.

Computation of net present value involves discounting the cash flow through the discounting function:

$$NPV = \sum_{n=0}^{y} A_n (1 + k)^{-n}$$

where:

NPV = net present value
A_n = the cash flow in the nth year
k = discount rate (after-tax cost of capital)
n = number of conversion periods, i.e., 1 year, 2 years, etc.
y = years

The "cash flow" including pollution control investment and annual costs for BPT and BAT and NSPS are described in the subsequent sections.

Construction of the Cash Flow

The cash flow used in the analysis of Level I (BPT - Best Practical Technology) and Level II (BAT - Best Available Technology) effluent control costs was constructed as follows:

1/ Refer to "Construction of the Cash Flow"

2/ Salvage value is defined here as the liquidation value of fixed assets plus working capital.

1. Salvage value taken in the year t_0, assumed to be equivalent to 1976.

2. After-tax cash proceeds taken for years t_1 to t_n.

3. Annual replacement investment, equal to annual current depreciation taken for years t_1 to t_n. A 20-year depreciation period was used for the effluent control system.

4. Terminal value equal to salvage value taken in year t_n.

5. Incremental pollution control investment taken in year t_0 (1976) for 1977 standards and year t_6 (1982) for 1983 standards.

6. Incremental pollution expenses taken for years t_1 to t_n for 1977 standards and years t_7 to t_n for 1983 standards, if additive to the 1977 standards.

7. Replacement investment taken in year t_n on incremental pollution investment in BPT on assumption of life of facilities as provided by EPA.

8. No terminal value of pollution facilities to be taken in year t_n. Land value will probably be assumed to be very small and/or zero, unless the costs provided indicate otherwise.

The length of the cash flow will depend upon the life of the pollution control technology provided by EPA. The length of the cash flow will be equal to the life of control equipment specified for 1983 installation.

The cash flow used in the analysis of Level III (New Source Effluent Standards) is constructed as follows:

1. Initial investment taken in year t_0, considered to be outlays for fixed assets and working capital.

2. After-tax cash proceeds taken for years t_1 to t_n.

3. Annual replacement investment, equal to annual current depreciation taken for years t_1 to t_n.

4. Terminal value taken in year t_n.

5. Investment for pollution control is added to outlays for fixed assets and working capital in year t_0.

6. Annual pollution control operating expenses are taken for years t_1 to t_n.

7. Replacement investment taken on pollution investment on assumption of life of facilities as provided by EPA.

8. No terminal value of pollution facilities to be taken in year t_n. Land value will probably be assumed to be very small and/or zero, unless the costs provided indicate otherwise.

Baseline cash flow excludes investment and other costs associated with the effluent controls.

It should be noted that a more common measure of profitability is return on investment (ROI) where after-tax income (as defined in equation below) is expressed as a percent of invested capital (book value) or as a percent of net worth. These measures should not be viewed so much as different estimates of profitability compared to net present value, but rather these should be seen as an entirely different profitability concept.

The data requirements for return on investment and net present value measures are derived from the same basic financial information, although the final inputs are handled differently for each.

In the construction of the cash flow for the net present value analysis, after-tax cash proceeds are defined as:

(1) After-tax income = $(1 - t) \times (R - E - I - D)$

(2) After-tax cash proceeds = $(1 - t) \times (R - E - D) + D$

where

t = tax rate

R = revenues

E = expenses other than depreciation and interest

I = interest expenses

D = depreciation charges

Depreciation is included only in terms of its tax effect and is then added back to obtain after-tax cash proceeds.

There is a temptation to include outlays for interest payments when computing the cash proceeds of a period. Cash disbursed for interest should not affect the cash proceeds computation. The interest factor is taken into consideration by the use of the present-value procedure. To also include the cash disbursement would result in double counting. The effect of interest payments on income taxes is also excluded from the cash proceeds computation. This is brought into the analysis when computing the effective rate of interest of debt sources of capital, which is used in the determination of the cost of capital.

A tax rate of 22 percent on the first $25,000 income and 48 percent on amounts over $25,000 was used throughout the analysis. Accelerated depreciation methods, investment credits, carry forward and carry back provisions were not used due to their complexity and special limitations.

Cost of Capital - After-tax

Return on invested capital is a fundamental notion in the U.S. business. It provides both a measure of the actual performance of a firm as well as its expected performance. In the latter case, it is also called the cost of capital and this, in turn, is defined as the weighted average of the cost of each type of capital employed by the firm -- in general terms, equities and interest-bearing liabilities. There is no methodology that yields the precise cost of capital, but it can be approximated within reasonable bounds.

The cost of equity capital is estimated by two methods -- the dividend yield method and the earnings stock price (E/P ratio) method. Both are simplifications of the more complex DCF methodology. The dividend method is:

$$c = \frac{D}{P} + g$$

where

c = cost of equity capital
D = dividend yield
P = stock price
g = growth

The E/P method is simply

$$c = E/P$$

where

c = cost of equity capital
E = earnings
P = stock price

and is a further simplification of the first. The latter assumes future earnings as a level, perpetual stream.

The after-tax cost of debt capital was estimated by using an estimated cost of debt (interest rate) and multiplying it by .52 -- assuming a 48 percent tax rate.

$$d = .52i$$

where

d = after-tax cost of debt capital

i = before-tax cost of debt (interest rate)

The sum of the cost of equity and debt capital weighted by the respective equity to total assets and total liabilities to total assets ratios yields the estimated weighted average cost of capital - after tax (k).

Investment

In evaluating the feasibility of new plants, investment is thought of as outlays for fixed assets and working capital. However, in evaluating closure of an on-going plant, the investment basis is its salvage value (opportunity cost or shadow price). 1/ For this analysis, salvage value was taken as the sum of liquidation value of fixed assets plus working capital (current assets less current liabilities) tied up by the plant. This same amount was taken as a negative investment or "cash out" value in the terminal year.

The rationale for using total shadow priced investment was that the cash proceeds do not include interest expenses which are reflected in the weighted cost of capital. This procedure requires the use of total capital (salvage value) regardless of source. An alternative would be to use as investment, net cash realization (total less debt retirement) upon liquidation of the plant. In the single plant firm, debt retirement would be clearly defined. In the case of the multiplant firm, the delineation of the debt by the plant would likely not be clear. Presumably this could be reflected in proportioning total debt to the individual plant on some plant parameter (i.e., capacity or sales). Under this latter procedure, interest and debt retirement costs would be included in the cash flows.

The two procedures will yield similar results if the cost of capital and the interest charges are estimated on a similar basis. The former procedure, total salvage value, was used as it gives reasonable answers and simplified both the computation and explanation of the cash proceeds and salvage values.

Replacement investment was considered to be equal to the annual depreciation. This corresponds to the operating policies of some managements and serves as a good proxy for replacement in an on-going business.

Investments in pollution control facilities are from estimates provided by EPA. Only incremental values are used in order to reflect in-place facilities. Only the value of the land for control was taken as a negative investment, or "cash out" value, in the terminal year.

1/ This should not be confused with a simple buy-sell situation which merely involves a transfer of ownership from one firm to another. In this instance, the opportunity cost (shadow price) of the investment may take on a different value.

2. Price and Production Impact Analyses

Price and production impact analyses necessarily have to proceed simultaneously. In order to evaluate these impacts, two types of analyses are used: one is at the micro level utilizing the model plant as the basis of the analysis to arrive at required price impacts to maintain profitability levels; the other is at the industry level utilizing supply and demand analysis.

Application of the preceding DCF procedure to these costs yields the present value of pollution control costs (i.e., investment plus operating cost less tax savings). If this is known, the price increase required to pay for pollution control can readily be approximated by the formula 1/:

$$X = \frac{(PVP)\ (100)}{(1-T)\ (PVR)}$$

where

X = required percentage increase in price

PVP = present value of pollution control costs

PVR = present value of gross revenue starting in the year pollution control is imposed

T = average tax rate

The required price increase at the plant level is evaluated in light of the price elasticities of the commodity involved and the competitive structure of the industry. This represents the second approach using supply and demand analysis. The supply and demand analysis provides some insights into likely quantities and supply response to different prices. This allows a preliminary estimate of the production and price impact of pollution control costs. Following this, further analysis at the micro level is performed to obtain a more detailed insight into the plants' response to expected prices, absorption or shutdown. The indicated plant shutdowns are then aggregated to test whether or not the lost production could be absorbed by the remaining capacity or whether such curtailments would increase prices.

1/ The above procedure is conceptually correct where an average tax rate is used. However, to insure accuracy in the machine program where the actual tax brackets are incorporated, a more detailed iterative process is required.

3. Financial Impact Analysis

The financial impact analysis involves preparation of pro forma income statements and cash flow statements following the assessment of the likely price change. The analysis provides estimates of profitability with and without pollution control costs and also provides information relative to the ability of the industry to finance this investment and estimated financial requirements. The ability to finance plant investment for pollution control may have a definite bearing on judgments and estimates with regard to likely plant closures.

4. Plant Closures and Production Effects

Plant closures may result from the inability of less profitable plants to adequately recover required pollution abatement cost through increased product prices, decreased input prices, or improvements in economic efficiency. Often closures can be anticipated among older, smaller, and less efficient plants as a result of economies of scale in pollution control which would lower the overall costs to a larger operation. Since the larger plants, whose unit pollution control costs are usually much less, will be able to afford to sell at a lower price than the high-cost plants, the high-cost plants will have no recourse other than to sell at the long run equilibrium price set by the low-cost plants. Consequently in the long run, it is expected that the older, smaller, less efficient plants will eventually yield to the dominance of the larger more efficient units. However, in the short run, it is always possible that a plant may continue to operate even when economic considerations indicate closure. Possible exceptions will occur to the extent that smaller high cost plants are protected by regional markets and other non-price impediments to competition from the larger low cost plants.

5. Employment Impact Analysis

This analysis is concerned with estimating likely employment losses due to curtailed production and/or plant closures as a result of pollution controls. If the actual plants which are expected to curtail production and/or close can be identified, employment impacts can be estimated directly. Otherwise the employment impact analysis involves the application of estimates of employment changes by model plants. Employment changes in model plants are then generalized according to the number of actual plants represented by the model plant and aggregated to derive an estimate of total employment effects for the industry. Employment dislocations will be noted as appropriate.

6. Community Impact Analysis

This task is designed to identify potential impacts on local community economies where the impacted plant might represent a major source of employment and income. This analysis is based on a knowledge of the location of plants, particularly threatened plants, and a general understanding of the economic base of those communities and the relative importance of threatened plants to local economies.

7. Balance of Payments Impact Analysis

Balance of payments impact analysis deals with those products that have competitive positions with regard to imports and exports. The analysis considers whether or not the estimated price changes would hinder competitive positions with regard to exports or increase foreign imports. Where important, estimates on the amount of trade that potentially could be impacted and total trade levels are presented.

8. Other Impact Analysis

Other potential impacts may be created by the imposition of pollution control guidelines. This will likely be unique to given industries requiring a case-by-case approach. An illustration of the possible type of impact would be a plant that produces a critical intermediate, an input for other industries. The loss of this plant or large price increases could produce serious backward or forward effects on producers or consumers. To the extent additional impacts are identified and are important, these will be noted.

PART II

MALT BEVERAGES

I. INDUSTRY STRUCTURE

The Census of Manufactures defines the Malt Beverage Industry (SIC 2082) as an industry comprised of establishments primarily engaged in manufacturing a variety of types of malt beverages. The various beverage types include lager beer, malt liquor, draught beer, ale, porter or stout beer and bock beer. Of the beverages produced approximately 90 percent is lager beer. Malt beverages are sold in a variety of packages including cans, bottles, both returnable and non-returnable, and barrels.

A. Characteristics of the Industry

As previsouly discussed, breweries primarily produce lager beer (hereafter referred to as beer) and may or may not also produce other malt beverage products.

The industry is highly competitive and accordingly industry members do not readily release information regarding the operational data of their facilities. As a result, information concerning the industry characteristics must be derived from traditional sources such as the published reports of the Census of Manufactures, Internal Revenue Service, and the Bureau of Alcohol, Tobacco and Firearms (BATF). The United States Brewers Association (USBA) also provided their available information and helped act as a liaison with industry members. Some of these sources do have their limitations; however, overall they do provide an aggregated source of the general industry characteristics. Finally, when possible, discussions with industry members were utilized to fill the voids where published data are not available.

1. Number and Size of Firms and Plants

According to BATF, in 1935 there were 750 breweries authorized to operate in the United States. Since 1935, this number has decreased steadily and as of January 1, 1976, there were 54 brewing companies which operated 94 breweries (Table I-1). In terms of percentages, the Malt Beverage Industry has maintained an average annual decrease in the number of breweries of 4.5 percent.

The Census of Manufactures states in 1972 there were 167 establishments in the Malt Beverage Industry. For the same year BATF Statistics indicate only 139 breweries were authorized to operate. While the two sources disagree, the Census does provide some additional information which is useful for the purposes of this analysis and accordingly when other data are lacking, Census data will be used.

Table I-1. The Malt Beverage Industry, number of breweries

Year	Number of Plants	Percentage Change (Percent)
1935	750	-
1940	611	-19
1945	468	-23
1950	407	-13
1955	292	-28
1960	229	-22
1965	197	-14
1970	143*	-27
1975	94*	-34

*Excludes experimental breweries.

Source: U.S. Treasury, Bureau of Alcohol, Tobacco, and Firearms and the United States Brewers Association.

As can be seen in Table I-2, Census data indicates the majority of the breweries leaving the industry employed less than 250 people. The reasons for the smaller brewers leaving the industry are numerous. According to the USBA the smaller brewers have been unable to build modern efficient plants as they have lacked sufficient financing and subsequently they cannot produce malt beverages as cheaply as larger, more efficient operations. Additionally, many smaller brewers lack effective distribution programs and thus, they are hard pressed to provide a product which is competing in price with larger companies even though they may market in smaller areas with more specific or regional taste preferences.

Table I-2 also indicates each employment size group's value of shipment and the corresponding percentage of the total. As can be seen, in 1972, over 87 percent of the industry shipments were made by establishments with over 250 employees. These larger establishments account for only 37.7 percent of all brewery plants. Furthermore, it should be noted that 56.4 percent of the industry shipments were accounted for by less than 15 percent of the establishments.

As stated previously, the Malt Beverage Industry is currently comprised of 54 brewing companies which operate 94 individual breweries. These companies and their respective plants are listed in Table I-3.

From the table it can be seen that of the 54 brewing companies 41 operate single brewery operations with the remaining 13 companies operating 53 breweries. Of the multi-plant companies Anheuser-Busch operates the most breweries, 9, Schlitz operates 7, Falstaff operates 6 and Carling and Pabst operate 5 each. These five companies operate 34 percent of the total breweries in the industry.

In terms of barrels produced, the five largest companies produced 63.6 percent of the total industry's barrelage in 1974. Individual companies' estimated proportions for 1974 were: Anheuser-Busch, 24 percent; Schlitz, 16.1 percent; Pabst, 10.1 percent; Coors, 8.5 percent; and Miller, 7.2 percent. Historically, these brewers have increased their portion of the market steadily; from 50.9 percent in 1968, 55.5 percent in 1972 and 59.4 percent in 1973.[1/]

[1/] Estimates by Joseph C. Frazzano, analyst at Edwards & Hanly, The Wall Street Journal, "Beer Drinkers Continue to Favor Big Brewers Despite the Higher Prices for Premium Brands," July, 18, 1975.

Table I-2. The Beer Industry, by employment size group, number of establishments, and value of shipments, 1963-1972

No. of Employees	1963 Establishments Number	1963 Establishments Percent of Total	1963 Value of Shipments Million Dollars	1963 Value of Shipments Percent of Total	1967 Establishments Number	1967 Establishments Percent of Total	1967 Value of Shipments Million Dollars	1967 Value of Shipments Percent of Total	1972 Establishments Number	1972 Establishments Percent of Total	1972 Value of Shipments Million Dollars	1972 Value of Shipments Percent of Total
1-4	17	7.7	.5	< .1	22	11.9	1.0	< .1	22	13.1	2.4	0.1
5-9	6	2.7	.7	< .1	5	2.7	1.0	< .1	3	1.8	0.8	< .1
10-19	19	8.5	5.6	.2	8	4.3	3.2	.1	12	7.2	9.8	.2
20-49	31	14.0	21.7	.9	23	12.4	70.3	2.4	17	10.2	31.3	.8
50-99	30	13.5	46.1	2.1	22	11.9			18	10.8	57.2	1.4
100-249	52	23.4	295.5	12.8	40	21.6	318.1	10.9	32	19.2	400.3	9.9
250-499	33	14.9	454.6	19.6	32	17.3	587.3	20.0	39	23.3	1,266.3	31.2
500-999	23	10.4	591.1	25.5	21	11.4	678.4	23.2	15	9.0	835.3	20.6
1,000-2,499	8	3.6	499.9	21.6	9	4.9	772.0	26.4	6	3.6	710.1	17.5
2,500+	3	1.3	399.3	17.3	3	1.6	498.4	17.0	3	1.8	740.9	18.3
Total	222	100.0	2,315.0	100.0	185	100.0	2,929.7	100.0	167	100.0	4,054.4	100.0

Source: Census of Manufactures.

Table I-3. The Malt Beverage Industry, Breweries operating as of January 1, 1976.

1. Anheuser - Busch, Inc.
   Los Angeles, California
   Jacksonville, Florida
   Tampa, Florida
   St. Louis, Missouri
   Merrimack, New Hampshire
   Newark, New Jersey
   Columbus, Ohio
   Houston, Texas
   Williamsburg, Virginia

2. Blitz Weinhard Co.
   Portland, Oregon

3. Carling Brewing Company
   Belleveile, Illinois
   Baltimore, Maryland
   Natick, Massachusetts
   Frankenmuth, Michigan
   Tacoma, Washington

4. Cold Springs Brewing Co.
   Cold Springs, Minnesota

5. Coors Co., Adolph
   Golden, Colorado

6. Champale Products Corp.
   Virginia

7. Champale, Inc.
   Trenton, New Jersey

8. Dixie Brewing Co.
   New Orleans, Louisiana

9. Duncan Brewing Co.
   Auburndale, Florida

10. Eastern Brewing Co.
    Hammonton, New Jersey

11. Erie Brewing Co.
    Erie, Pennsylvania

12. Falls City Brewing Co.
    Louisville, Kentucky

13. Falstaff Brewing Corp.
    Fort Wayne, Indiana
    New Orleans, La.
    St. Louis, Missouri
    Omaha, Nebraska
    Cranston, Rhode Island
    Galveston, Texas

14. General Brewing Company
    Los Angeles, California
    Vancouver, Washington

15. Genesee Brewing Co.
    Rochester, New York

16. Geyer Bros. Brewing Co.
    Frankenmuth, Michigan

17. Hand Brewing Co., Peter
    Chicago, Illinois

18. Heileman Brewing Co., G.
    Evansville, Indiana
    Newport, Kentucky
    St. Paul, Minnesota
    LaCross, Wisconsin

19. Honolulu Sake Brewery and Ice Co.
    Honolulu, Hawaii

20. Horlacher Brewing Co.
    Allentown, Pennsylvania

21. Huber Brewing Co., Jos.
    Monroe, Wisconsin

22. Hudepohl Brewing Co.
    Cincinnati, Ohio

Table I-3 (continued)

23. Hull Brewing Co.
New Haven, Conn.

24. Jones Brewing Co.
Smithton, Pa.

25. Koch, Fred, Brewery Inc.
Dunkirk, New York

26. Latrobe Brewing Co.
Latrobe, Pa.

27. Leinenkugel, Jacob Brewing Co.
Chippewa Falls, Wis.

28. Lion, The., Inc., Gibbons Brewery
Wilkes-Barre, Pa.

29. Lone Star Brewing Co.
San Antonio, Texas

30. Miller Brewing Co.
Azusa, California
Ft. Worth, Texas
Milwaukee, Wisconsin

31. Mt. Carbon Brewery
Pottsville, Pa.

32. National Brewing Co.
Phoenix, Arizona
Baltimore, Md.

33. Olympia Brewing Co.
Olympia, Washington
St. Paul, Minnesota

34. Ortlieb, Henry R. Brewery Co.
Philadelphia, Pa.

35. Pabst Brewing Co.
Los Angeles, California
Pabst, Georgia
Peoria Heights, Illinois
Newark, New Jersey
Milwaukee, Wisconsin

36. Pearl Brewing Co.
San Antonio, Texas

37. Pickett & Sons, Joseph S. Inc.
Dubuque, Iowa

38. Pittsburg Brewing Co.
Pittsburg, Pa.

39. Rainier Brewing Co.
Seattle, Washington

40. Reading Brewing Co.
Reading, Pa.

41. Rheingold Brewerys, Inc.
New Bedford, Mass.
Orange, New Jersey
Brooklyn, New York

42. Schaefer, F&M Brewing Co.
Baltimore, Md.
Brooklyn, New York
Allentown, Pa.

43. Schell, Aug., Brewing Co.
New Ulm, Minnesota

44. Schlitz, Jos. Brewing Co.
Van Nuys, California
Tampa, Florida
Honolulu, Hawaii
Winston Salem, N.C.
Memphis, Tenn.
Longview, Texas
Milwaukee, Wis.

45. Schmidt & Sons, C., Inc.
Philadelphia, Pa.
Cleveland, Ohio

46. Schoenling Brewing Co.
Cincinnati, Ohio

47. Spoetzl Brewery Inc.
Shiner, Texas

Table I-3 (continued)

48. Steam Beer Brewing Co.
San Francisco, California

49. Stevens Point Brewery
Stevens Point, Wisconsin

50. Straub Brewery
St. Mary's, Pennsylvania

51. Stroh Brewery Co., The
Detroit, Michigan

52. Walter Brewing Co.,
Eau Claire, Wis.

53. West End Brewing Co.
Utica, New York

54. Yuengling & Son, Inc., D.G.
Pottsville, Pa.

2. Value of Shipments

Value of shipments and other receipts of the Malt Beverage Industry in 1972 totalled $4,054.4 million. This included shipment of malt beverages (primary products) valued at $4,029.2 million, shipments of other products (secondary products) valued at $2.5 million and miscellaneous receipts (mainly resales) of $22.7 million.

Estimates of the 1975 value of shipments are expected to total $5,361.0 million, 11.1 percent above the estimated shipments for 1974 and 32.2 percent above the 1972 value of shipment (Table I-4). Historically, the value of shipments have increased by an average of 6.1 percent per year since 1958, from $1,983.0 million in 1958, to the estimated $5,361.0 million in 1975. This rate of increase has fluctuated from year to year in the past and in 1972 the value of shipments was actually lower than the previous years. Since 1972, the value of shipment has increased at relatively high rates (6.2%, 12.0% and 11.2% for 1973, 1974, and 1975 respectively).

Shipments of malt beverages (primary products) in 1972 represented 100 percent (specialization ratio) of the industry's total products shipments (primary and secondary). The industry specialization ratio in 1967 was also 100 percent.

Shipment of malt beverages (primary products) from establishments classified in industry 2082 in 1972 represented 100 percent (coverage ratio) of these product valued at $4,038.7 million shipped by all industries. This ratio in 1967 was also 100 percent. Thus it can be concluded that establishments producing and shipping malt beverages are all classified in industry 2082.

3. Level of Integration

The Malt Beverage Industry is comprised of firms which vary in their degree of integration. In terms of forward integration, most firms do not integrate any further than their sales to distributors. Some firms may operate their own distributorships but these are usually limited to extremely small brewers or to brewers who act as their distributor for export markets.

Brewers vary in their degrees of backward integration from those purchasing all raw material inputs to those which manufacture their own cans and bottles and contract with farmers for their grain. Also some of the larger brewers also maintain their own malting operations.

Table I-4. The malt beverage industry, value of shipments, 1958-1975

Year	Value of Shipments ($ Million)	Percentage Change (%)
1958	1,983	
1959	2,095	5.6
1960	2,180	4.1
1961	2,200	0.9
1962	2,282	3.7
1963	2,315	1.4
1964	2,470	6.7
1965	2,497	1.1
1966	2,700	8.1
1967	2,930	8.5
1968	3,131	6.9
1969	3,418	9.2
1970	3,822	11.8
1971	4,140	8.3
1972	4,054	-2.1
1973	4,305	6.2
1974	4,822	12.0
1975	5,361	11.2

Source: Department of Commerce, Bureau of Census, Bureau of Labor Statistics, BDC.

4. Number of Products

The Malt Beverage Industry primarily produces lager beer but it also produces malt liquors, draught beer, ale, porter or stout beer and bock beer. As stated previously approximately 90 percent of the beer produced is lager beer. Most breweries produce various container sizes and types (cans, returnable bottles, non-returnable bottles and kegs) of one brand label. Some of the larger breweries may produce other brand labels; however, the basic brewing process is changed very little for the different labels.

5. Level of Diversification

The Census of Manufactures shows the Malt Beverage Industry with a very high specialization ratio of 100 percent in 1972. As stated previously this indicates that 100 percent of the sales of the establishments classified in industry SIC 2082 are in the primary SIC code. The typical brewery is not diversified as governmental restrictions limit the facility's possibilities as well as the fact that the processes and equipment are specialized, non-interchangeable and do not lend themselves to the production of other products.

6. Location of Breweries

The specific locations of breweries presently operating are available in Table I-3 which list the specific brewers and their respective plant locations. Presently, there are 94 individual breweries and these are located in 31 states (Table I-5). Because of the bulkiness of beer and the corresponding high costs of transportation, breweries have tended to locate in or near market centers. As a result, there are few breweries in the High Plains or Mountain Regions of the United States.

7. Age of Plants and Level of Technology

Within the Malt Beverage Industry, there exist a wide variety of plant ages varying from over 100 years old to those which only recently have been constructed. While many of the breweries are relatively old, throughout their useful life new equipment has been added or used to replace that which is worn out or technologically obsolete. As a result, most older breweries in the industry represent a combination of both old and new equipment. Furthermore, it can be generally assumed that the newer the plant and its equipment, the more technologically advanced the plant.

Table I-5. The Malt Beverage Industry, number of plants by state, 1975.

State	Number of Breweries
Arizona	1
California	6
Colorado	1
Connecticut	1
Florida	4
Georgia	1
Hawaii	2
Illinois	3
Indiana	2
Iowa	1
Kentucky	2
Louisiana	2
Maryland	3
Massachusetts	2
Michigan	3
Minnestoa	4
Missouri	2
Nebraska	1
New Hampshire	1
New Jersey	5
New York	5
North Carolina	1
Ohio	4
Oregon	1
Pennsylvania	13
Rhode Island	1
Tennessee	1
Texas	7
Virginia	2
Washington	4
Wisconsin	8
Total United States	94

In a 1974 survey of the breweries conducted for the USBA, brewers were asked to indicate the date of construction of the original brewery as well as the date of the last major expansion. Of the 45 responses 38 percent indicated their breweries were built prior to or about 1900, 18 percent were built between 1910 and 1950, 13 percent were built between 1950 and 1960, 20 percent between 1960 and 1970 and finally 11 percent were built after 1970. In terms of the last major expansion of the 38 responses, 42 percent indicated a major expansion had been completed since 1970, 37 percent indicated their last major expansion was between 1965 and 1970 and the remainder, 21 percent, indicated their last major expansion was between 1955 and 1965.

Another measure of the physical state of the industry can be obtained utilizing IRS data to depict, for variously sized breweries, the brewers' accumulated depreciation expressed as a percent of their total depreciable assets. As can be seen in Table I-6, there is an obvious trend for the smaller brewers to be more highly depreciated and accordingly it can be assumed that these brewers have plants and equipment which are older and thus less efficient.

8. Plant Efficiency

Breweries vary significantly between each other in terms of plant efficiency. Primarily the difference between plants' efficiency will be dependent on the technical level with which the plant operates. Furthermore, the age and condition of the equipment will significantly influence the efficiency of the brewery. Those breweries with old and neglected equipment will undoubtedly encounter many more hours of down-time due to mechnaical failures.

B. Employment Characteristics

Total employment within the Malt Beverage Industry has decreased by over 28 percent from 71,700 employees in 1958, to 51,500 employees in 1972. Current estimates by the industry indicate that in 1975 there were approximately 50,000 employees. Of the employees in 1972, production workers represented approximately 65 percent of the total employees, and during the above period decreased from 48,000 in 1958 to 33,800 in 1972.

Overall, the productivity of the production worker has increased significantly since 1958. Since then the value added per production worker has more than doubled and the value of shipment per production worker has nearly tripled. Some of these increases are attributable to inflation, however, a good portion is explained by the installation of automated equipment (especially in the bottling and canning lines) as well as the better utilization of those employed.

Table I-6. The Malt and Malt Liquor Industries, accumulated depreciation as a percent of total depreciable assets, by total asset size

Fiscal Year	Size of Total Assets ($1,000)										
	0-100	100-250	250-500	500-1,000	1,000-5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000+
	Percent										
1968-1969	-	61	-	59	48	29	49	50	51	45	36
1969-1970	-	-	-	-	63	16	52	49	50	38 1/	-
1970-1971	-	71	79	76	54	61	53	46	54	34 1/	
1971-1972	-	-	62	77	65	-	55	51	54	30	36
Average		66.0	70.5	70.7	57.5	35.3	52.2	49.0	52.2	36.8	36.0

1/ Asset size group is 100,000 or more.

Source: Department of Treasury, Internal Revenue Service, Source Book of Statistics of Income, Annual.

Table I-7. The malt beverage industry, employment statistics, 1958-1972.

Year	All Employees		Production Workers			Value of Shipments/ production worker	Man hours/ production worker	Wage per Production worker Man-Hour	Value added/ production worker Man-hour
	Number (000)	Payroll ($ Mil)	Number (000)	Man-Hrs. (Million)	Wages ($ Mil)	($000)		($)	($)
1958	71.7	443.3	48.0	91.7	280.1	41.3	1,910	3.05	12.18
1959	70.9	461.1	48.0	91.9	292.6	43.7	1,915	3.18	13.06
1960	69.8	461.7	47.7	90.0	296.8	45.7	1,887	3.30	13.87
1961	68.2	466.5	46.2	87.5	297.7	47.6	1,894	3.40	14.25
1962	66.0	476.8	44.8	86.0	304.8	50.9	1,920	3.54	14.77
1963	62.6	470.8	42.7	81.9	302.3	54.2	1,918	3.69	15.70
1964	61.9	485.6	42.0	80.6	311.4	58.8	1,919	3.86	16.95
1965	60.4	488.1	40.6	78.7	310.4	61.5	1,938	3.94	17.28
1966	60.5	509.2	40.3	78.5	334.0	67.0	1,948	4.25	17.99
1967	59.6	519.8	40.0	76.8	331.4	73.2	1,920	4.32	20.13
1968	58.7	537.0	39.7	76.5	343.5	78.9	1,927	4.49	21.35
1969	57.3	570.8	38.6	74.2	359.4	88.6	1,922	4.84	24.09
1970	57.3	615.6	38.0	74.3	382.6	100.6	1,955	5.15	27.29
1971	57.0	653.6	37.2	71.6	405.2	111.3	1,925	5.66	30.40
1972	51.5	652.8	33.8	66.9	408.7	120.0	1,979	6.11	29.80

Source: U.S. Department of Commerce, Bureau of Census, Census of Manufactures.

The brewery production workers can be characterized as predominantly union and semi-skilled. Much of the labor involves the monitoring of either the brewing process or the bottling operations. The average annual hours worked per production worker totaled 1,979 hours in 1972. Hourly wages have more than doubled since 1958 from $3.05 per hour in 1958 to $6.11 in 1972. Corresponding to the wage increase, the value added per production worker also has doubled during the same period.

As can be seen in Table I-8, the majority of the industry's employees are concentrated in the middle to larger sized establishments with 85.4 percent of all employees and 84.0 percent of the production workers being employed by breweries with 250 employees or more.

C. Segment Portions of the Total Industry

While the preceding sections of this chapter have been concerned with brewery data for the overall Malt Beverage Industry, concern is also warranted about the different types of operations within the overall industry.

Breweries within the industry can be categorized into two distinctively different type of operations. First, there are those breweries which were built many years ago and through remodeling and expansions have been able to maintain their place in the industry. These breweries number 79 and can be classified according to size as either small, medium or large operations. For each of the size classifications it has been determined that there are 64 small breweries, 9 medium sized breweries and 6 large older breweries.

The second type of brewery category are those operations which have been constructed within the last 15 to 20 years and by industry standards are considered modern breweries. Some of these breweries, particularly those built in the late 1950's or early 1960's, have required in-house modifications to be considered in the modern brewery category. As of January, 1976, it was determined that there were 15 of these breweries in operation.

In terms of the aggregated Malt Beverage Industry, it has been estimated that the small, older breweries represent 68 percent of all breweries and produce 28 percent of the industry's annual barrels. The medium older breweries represent 10 percent of all breweries and produce 16 percent of the industry's total annual barrels. The large, older breweries represent only 6 percent of all breweries but produce 22 percent of the annual barrels.

Table I-8. Malt Beverage Industry Employment - 1972

Employment Size	All Employees	Percent of Total	Production Workers	Percent of Total
1-4	< 50	< .1	< 50	< 0.1
5-9	< 50	< .1	< 50	< 0.1
10-19	200	0.4	100	0.3
20-49	600	1.2	400	1.2
50-99	1,200	2.3	800	2.4
100-249	5,500	10.7	3,900	11.5
250-499	13,700	26.6	9,500	28.1
500-999	10,400	20.2	6,700	19.8
1,000-2,499	10,800	20.9	6,700	19.8
2,500 or more	9,100	17.7	5,500	16.3
Total	51,500	100.0	33,800	100.0

The remaining category, the modern breweries represent 16 percent of the total number of breweries and produce 34 percent of all barrels produced by the industry.

D. Significant Impacts to Industry Segments

The Malt Beverage Industry has only three breweries which are known to be directly discharging to navigable waters.

It is understood that all of the three plants are meeting BPT and two of the three is already meeting BAT. As a result the direct impacts on the industry resulting from the imposition of effluent controls on the direct dischargers are expected to be limited.

A number of the breweries utilizing municipal treatment systems have reported rapidly increasing user charges (see also discussion in Chapter II, Section C). As a result the possibility of breweries now discharging to municipal systems constructing their own end-of-pipe system may become an economically attractive alternative in certain individual situations.

It is also recognized that differences may exist in the federal standards and the state or local regulations. As a result, individual plants may find that added expenditures are necessary to comply with local or state regulations. Even though this problem is recognized, the impact of regulatory variability is not addressed in this report.

Narrowing the Scope of Study

The preceding has attempted to describe an overall picture of the Malt Beverage Industry. In the remainder of this analysis, efforts will be made to concentrate on those breweries which could be subject to potential impacts due to the imposition of effluent controls including new plants to be constructed after the promulgation of the Guidelines. This will be accomplished utilizing representative model plants to estimate impacts and extending these impacts by association to the wider spectrum of breweries which correspond to the model plants.

II. FINANCIAL PROFILE OF THE INDUSTRY

Firms in the Malt Beverage Industry are primarily either family or closely held corporations or divisions or subdivisions of large, often multi-plant operations. As a result, financial information relating to a single brewery is difficult to obtain. However, by relating information available from a variety of sources, a picture of the Malt Beverage Industry can be attempted. Information used to develop financial profiles was integrated from several sources, including the Census of Manufactures, Annual Survey of Manufactures, Internal Revenue Service, United States Brewers Association, and associated published industry operational and financial statistics.

A. Sales and Taxes

For 1975, the Malt Beverage Industry's value of shipments amounted to an estimated $5,361 million. This compares to $4,305 million in 1974, $3,822 million in 1970 and $2,180 million in 1960 (Table II-1). While the above data reflects the value of the industry's shipment, Standard and Poors[1/] estimate consumers expenditures for malt beverages to be $13.8 billion in 1974. This was up 12 percent from the 11.5 billion estimated in 1973. According to Standard and Poors, most of the 1974 increase was due to a 5 percent gain in volume, as well as substantial increases in retail beer prices.

Breweries besides generating annual sales also generate substantial tax revenues for the federal, state and local governments. In 1974, federal excise tax collected from the breweries amounted to $1,262.9 million or approximately 26 percent of the industry's total value of shipments. The federal taxes are collected at a rate of $9.00 per 31 gallon barrel. In terms of state revenues derived from malt beverages, states tax at an average rate of $4.63 per barrel. State reveneus amounted to $710 million in 1974. Thus when state and federal taxes are combined the Malt Beverage Industry generated approximately $1,973 million to these governments in 1974. This amounted to approximately 41 percent of the industry's total value of shipments and 14 percent of total consumer sales for malt beverages.

The 1972 Census of Manufactures' estimate of value of shipments for the industry was based on information provided by 167 establishments. This gives the shipment for an average brewery to be $24.3 million (Table II-2). This compares to $15.8 million in 1967.

While the average brewery had shipments valued at $24.3 million in 1972 with 308 employees, the actual breweries in the industry vary considerably in size. Actual breweries ranged in 1972 from small plants with less than

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1/ Industry Surveys - Liquor, Standard and Poors, October 16, 1975.

Table II-1. The Malt Beverage Industry, annual value of shioments, production, consumption and taxes.

Year	Total Value of shipments (million dollars)	Total Production of Malt Beverages (1,000 barrels)	Total Tax Paid Withdrawals (1,000 barrels)	Per Capita of Consumption Malt Beverages (gallons)	Federal Excise Federal Excise Taxes Paid (Million dollars)	State Excise Taxes and License Taxes Paid (Million dollars)
1960	2,180	94,547.9	88,928.9	15.4	796.2	-
1961	2,200	93,496.5	87,925.8	14.9	795.4	275.2
1962	2,282	96,417.5	90,693.3	15.1	813.5	295.0
1963	2,315	97,961.4	91,493.6	15.0	825.4	324.1
1964	2,470	103,017.9	96,247.4	15.6	887.4	349.4
1965	2,497	108,015.2	100,306,7	16.0	950.7	375.0
1966	2,700	109,736.3	101,510.3	16.1	887.3	394.7
1967	2,930	116,564.4	107,301.4	16.8	940.6	414.9
1968	3,131	117,523.5	107,470.4	16.7	959.6	442.6
1969	3,418	122,657.5	111,866.6	17.2	1,003.4	469.9
1970	3,822	134,653.9	122,550.2	18.7	1,077.5	527.2
1971	4,140	134,091.7	123,850.4	18.6	1,104.2	580.1
1972	4,054	140,326.7	130,740.6	19.5	1,164.3	622.2
1973	4,305	143,013.6	133,960.5	19.8	1,199.5	672.7
1974	4,822	153,053.0	142,312.0	20.9	1,262.9	710.0

Source: Bureau of the Census, Bureau of Alcohol, Tobacco, and Firearms and United States Brewers Association.

Table II-2. The Malt Beverage Industry, value of shipments, value added, and employees, census years 1963, 1967, and 1972

Item	Units	1963		1967		1972	
		Industry Total	Per Establishment	Industry Total	Per Establishment	Industry Total	Per Establishment
Establishments	No.	222	-	185	-	167	-
Value of Shipments	$ Mil.	2,315.0	10.4	2,929.7	15.8	4,054.4	24.3
Value Added	$ Mil.	1,286.0	5.79	1,545.7	8.36	1,993.6	11.94
Total Employees	No.	62,600	282	59,600	322	51,500	308

Source: Census of Manufactures.

5 employees and annual shipments valued at $109,000 to extremely large breweries employing over 2,500 employees and annual shipment of $247 million.

B. Distribution of Sales Dollars

The allocation of the sales dollar among the various cost components incurred by the Malt Beverage Industry shifted slightly during the period 1967 and 1972. For the most part, the most significant change has been experienced by the portion of the sales dollar going to raw materials and purchased production suppliers. In 1967, these costs represented 47.2 percent of sales and by 1972 had increased to 51.0 percent, an increase of 3.8 percent. To offset this increase the portion attributable to labor and related expenses decreased by 1.6 percent and the portion attributable to other indirect costs, taxes and profits decreased by 2.2 percent. These percentages are summarized below.

	Distribution of Sales Dollar (Percent)	
	1967	1972
Total Sales	100.0	100.0
Raw Materials	47.2	51.0
Payroll	17.7	16.1
Other indirect operating costs, taxes and profits	35.1	32.9

Some of the above shifts can be explained by the costs for some items increasing at rates faster than the costs for other items. Furthermore, as the percentages depicted above reflect only the 1967 and 1972 period, it is assumed that additional changes in the allocation have occurred since 1972 as the brewers' prices of corn, malt, and barley all began to increase in 1973 and then increased substantially in 1974 and to some extent 1975 (these ingredients costs are discussed further in Chapter IV, Pricing Patterns).

C. Earnings

According to Standard and Poors, the Malt Beverage Industry has experienced a deterioration in earnings in the past recent years. This has been resultant of the increasing inter-industry competition generated by the increasing concentration of brewers as well as significantly large increases in container costs and prices paid for agricultural commodities. The lower earnings have particularly been experienced by smaller regional and local

brewers who, even before input costs began to increase, have been faced with a decreasing market share. This is primarily due to their inability to effectively compete against the large national brewers who usually operate larger, more efficient plants and have much more effective distribution systems and advertising campaigns. Following the 1972 wheat sales to Russia, grain costs also began to increase substantially and this effected not only the small brewers but the large, national brewers as well. In addition all brewers have had to absorb substantial can cost increases which rose an unprecedented 35 percent in 1974 alone.

The aggregated earnings for the Malt and the Malt Beverage Industries as compiled by the Internal Revenue Service also reveal that in general earnings deteriorated during the years 1969 to 1972 (Table II-3). According to the IRS data the average net profits before taxes expressed as a percent of net sales declined from 6.4 percent in 1969 to 4.1 percent in 1971 and 4.2 percent in 1972. Table II-4 also indicates the profits by the size of the operation. As has been previously discussed, profits for the smaller sized operations on the average have been lower than those for the larger operations. This trend is also the conclusion of a recent report submitted to the Federal Trade Commission concerning price and profit trends in selected food manufacturing industries.[1/] This report utilized quarterly data from July, 1972, through March, 1975, and determined that for the 11 quarter period, the after-tax profits on sales were 0.8 percent for the brewers with total assets under $50 million and 4.3 percent for those brewers with assets of $50 million or more.

The outlook for the Malt Beverage Industry at the present is somewhat unstable due to the unpredictability of the economic environment. However, Standard and Poor's indicate that the industry, particularly the larger brewers, is showing some signs of a restoration of earnings. This has primarily come about due to an increase in volume which has coupled with some rather substantial price increases (13 percent in 1974). The longevity of this recovery will be dependent upon several factors some of which are the ability of brewers to increase prices as costs increase and still maintain consumer demand and the effect of the potential state banning of one-way containers.

Finally, one factor which may contribute to the deterioration of earnings for some individual firms is the trend for increasing user charges for municipal dischargers. While at the present these charges represent only a small portion of the breweries' total costs, industry members indicate that the user charge significance is of increasing concern. In a recent survey conducted for the USBA, 52 breweries responded to indicate that the average costs for municipal wastewater treatment increased from almost

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1/ Price and Profit Trends in Four Food Manufacturing Industries, Staff Report to the Federal Trade Commission, July, 1975.

Table II- 3. The Malt and Malt Liquor Industries, Net Profit before tax, by asset size, 1969-1972

Fiscal Year	Zero Assets	Under 100	100-250	250-500	500-1,000	1,000-5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000 or more	Total
	Asset Size ($000)												
	Percent of net sales												
1968-1969	7.4	-	5.6	-	2.6	2.8	8.8	7.3	3.2	3.4	11.1	8.8	6.4
1969-1970	-	-	-	-	-	0.87	11.1	4.2	4.4	3.3	6.6 1/		5.1
1970-1971			4.6	-5.2	-1.2	3.1	1.5	3.1	2.2	0.90	5.8 1/		4.1
1971-72	0.38	-	-	6.7	1.0	4.7	-	2.9	2.9	-0.29	6.5	5.7	4.2

1/ Asset size is 100,000 or more.

Source: Department of Treasury, Internal Revenue Service, Source Book of Statistics of Income, Annual.

4 cents per barrel of beer produced in 1970 to 8 cents in 1974. Thus in a five year period, user charges increased by 100 percent, or an average of 20 percent per year.

D. Ability to Finance New Investment

The ability of a firm to finance new investments for pollution abatement is a function of several critical financial and economic factors. In general terms, new capital must come from one or more of the following sources: (1) funds borrowed from outside sources; (2) equity capital generated through the sale of common or preferred stock; (3) internally generated funds -- retained earnings and the stream of funds attributed to depreciation of fixed assets.

For each of the three major sources of new investment, the most critical set of factors is the financial condition of the individual firm. For debt financing, the firm's credit rating, earnings record over a period of years, stability of earnings, existing debt-equity ratio and the lenders' confidence in management will be major considerations. New equity funds through the sale of securities will depend upon the firm's future earnings as anticipated by investors, which in turn will reflect past earnings records. The firms' record, compared to others in its own industry and to firms in other similar industries, will be a major determinant of the ease with which new equity capital can be acquired. In the comparisons, the investor will probably look at the trend of earnings for the past five years.

Internally generated funds depend upon the margin of profitability and the cash flow from operations. Also, in publicly held corporations, stockholders must be willing to forego dividends in order to make earnings available for reinvestment.

The condition of the firm's industry and general economic conditions are also major considerations in attracting new capital. The industry will be compared to other similar industries (i.e., other beverage industries) in terms of net profits on sales and on net worth, supply-demand relationships, trends in production and consumption, the state of technology, impact of government regulation, foreign trade and other significant variables. Declining or depressed industries are not good prospects for attracting new capital. At the same time, the overall condition of the domestic and international economy can influence capital markets. A firm is more likely to attract new capital during a boom period than during a recession. On the other hand, the cost of new capital will usually be higher during an expansionary period. Furthermore, the money markets play a determining role in new financing.

These general guidelines can be applied to the Malt Beverage Industry by looking at general economic data and industry performance over the recent past.

1. General Industry Situation

As was depicted in Table II-3, the Malt Beverage Industry has experienced a declining trend in its profits during the past few years. However, Standard and Poors have projected that the industry has good earnings potential if the general economic environment stabilizes.

Total assets and liabilities of the alcoholic beverage industry are shown in Table II-4 for the years 1968-1969 through 1971-72. From the table, it is apparent that the industry's fixed assets represent approximately 70 percent of all assets and that current assets represent approximately 30 percent. Also, it is apparent that of the total liabilities, long term debt represents approximately 25 percent, current liabilities represent 18 percent and net worth represents 57 percent.

2. Expenditures for Plant and Equipment

New expenditures as reported by the Annual Survey of Manufactures and the Census have increased from $75.9 million in 1960 to $158.1 million in 1972 (Table II-5). The yearly expenditures have fluctuated from year to year, but overall has been increasing except that beginning in 1969 expenditures tended to peak. Since 1969, expenditures have decreased.

A closer look at the $158.1 million spent as capital expenditures in 1972 (depicted below) reveals $39-8 million were spent for new structures and additives to plants, $115.8 million for new machinery and equipment and the remainder, $2.5 million, being spent to purchase used plants and equipment.

As also depicted below, comparable data for 1967 reveals that the industry utilized a greater portion of its capital expenditures for new machinery and equipment and a smaller portion for new structures and additions to existing plants and also used plants and equipment. This can be interpreted to suggest that the industry is moving toward the upgrading of existing facilities instead of the construction of new facilities.

Expenditures for Plants and Equipment

	1967		1972	
	$ Million	Percent	$ Million	Percent
Total	176.9	100.0	158.1	100.0
New Structures & Additions to plants	62.2	35.2	39.8	25.2
New Machinery & Equipment	110.6	62.5	115.8	73.2
Used Plants and Equipment	4.1	2.3	2.5	1.6

Table II-4. The Malt and Malt Liquor Industries.

	1968-69		1969-70		1970-71		1971-72	
	($ Mil.)	(%)	($ Mil.)	(%)	($ Mil.)	(%)	($ Mil.)	(%)
Assets								
Current Assets	782.6	33	831.0	29	954.4	29	929.2	28
Fixed Assets	1,567.3	67	2,037.0	71	2,379.1	71	2,424.2	72
Total Assets	2,349.9	100	2,868.0	100	3,333.5	100	3,353.4	100
Liabilities & Equity								
Long term debt	414.6	17	695.9	24	872.2	26	919.7	27
Current liabilities	464.7	20	522.6	18	562.6	17	554.4	17
Net worth	1,470.6	63	1,649.5	58	1,898.7	57	1,879.3	56
Total liabilities & equity	2,349.9	100	2,868.0	100	3,333.5	100	3,353.4	100

Source: Department of Treasury, Internal Revenue Service, Source Book of Statistics of Income, Annual.

Table II-5. The Malt Beverage Industry, capital expenditures 1960 through 1972.

Year	Capital Expenditures ($ Million)
1960	75.9
1961	89.9
1962	84.6
1963	86.2
1964	105.4
1965	115.4
1966	168.8
1967	140.4
1968	193.6
1969	249.8
1970	177.7
1971	160.2
1972	158.1

Source: Census of Manufactures.

3. Capital Availability

In summary, it would appear the Malt Beverage Industry can be categorized into two types of financial positions in terms of the availability of capital to utilize for expenditures on pollution controls. First, there are the large diversified firms who have experienced reasonably steady profits and through diversification have been able to maintain adequate cash flows. For these firms the acquisition of additional capital for pollution controls should not be a major problem.

The other financial position will be encountered by the smaller firms who do not have the available sources from which additional capital can be readily generated. These firms will primarily have to rely on internally generated capital (if available) or attempt to borrow it. Depending on the firms' potential and the industry's outlook, some of the smaller firms may encounter significant problems in obtaining capital.

E. Cost of Capital - After Tax

Return on invested capital is a fundamental notion in U.S. business. It provides both a measure of actual performance of a firm as well as expected performance. In this latter case, it is also called the cost of capital. The cost of capital is defined as the weighted average of the cost of each type of capital employed by the firm, in general terms equities and interest bearing liabilities. There is no methodology that yields the precise cost of capital, but it can be approximated within reasonable bounds.

The cost of capital was determined for purposes of this analysis by estimating performance measures of the industry. The weights of the two respective types of capital for the Malt Beverage Industry were estimated at 23 percent debt and 77 percent equity. The cost of equity was determined from the ratio of earnings to net worth and estimated to be 9.8 percent.

To determine the weighted average cost of capital, it is necessary to adjust the before tax costs to after-tax costs (debt capital only in this case). This is accomplished by multiplying the costs by one minus the tax rate (assumed to be 48 percent). These computations are shown below and result in the estimated after-tax cost of capital being 8.8 percent.

Weighted Average After Tax Cost of Capital

Item	Weight	Before Tax Cost	Tax Rate	After Tax Cost	Weighted Cost
Debt	.23	10.0	.48	5.2	1.2
Equity	.77	-	-	9.8	7.6
					8.8

III. MODEL PLANTS

The Malt Beverage Industry is comprised of several breweries which utilize slight variations of a basic process to produce differentiated types of beer. As stated previously, the industry consists of establishments engaged in the manufacturing of malt beverages which include lager beer, malt liquor, draught beer, ale, porter or stout beer and bock beer. As this chapter is concerned with the development of economic model plants representative of breweries which could be directly or indirectly effected by the imposition of effluent controls, an attempt will be made to describe models which together could typify most brewery operations in the United States.

A. Types of Plants

Breweries can be categorized according to their age and technological state. As was mentioned in Chapter I, breweries fall into two distinct categories: (1) those breweries built many years ago and through remodeling and expansion have maintained their place in the industry; and (2) those breweries built within the last 15 to 20 years and are basically considered to be modern.

While the above categories differentiate breweries, the basic brewing process utilized by all breweries is about the same. The manufacture of beer is an ancient activity which has evolved into a modern industry. The primary raw material inputs of malt beverage manufacture are barley, rice or corn, hops, yeast, corn syrup and water. The basic manufacturing process is briefly described below:

1. Cleaned barley is steeped in aerated water and spread out on floors or in special compartments and regularly turned for five to eight days for germination.

2. At the point in germination where enzymes are formed, moisture is removed and the germinated grain is transferred to a drying kiln. Sprouts are removed and the remaining starch material, malt, is ready for the brewing process.

3. Following the malting process (which may occur in another location) the malt is ground and the malt adjuncts, ground corn or rice, are added.

4. A small portion of the malt and adjunct is cooked until the starch is liquified and then added to the cooker mash (step 5).

5. The next step, mashing, extracts the valuable constituents of malt, malt adjuncts, and sugars by macerating (separating) the materials with water. In the cooker the malt's natural enzymes convert the insoluble starches to liquified starch and the soluble malt starch into dextrin and malt sugars.

6. The resulting liquid materials called "wort" are separated from the insoluble spent grains by filtration (lautering).

7. The wort is transferred to a brew kettle where, after about one hour of boiling, hops are introduced and the substance is cooked for an additional period.

8. Boiling wort is then filtered to remove the hop leaves and the clear wort is then cooled. The cooling process, by allowing the wort to absorb air, facilitates fermentation.

9. The chilled wort flows into fermenting tanks where yeast is added to initiate fermentation, the process which converts fermentable sugars into alcohol and carbon dioxide. The evolved carbon dioxide is collected and stored for subsequent use in carbonating the beer. Fermentation occurs over a seven to ten day period as the yeast gradually settles.

10. The yeast is removed and the remaining wort, now beer, is piped into vatting tanks for aging and mellowing (lagering) for three to six weeks at a temperature of approximately 30 to 32 degrees. During this period clarification, separation, and the precipitation of hard resins occurs through several filterings.

11. The beer is then carbonated and filtered.

12. The product is packaged in bottles, cans, or kegs. The bottles or cans of beer are typically pasteurized at 140 degrees F. The draught beer is diverted to a racking room where it is immediately placed in kegs. Keg beer is kept refrigerated and does not require pasteurization.

13. The spent grain left after separation of the wort is sold wet or is dried for animal feed. Remaining brewer's yeast is often also sold but in some breweries, it is discharged with the effluent.

B. Sizes of Breweries

The value of shipments of the Malt Beverage Industry in 1972 was $4,054.4 million according to the Census. This gives an average for the 167 breweries of $24.3 million. While this figure reflects the shipments of the average brewery in 1972 it does not provide a good representation of the industry as the range of plant size varies considerably from the small breweries to the extremely large.

According to the Bureau of Alcohol, Tobacco and Firearms and the United States Brewers Association (USBA) as of January 1976 there were 94 breweries in operation. To determine the criteria for defining the size of the model breweries discussions with the USBA resulted in the determination that the daily number of barrel equivalents produced is the most realistic measure. Accordingly, model brewery sizes were determined for the small, medium and large older breweries as well as defining sizes for a representative existing modern brewery and new, yet to be constructed breweries (new source).

The model breweries are depicted in Table III-1. For the models, the small older brewery produces 2,700 barrels of beer a day, the medium, older model produces 11,000 barrels, the large older brewery produces 22,000 barrels, the existing modern brewery produces 14,000 barrels per day, and the new, yet to be constructed breweries produce either 7,500 or 25,000 barrels per day. Other relevant information concerning the brewery models are also shown on Table III-1.

The financial profiles for each of the model breweries are shown in Table III-2. These profiles were derived from a variety of sources including the Census of Manufactures, Internal Revenue Service, Bureau of Alochol, Tobacco and Firearms, Standard and Poors - Industries Surveys, and discussions with the United States Brewers Association.

C. Investment

The estimated book value and salvage value for each model brewery are shown in Table III-3. Also shown are current assets, current liabilities and net working capital.

1. Book Value of Investment

The estimates of book value of assets were developed from data available published sources as well as data furnished from industry sources. The estimates were computed utilizing a derived estimate of asset value per annual barrels produced. The values per annual barrel were $12.00, $13.33, $15.00, $25.00 and $45.00 for the older small, medium, large existing modern and new source brewery models respectively.

Table III-1. The Malt Beverage Industry, model breweries, descriptive information

Size	Older Small	Older Medium	Older Large	Existing Modern	Small New Source	Large New Source
Barrels per day	2,700	11,000	22,000	14,000	7,500	25,000
Barrels per year	621,000	2,530,000	5,060,000	3,220,000	1,725,000	5,750,000
Days per year	230	230	230	230	230	230
Average number of employees	283	977	1,939	733	265	885
Barrels per man per year	2,194	2,589	2,610	4,393	6,500	6,500

Table III-2. The Malt Beverage Industry, model breweries financial profiles ($000)

Size	Older Small	Older Medium	Older Large	Existing Modern	Small New Source	Large New Source
Barrels/Year (000)	621	2,530	5,060	3,220	1,725	5,750
Number employees	283	977	1,939	733	265	885
Revenue						
Sales ($30/bbl.)	18,630	75,900	151,800	96,600	51,750	172,500
Dried Grains	-- 1/	-- 1/	1,138	725	388	1,294
Total revenue	18,630	75,900	152,938	97,325	52,138	173,794
Costs						
Cost of Materials	9,874	39,088	75,905	48,273	25,860	86,202
Labor	3,037	12,213	26,176	9,830	3,644	12,169
Supplies & Other	4,955	19,498	35,687	25,596	12,522	39,850
Total costs	17,866	70,799	137,768	83,699	42,026	138,221
Cash Earnings	764	5,101	15,170	13,626	10,112	35,573
Less						
Depreciation	298	1,686	4,554	4,830	4,658	15,600
Interest	186	759	1,518	973	521	1,725
Pre-tax Income	280	2,655	9,098	7,823	4,953	18,248
Income Tax	128	1,268	4,361	3,749	2,371	8,753
After-tax Income	152	1,388	4,737	4,07[illegible]	2,582	9,495
Cash Flow	450	3,074	9,291	8,904	7,240	25,095

1/ Assumes the older small and medium model plants disposed of spent grains wet and generated little if any revenue.

Table III-3. The Malt Beverage Industry, estimated capital costs for model breweries.

	Older Small		Older Medium		Older Large		Existing Modern		New Source Small		New Source Large	
	Book	Salvage	Book	Salvage	Book	Salvage	Book	Salvage	Book	Salvage	Book	Salvage
	($1,000)											
Total Fixed Assets	7,452	745	33,725	3,372	75,900	7,590	80,500	8,050	77,625	7,763	258,750	25,875
Current Assets	3,194	3,194	14,454	14,454	32,529	32,529	20,430	20,430	10,948	10,948	36,496	36,496
Current Liabilities	1,774	1,774	9,034	9,034	23,235	23,235	14,593	14,593	7,821	7,821	26,069	26,069
Net Working Capital	1,420	1,420	5,420	5,420	9,294	9,294	5,837	5,837	3,127	3,127	10,427	10,427
Total Invested Capital	8,872	2,165	39,145	8,792	85,194	16,884	86,337	13,887	80,752	10,890	269,177	36,302

2. Salvage Value

The salvage value of breweries will vary widely from plant to plant, depending upon the age of the plant and its condition, the age of the equipment and its condition and the location of the plant. In some instances the salvage value of old, obsolete plants will be equal to site value plus the scrap value of the equipment.

There is a market for certain types of used machinery and equipment, however, this is limited primarily to modification of existing operations as virtually all new plants begin with all new equipment. As no data are available on actual salvage values for breweries and only a limited market exists for used equipment, it is difficult to estimate the salvage value of plant closed due to the added costs of effluent controls. For purposes of analysis, the estimated salvage value has been determined based on 10 percent of the book value brewery's assets.

3. Operating Capital

Current assets, current liabilities and net working capital are also shown in Table III-3. Current assets were determined to represent approximately 17 percent of sales for the small model brewery, 19 percent for the medium brewery and 21 percent for the remaining model breweries.

Current liabilities were estimated utilizing a current ratio (current assets divided by current liabilities) of 1.8 for the older small model, 1.6 for the older medium model brewery and 1.4 for the old large, existing modern and new source model breweries.

D. Model Brewery Capacity and Utilization

As breweries vary from one to another, there appears to be no industry rule by which the model breweries' capacity or utilization can be accurately described. The limiting factor for most breweries are the capacity of their brew kettles or fermentation tanks. In some instances the capacity of the bottling lines may also be a constraint under which the brewery must operate.

Commonly, breweries will operate 5 days per week for approximately 230 days per year. The model breweries were based on these numbers but it should be noted that due to the seasonal trend in the consumption of beer, (Table III-4), it will not be uncommon for breweries to operate 6 to 7 days per week during the peak demand season and only 3 or 4 days per week during the reduced demand period.

Table III-4. The Malt Beverage Industry, monthly production, withdrawals and consumption, 1974.

Month	Beer Produced	Total Withdrawals	Consumption
	1,000 barrels		
January	12,191.6	10,967.0	10,534.8
February	10,984.1	9,871.1	9,719.4
March	13,047.0	11,816.2	11,274.1
April	13,089.6	11,741.2	11,626.0
May	14,713.3	13,758.1	13,485.3
June	15,043.0	13,859.4	13,859.3
July	15,731.2	14,734.3	14,505.5
August	14,610.9	13,886.0	13,915.8
September	12,667.1	12,090.4	12,408.7
October	12,277.2	11,586.1	11,475.6
November	10,711.7	10,419.2	10,625.1
December	11,113.6	10,735.0	10,767.0

The brewing process is basically a batch process (in tanks) and as such breweries can reduce their daily production by using less tanks. For purposes of this analysis, however, it was assumed that when operating the model plants maintained near maximum utilization levels (used all their tanks).

E. Cost Structure of Model Plants

The cost structure for the model breweries were shown in Table III-2. Major items are discussed below.

1. Materials

Materials purchased by breweries represent the greatest expenditure the industry incurs. Included in materials purchased by breweries are: agricultural products such as barley, rice, corn, hops, yeast and corn syrup; packaging and related materials; and other miscellaneous items. Of the purchased materials agricultrual products represented approximately 21 percent of all materials purchased and packaging and related materials represented 64 percent.

2. Labor

Labor costs were estimated using the number of employees per model plant multiplied times an estimate annual costs per employee. Labor costs, as estimated, included indirect expenditures incurred by the brewery for such things as fringe benefits, taxes, etc. The estimated annual employee costs ranged from $11,500 for the older small model brewery to $13,500 for the new source models.

3. Supplies

This cost classification includes miscellaneous other costs as well as expenditures for fuels and indirect costs (i.e., administrative costs).

4. Depreciation and Interest

Depreciation was derived from IRS data and determined to be, expressed as a percent of the book value of assets, 4 percent for the older small brewery, 5 percent for the medium older brewery and 6 percent for the remaining four brewery models. These varying percentages are based on the assumption that the older small and medium breweries are relatively old and have not been up-dated to any great extent. Thus the portion of depreciable assets would vary. The older large brewery model's percentage was determined to be the same as the newer plants as in order to maintain efficient operation the older large plants have had to, at various times, invest relatively large sums of money in remodeling or expanding.

Interest was estimated to be one percent of the annual sales.

5. Total Costs

Material costs ranged from 49.6 percent of total sales for the older large, existing modern and new source models to 53 percent for the older small model. Labor represented the greatest percentage for the older large model, being 17.1 percent. The other two older models labor costs represented approximately 16 percent and the existing modern and new source models' labor costs were 10.1 and 7.0 percent of sales respectively. Finally, expenditures for supplies and other costs were not widely spread with all brewery models ranging between 22.9 and 26.6 percent.

Thus, for the model breweries, total costs for the older small model were estimated to represent 95.9 percent of its annual sales. For the older medium and large models, total costs were estimated to represent 93.3 and 90.1 percent respectively. Total costs for the existing modern model plants were estimated to be 86.0 percent and for the new source plants, 79.5 percent for the large and 80.6 percent for the small.

F. Annual Profits

After-tax income, return on sales, both pre-tax and after-tax and return on total invested capital for the various sized model breweries are depicted in Table III-5. It should be noted that the model breweries were based on average 1973-74 conditions as no later published sources of information were available.

G. Annual Cash Flows

Estimated annual cash flows for the different sizes of models breweries are shown in Table III-6. Cash flow as calculated represents the sum of after-tax income plus depreciation. In the table it is shown in absolute dollars as well as a percent and as a percent of total invested capital.

Table III-5. The Malt Beverage Industry, net income, return on sales, and investment for model breweries

Size of Model Brewery	After-tax Income	Return on Sales		Return on Total Invested Capital	
		Pre-tax	After-tax	Pre-tax	After-tax
	(1,000 Dollars)	Percent			
Older small	152	1.5	0.8	3.2	1.7
Older medium	1,388	3.5	1.8	6.8	3.5
Older large	4,737	6.0	3.1	10.7	5.6
Existing modern	4,074	8.0	4.2	9.1	4.7
New Source Small	2,582	9.5	5.0	6.1	3.2
New Source Large	9,495	10.5	5.5	6.8	3.5

Table III-6. The Malt Beverage Industry, annual cash flows for the model breweries

Size of Model Brewery	Annual Cash Flow (1,000 Dollars)	Cash Flow as a percent of sales (Percent)	Cash Flow as a percent of total invested capital (Percent)
Older Small	450	2.4	5.1
Older Medium	3,074	4.1	7.9
Older Large	9,291	6.1	10.9
Existing Modern	8,904	9.1	10.3
New Source Small	7,240	13.9	9.0
New Source Large	25,095	14.4	9.3

IV. PRICING PATTERNS

Historically the price of beer has shown a constant annual increase. This has been attributable to several factors with the more significant being strong consumer demand and increasing ingredient costs.

A. Price Determination

The determination of prices for malt beverages involves a complex interaction of consumer demand and attitudes, the available supply and to some extent government taxes. While supply and taxes play an important function in influencing the overall determination of prices, consumer demand and attitudes along with breweries' costs dominate the actual price determination process.

1. Consumer Demand and Attitudes

Consumer demand can be defined as the quantity of beer consumers are willing to purchase at the current level of prices. In the past, the demand for beer (consumption) has increased at an annual rate of 3.5 percent. This increase, however, has not been steady as the annual rate has fluctuated between a low of minus 1.1 percent in 1961 to a high of 9.6 percent in 1970 (Table IV-1). During the most recent five years the rate of increase in demand has varied between 1.1 percent and 9.6 percent and has averaged 5.0 percent.

The trend for increased consumption of malt beverages is also evident when the per capita consumption of beer is reviewed (also in Table IV-1). Since 1960, the per capita consumption of beer has increased from 15.4 gallons to the 1974 figure of 20.9 gallons. While between these 15 years, per capita consumption increased by 36 percent, at an annual average rate of 2.2 percent, there were four years in which per capita consumption decreased. Thus when total consumption is viewed with per capita consumption, it becomes obvious that while individuals are drinking more malt beverages, the number of individuals drinking malt beverages, has also increased.

During 1975 the growth rate for the Malt Beverage Industry dropped rather substantially due to a series of wholesale price increases beginning in April 1974 through early 1975. These increases coupled with the recession resulted in reduced consumer incomes and accordingly individual malt beverage consumption did not increase as much as it had previously. The outlook for the future is reasonably good as it appears that consumers incomes will recover and that the number of individuals in the lower age groups, primarily the 20 to 34 year old segment, will increase by 21 percent between 1975 and 1985. This age group is generally regarded as the most frequent users of malt beverages.

Table IV-1. The Malt Beverage Industry, consumption since 1960.

Year	Taxable Withdrawals		Per Capita Consumption[1/]	
	Barrels	Percentage Change from Previous Year	Gallons	Percentage Change from Previous Year
1960	88,928.9	-	15.4	-
1961	87,925.8	(1.1)	14.9	(3.2)
1962	90,693.3	3.1	15.1	1.3
1963	91,493.6	0.9	15.0	(0.7)
1964	96,247.4	5.2	15.6	4.0
1965	100,306.7	4.2	16.0	2.6
1966	101,510.3	1.2	16.1	0.6
1967	107,301.4	5.7	16.8	4.3
1968	107,470.4	0.2	16.7	(0.6)
1969	111,866.6	4.1	17.2	3.0
1970	122,550.2	9.6	18.7	8.7
1971	123,850.4	1.1	18.6	(0.5)
1972	130,740.6	5.6	19.5	4.8
1973	133,960.5	2.5	19.8	1.5
1974	142,312.0	6.2	20.9	5.6

Source: United States Brewers Association.

[1/] Based on total population regardless of age.

Consumer demands and attitudes between individual brands of beer also is an important factor in the determination of the overall demand for malt beverages. In 1974, the five largest brewers accounted for 63.6 percent of the total industry's barrelage[1/]. As stated in Chapter I, these brewers and their respective shares are as follows: Anheuser Busch, 24 percent; Schlitz, 16.1 percent; Pabst, 10.1 percent; Coors, 8.5 percent; and Miller, 7.2 percent. Historically, these five brewers have increased their aggregated share of the beer market from 50.9 percent in 1968 to 55.5 percent in 1972 to the 1974 level of 63.6 percent. According to some sources, the ability to continue expanding their market share by the major brewers is not too surprising as they have experienced an advantage to compete vigorously against smaller brewers in the economic climate of the past two years. Traditionally, it had been thougnt that malt beverage consumers might "trade down" to lower-priced brands of small or regional brewers but according to data compiled by Mr. Frazzano[2/], the clear trend is that higher-priced brands that have been well-advertised continue to do well. Thus, an individual brewer's demand for its beer is dependent on a variety of factors with the most important being beer consumption trends and the image which that brewer's brand maintains in the consumers eye.

2. Supply of Malt Beverages

Given the present levels of consumption, there are very few constraints on the Malt Beverage Industry in its ability to supply enough malt beverages to meet demand. Presently the production of beer is geared toward the expected future demand with consideration for production and distribution lead-times. Some problems may arise if single-plant brewery is operating at full capacity and additional output is needed. But these situations are few and even when they do exist, they usually occur in a regional area. When they do arise, the end results are usually that the consumer purchases another brand of beer.

3. Market Structure

Predicated on the industry concentration among a few large brewers described previously the Malt Beverage Industry can be basically characterized as oligopolistic in its market structure. A strict economic definition of an oligopoly is as follows:

> "A market situation where sellers are so few that the supply offered by any one of them materially affects the market price, and, in which, because sellers are so few, each one is able to

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[1/] Estimates by Joseph C. Frazzano, analyst at Edwards & Hanly, The Wall Street Journal, "Beer Drinkers Continue to Favor Big Brewers Despite the Higher Prices for Premium Brands," July, 18, 1975.

[2/] Ibid.

measure, with a fair degree of accuracy, the effect of his price and production decisions upon similar decisions by his competitors."

In an oligopolistic industry, the pricing decision is subject to a greater uncertainty because of interdependent reaction, i.e., if a price increase does not succeed the firm may experience a substantial loss in sales, profit, and prestige. Therefore, the oligopolistic firm is likely to possess more discretion, and therefore to view the pricing decision in a longer-term perspective and is less likely to attempt to equilibrate supply and demand in the short run. When demand rises, more of the burden of market adjustment will fall on rationing and backlogs of orders, particularly since pruchasers have fewer alternative sources of supply. When demand falls, more of the adjustment will be on lower production instead of cutting of price.[3/]

According to interview studies, a common principle of long term pricing appears to be to set price to earn a target rate of return on capital at a standard volume of output[4/]. Price is altered if the cost of producing the standard output changes, either because of changes in prices of the main inputs or because of technological progress. According to this practice, for a level of output at or above breakeven point, average direct cost per unit is estimated and a given percentage of direct cost is added to direct cost to cover both fixed cost per unit and the desired target rate of return. The price based on this formula may be called the normal price. The actual price that a firm seeks to charge in a given location is the normal price adjusted for freight charges, discounts or allowances and the market strategy (i.e., advertising campaigns and "specials") for that area.

The firms that ordinarily set the prices as price leaders usually have cost advantages based on location and scale and are usually large in terms of their local market share. Other firms that have less of a cost advantage and produce lower volumes of output will charge an actual price close to that of the actual prices charged by the price leaders, which is often lower than the price leaders' prices. The normal prices determined by the price leaders in a given location are often the price at which they presumably maximizes their profits (or minimizes their losses).[5/]

[3/] Eckstein, Otto and From, Gary, "The Price Equation," The American Economic Review, December, 1968.

[4/] Kaplan, A.D.H., Dirlam, J.B., and Lazzilotti, R.R., Pricing is Big Business - A Case Approach, 1958.

[5/] Environmental Protection Agency, Economic Analysis of Proposed Effluent Guidelines Cement Industry, August, 1973.

Finally, it should be noted that the market structure also may vary from state to state. This is primarily the result of various state and local controls over the sale of alcoholic beverages. Brewers also must meet various federal controls which indirectly may also effect the basic nature of the market structure.

B. Price Trends

The prices of malt beverages have, traditionally, remained relatively constant with only occasional increases to keep pace with inflation. The brewers could afford to do this for many years as their gained efficiency in production due to technological advances usually offset increased material and labor costs. (Note, the smaller breweries often could not afford to implement these changes and as a result were forced out of business.) Thus most breweries have often been characterized as being able to maintain respective profits without increasing their prices substantially. This trend has been experienced for several years and as can be seen in Table IV-2, the malt beverage wholesale price index increased by only 14 percent between 1965 and 1973, a period of 9 years.

In 1974, however, brewers began experiencing substantial increases in material costs particularly for agricultural products and containers. The price of metal cans rose 21 percent in the first half of 1974 and another 13 percent in the latter half. In the first quarter of 1975, metal can prices increased another 7 percent. Glass container prices rose 16 percent in 1974 and malt, which in 1972 constituted about 8 percent of total direct costs, rose by 70 percent.

As a result of the increased costs being incurred by the brewers, the average annual prices paid for malt beverages rose by over 9 percent between 1973 and 1974, with the December, 1974 wholesale price index for malt beverages being nearly 17 percent higher than the average index for 1973. According to Standard and Poors, these price increases should level off in 1975 as there appears to be improvement in the prices of the major purchased ingredients.

Finally, it should be noted that brewer's price their product differently for different container types. As can be seen in Table IV-3, the majority of beer is sold in metal cans with one-way bottles representing the next most popular form. Recent governmental action has considered banning one-way beverage containers and if such a ban was imposed, the industry may see an additional need to again increase prices.

Table IV-2. The Malt Beverage Industry, Wholesale price index for selected products

Year	Malt Beverages	Beer-Bottle	Beer Can	Barley No. 3, Minn.	Corn No. 2, Chicago	Malt
	1967 = 100					
1965	97.9	97.5	98.4	99.1	100.2	N.A.
1966	98.4	98.1	98.9	104.3	105.4	N.A.
1967	100.0	100.0	100.0	100.0	100.0	100.0
1968	101.4	101.8	101.1	91.1	88.0	97.1
1969	103.2	104.5	101.7	83.4	95.3	97.1
1970	106.0	108.4	103.2	88.0	105.4	94.6
1971	110.2	113.8	105.7	91.6	107.8	98.5
1972	110.8	114.5	106.3	92.1	100.8	94.2
1973	111.6	115.0	107.4	138.7	172.3	121.3
1974	121.9	126.6	116.1	214.0	248.0	206.2
January	114.9	119.0	109.9	199.6	225.6	163.2
February	114.9	118.6	110.4	237.8	234.8	171.4
March	116.1	119.9	111.3	216.6	231.9	177.2
April	118.5	123.1	112.8	131.6	204.8	190.6
May	117.4	121.9	111.9	176.6	208.2	204.2
June	118.7	123.0	113.3	193.6	222.5	204.2
July	122.5	127.3	116.5	189.0	245.6	204.2
August	125.3	130.4	118.9	239.5	290.2	204.2
September	125.6	130.5	119.5	196.2	269.6	221.4
October	129.7	135.7	122.2	259.0	291.2	237.4
November	129.4	134.7	122.9	282.4	275.2	237.4
December	130.2	135.7	123.5	246.3	276.3	258.8

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

Table IV-3. The Malt Beverage Industry, tax paid removals of malt beverages by type of container

Year	Draught Sales	Packaged Removals				Total Removals
		Metal Cans	One-Way Bottles	Returnable Bottles	Total Packaged	
1967	16.3	36.8	17.6	29.3	83.7	100.0
1968	15.6	40.5	17.7	26.2	84.4	100.0
1969	14.9	41.7	18.7	24.7	95.1	100.0
1970	14.1	44.7	18.9	22.3	85.9	100.0
1971	13.6	48.4	18.1	19.1	86.4	100.0
1972	13.3	50.3	18.2	18.2	86.7	100.0
1973	13.1	53.0	18.3	15.6	86.9	100.0
1974	12.5	54.2	18.4	14.9	87.5	100.0

Source: United States Brewers Association

V. EFFLUENT CONTROL COSTS

The effluent control system requirements and costs depicted in this chapter were provided by the Effluent Guidelines Division of the Environmental Protection Agency as provided by the technical contractor, Environmental Science Engineering. The recommended and optional treatment alternatives for the model breweries were the same as presented in the Development Document[1/]. However, the associated investment and annual costs have been revised by the technical contractor to reflect the model breweries production characteristics previously described in Chapter III.

A. Pollution Control Requirements

Three effluent control levels for point source categories (direct dischargers) were originally considered as proposed by EPA:

BPT - Best Practicable Control Technology Currently Available, to be achieved by July, 1977.

BAT - Best Available Pollution Control Technology Economically Achievable, to be achieved by July, 1983.

NSPS - New Source Performance Standards were recommended to be equal to the BAT control technology but the standards were based on an "average of the best" raw waste load data applying to that technology. These apply to any source for which construction starts after the publication of the proposed regulations.

Raw waste loads for the existing and new source model breweries are shown in Table V-1. From this table it can be seen that variation in flow, biological oxygen demand (BOD) and suspended solids (SS) do exist with the BOD and SS concentrations being higher for the modern and new source breweries than for the older existing breweries. This is explained by the reduced consumption of water by the newer breweries which therefore reduces the dilution of discharged brewery wastes. The concentrations of fats, oils and grease (FOG) are not significant. The recommended effluent limitation guidelines for the model breweries as proposed in the Development Document are shown in Table V-2.

1/ Development Document for Effluent Limitation Guidelines and New Source Performance Standards, Miscellaneous Foods and Beverages, Point Source Category, Draft Report prepared by Environmental Science and Engineering, Inc. for the U.S. Environmental Protection Agency.

Table V-1. Raw waste loads for model breweries

	Production bbl/day	Flow MGD	BOD mg/l	SS mg/l	FOG mg/l
Existing					
Small-older	2,700	0.921	1,710	667	N.A.
Medium-Older	11,000	3.750	1,710	667	N.A.
Large-Older	22,000	7.500	1,700	670	N.A.
Modern	14,000	2.350	1,940	713	N.A.
New Source					
Small	7,500	1.040	1,900	624	N.A.
Large	25,000	3.500	1,900	624	N.A.

Source: Effluent Guidelines Division, Environmental Protection Agency.

Table V-2. Recommended effluent limitation guidelines for the malt beverage industry.

	BPT		BAT		
	Older	Modern	Older	Modern	NSPS
	----------kg/cu. m beer produced----------				
BOD					
Max 30 day ave.	0.55	0.28	0.27	0.14	0.099
Max Day	1.40	0.70	0.67	0.35	0.257
SS					
Max 30 day ave.	0.76	0.39	0.38	0.19	0.139
Max Day	1.90	0.97	0.95	0.48	0.361

Source: Development Document, Environmental Protection Agency.

B. Discharge Status of the Industry

The Malt Beverage Industry can be characterized as consisting of breweries which predominately discharge their wastewaters to municipal treatment facilities. In fact, of the 94 breweries which are presently authorized to operate, only three breweries are known to treat their own effluents. Of these three known direct discharges, (according to EPA), two meet the proposed BPT standards and the remaining brewery meets the proposed BAT standards.

C. Pollution Control Costs

The cost estimates as provided by EPA, in 1972 dollars, and the components of the recommended and optional (if considered desirable) treatment alternatives for the model breweries are shown in Tables V-5 through Table V-12. From the information provided, total investment and annual costs were inflated so as to be consistent with the cost associated with the models. Investment and annual costs were inflated from 1972 to 1974 dollars by the use of the Engineering News Record Construction Cost Index (1.205 times the provided EPA costs). The resulting treatment costs in 1974 dollars for both the recommended and optional treatment alternatives are summarized in Table V-3.

Investment costs include costs for construction, land, engineering and a contingency fee. Annual operating costs include expenditures for labor, power, chemicals, maintenance and supplies. Total yearly costs include annual operating costs, depreciation and interest. Depreciation was based on a 20 year depreciable life for the pollution controls. Interest was based on a 10 percent rate which was then computed as 10 percent of one half the total pollution control investment costs.

Total investment costs for pollution controls expressed as a percent of book value of the model breweries fixed assets and the total annual cost expressed as a percent of annual sales are depicted in Table V-4.

Table V-3. Effluent control costs for model breweries (1974 dollars)

Model	Treatment Alternative	BPT Investment Costs	BPT Annual Operating Costs	BPT Total Yearly Costs	Incremental BAT Investment Costs	Incremental BAT Annual Operating Costs	Incremental BAT Total Yearly Costs	NSPS Investment Costs	NSPS Annual Operating Costs	NSPS Total Yearly Costs
		$1,000								
Existing										
Small-Older	Rec.	1,868	395	582	60	8	14	-	-	-
	Opt.	2,836	1,242	1,526	61	9	15	-	-	-
Medium-Older	Rec.	6,018	1,315	1,917	242	34	58	-	-	-
	Opt.	10,602	4,969	6,029	242	35	59	-	-	-
Large-Older	Rec.	13,539	2,543	3,897	484	70	118	-	-	-
	Opt.	21,153	9,847	11,962	484	70	118	-	-	-
Modern	Rec.	5,059	951	1,457	171	24	41	-	-	-
	Opt	7,573	3,540	4,297	172	25	42	-	-	-
New Source										
Small	Rec.	-	-	-	-	-	-	2,231	430	653
	Opt.	-	-	-	-	-	-	3,555	1,575	1,930
Large	Rec.	-	-	-	-	-	-	7,001	1,236	1,936
	Opt.	-	-	-	-	-	-	11,654	5,226	6,391

Table V-4. Investment costs and yearly costs expressed as a percent of model breweries' investment and sales

Model	Treatment Alternative	BPT Total Investment as % of Book Value	BPT Total Yearly Costs as % of Annual Sales	BAT Total Investment as % of Book Value	BAT Total Yearly Costs as % of Annual Sales	NSPS Total Investment as % of Book Value	NSPS Total Yearly Costs as % of Annual Sales
		(%)					
Existing							
Small-Older	Rec.	25.1	3.1	25.9	3.2	-	-
	Opt.	38.1	8.2	38.9	8.3	-	-
Medium-Older	Rec.	17.8	2.5	18.6	2.6	-	-
	Opt.	31.4	7.9	32.2	8.0	-	-
Large-Older	Rec.	17.8	2.5	18.5	2.6	-	-
	Opt.	27.9	7.8	28.5	7.9	-	-
Modern	Rec.	6.3	1.5	6.5	1.5	-	-
	Opt.	9.4	4.4	9.6	4.5	-	-
New Source							
Small	Rec.	-	-	-	-	2.9	1.3
	Opt.	-	-	-	-	4.6	3.7
Large	Rec.	-	-	-	-	2.7	1.1
	Opt.	-	-	-	-	4.5	3.7

Table V-5. Itemized cost summary for malt beverages (older) alternative A 17-V (BPCTCA)

	Small	Medium	Large
Investment Costs			
Construction	1,245,110	4,039,220	9,139,450
Land	56,310	147,270	268,220
Engineering	124,510	403,920	913,940
Contingency	124,510	403,920	913,940
Total	1,550,440	4,994,330	11,235,550
Yearly Operating Costs			
Labor	74,970	74,970	74,970
Power	187,290	762,680	1,519,500
Chemicals	31,290	127,110	251,690
Maintenance & Supplies	34,170	126,120	264,510
Total	327,720	1,090,880	2,110,670
Total Yearly Costs			
Yearly Operating Cost	327,720	1,090,880	2,110,670
Yearly Investment Cost Recovery	62,020	199,770	449,420
Depreciation	74,710	242,350	548,370
Total	464,450	1,533,000	3,108,460

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 97.0 percent BOD reduction.

Treatment Modules:

B1.. Control House
B... Pumping Station
E1.. Screening & Grit Chamber
C... Equalization Basin
F... Acid Neutralization
H... Nitrogen Addition
K... Activated Sludge
Q... Sludge Thickener
R... Aerobic Digestor
S... Vacuum Filtration
Y... Holding Tank

Table V-6. Itemized cost summary for malt beverages (older)
Alternative A 17-II (BPCTCA-OPTION)

	Small	Medium	Large
Investment Costs			
Construction	1,887,190	7,055,280	14,090,470
Land	21,610	79,930	156,430
Engineering	188,720	705,630	1,409,050
Contingency	188,720	705,630	1,409,050
PVC Liner	67,600	251,060	489,500
Total	2,353,840	8,798,530	17,554,480
Yearly Operating Costs			
Labor	24,990	24,990	24,990
Power	906,060	3,697,120	7,350,250
Chemicals	16,350	66,240	130,810
Maintenance & Supplies	82,300	333,650	664,230
PVC Liner	1,120	1,800	1,800
Total	1,030,820	4,123,800	8,172,080
Total Yearly Costs			
Yearly Operating Cost	1,030,820	4,123,800	8,172,080
Yearly Investment Cost Recovery	94,150	351,940	702,180
Depreciation	116,610	435,930	869,900
Total	1,241,580	4,911,670	9,744,160

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste-water treatment chain design efficiency... 97.0 percent BOD reduction.

Treatment Modules:

B... Pumping Station
E1.. Screening & Grit Chamber
C... Equalization Basin
F... Acid Neutralization
H... Nitrogen Addition
L... Aerated Lagoon

Table V-7. Itemized cost summary for malt beverages (older)
Alternative A 17-VI (BATEA)

	Small	Medium	Large
Investment Costs			
Construction	1,286,700	4,206,570	9,474,150
Land	56,310	147,270	268,220
Engineering	128,670	420,660	947,410
Contingency	128,670	420,660	947,410
Total	1,600,350	5,195,160	11,637,190
Yearly Operating Costs			
Labor	74,970	74,970	74,970
Power	193,800	788,890	1,571,910
Chemicals	31,290	127,110	251,690
Maintenance & Supplies	34,850	128,870	270,010
Total	334,910	1,119,840	2,168,580
Total Yearly Costs			
Yearly Operating Cost	334,910	1,119,840	2,168,580
Yearly Investment Cost Recovery	64,010	207,810	465,490
Depreciation	77,200	252,390	568,450
Total	476,120	1,580,040	3,202,520

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 98.5 percent BOD reduction.

Treatment Modules:

B1.. Control House
B... Pumping Station
E1.. Screening & Grit Chamber
C... Equalization Basin
F... Acid Neutralization
H... Nitrogen Addition
K... Activated Sludge
Q... Sludge Thickener
R... Aerobic Digestor
S... Vacuum Filtration
Y... Holding Tank
N... Dual Media Pressure Filtration

Table V-8. Itemized cost summary for malt beverages (older)
Alternative A 17-II (BATEA-OPTION)

	Small	Medium	Large
Investment Costs			
Construction	1,928,780	7,223,620	14,425,160
Land	21,610	79,930	156,430
Engineering	192,880	722,360	1,442,520
Contingency	192,880	722,360	1,442,520
PVC Liner	67,600	251,060	489,500
Total	2,403,750	8,999,330	17,956,112
Yearly Operating Costs			
Labor	24,990	24,990	24,990
Power	912,570	3,723,330	7,402,670
Chemicals	16,350	66,240	130,810
Maintenance & Supplies	82,980	336,390	669,720
PVC Liner	1,120	1,800	1,800
Total	1,038,010	4,152,750	8,229,990
Total Yearly Costs			
Yearly Operating Cost	1,038,010	4,152,750	8,229,990
Yearly Investment Cost Recovery	96,150	359,970	718,240
Depreciation	119,110	445,970	889,980
Total	1,253,270	4,958,690	9,838,210

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 98.5 percent BOD reduction.

Treatment Modules:

B... Pumping Station
E1.. Screening & Grit Chamber
C... Equalization Basin
F... Acid Neutralization
H... Nitrogen Addition
L... Aerated Lagoon
N... Dual Media Pressure Filtration

Table V-9. Itemized cost summary for malt beverages (existing modern) Alternative A 16-V (BPCTCA) and Alternative A 16-VI (BATEA)

	BPT	BAT
Investment Costs		
Construction	3,413,070	3,531,830
Land	102,290	102,290
Engineering	341,310	353,150
Contingency	341,310	353,150
Total	4,197,980	4,340,120
Yearly Operating Costs		
Labor	74,970	74,970
Power	532,530	551,010
Chemicals	88,370	88,370
Maintenance & Supplies	93,280	95,220
Total	789,150	809,570
Total Yearly Costs		
Yearly Operating Cost	789,150	809,570
Yearly Investment Cost Recovery	167,920	173,600
Depreciation	204,780	211,890
Total	1,161,850	1,195,060

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 97.4 percent BOD reduction.

Treatment Modules:

BPT	BAT
B1.. Control House	B1.. Control House
B... Pumping Station	B... Pumping Station
E1.. Screening & Grit Chamber	E1.. Screening & Grit Chamber
C... Equalization Basin	C... Equalization Basin
F... Acid Neutralization	F... Acid Neutralization
H... Nitrogen Addition	H... Nitrogen Addition
K... Activated Sludge	K... Activated Sludge
Q... Sludge Thickener	Q... Sludge Thickener
R... Aerobic Digestor	R... Aerobic Digestor
S... Vacuum Filtration	S... Vacuum Filtration
Y... Holding Tank	Y... Holding Tank
	N... Dual Media Pressure Filtration

Table V-10. Itemized cost summary for malt beverages (existing modern) Alternative A 16-II (BPCTCA-OPTION) and Alternative A 16-III (BATEA-OPTION)

	BPT	BAT
Investment Costs		
Construction	5,040,830	5,159,290
Land	55,560	55,560
Engineering	504,080	515,930
Contingency	504,080	515,930
PVC Liner	180,420	180,420
Total	6,284,970	6,427,130
Yearly Operating Costs		
Labor	24,990	24,990
Power	2,630,470	2,648,950
Chemicals	44,960	44,960
Maintenance & Supplies	236,070	238,020
PVC Liner	1,420	1,420
Total	2,937,910	2,958,340
Total Yearly Costs		
Yearly Operating Cost	2,937,910	2,958,340
Yearly Investment Cost Recovery	251,400	257,090
Depreciation	311,470	318,580
Total	3,500,780	3,534,010

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 97.4 percent BOD reduction.

Treatment Modules:

BPT

B... Pumping Station
E1.. Screening & Grit Chamber
C... Equalization Basin
F... Acid Neutralization
H... Nitrogen Addition
L... Aerated Lagoon

BAT

B... Pumping Station
E1.. Screening & Grit Chamber
C... Equalization Basin
F... Acid Neutralization
H... Nitrogen Addition
L... Aerated Lagoon
N... Dual Media Pressure Filtra'n

Table V-11. Itemized cost summary for malt beverages (New Source) Alternative A 18-XI (NSPS, Small) and A 16-XI (NSPS, Large)

	Small	Large
Investment Costs		
Construction	1,492,560.00	4,725,590.00
Land	60,170.00	139,190.00
Engineering	149,260.00	472,560.00
Contingency	149,260.00	472,560.00
Total	1,851,250.00	5,809,900.00
Yearly Operating Costs		
Labor	74,970.00	74,970.00
Power	212,730.00	725,340.00
Chemicals	35,390.00	115,690.00
Maintenance & Supplies	33,670.00	109,680.00
Total	356,760.00	1,025,680.00
Total Yearly Costs		
Yearly Operating Cost	356,760.00	1,025,680.00
Yearly Investment Cost Recovery	74,050.00	232,400.00
Depreciation	89,550.00	283,540.00
Total	520,360.00	1,541,620.00

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 98.7 percent BOD reduction.

Treatment Modules:

B1.. Control House
B... Pumping Station
E1.. Screening & Grit Chamber
C... Equalization Basin
F... Acid Neutralization
H... Nitrogen Addition
K... Activated Sludge
Q... Sludge Thickener
R... Aerobic Digestor
S... Vacuum Filtration
Y... Holding Tank
N... Dual Media Pressure Filtration

Table V-12. Itemized cost summary for malt beverages (New Source - Option) Alternative A 18-X (NSPS-Small and A 16-X (NSPS - Large)

	Small	Large
Investment Costs		
Construction	2,367,720.00	7,771,730.00
Land	26,010.00	81,190.00
Engineering	236,770.00	777,170.00
Contingency	236,770.00	777,170.00
PVC Liner	83,340.00	264,340.00
Total	2,950,610.00	9,671,600.00
Yearly Operating Costs		
Labor	24,990.00	24,990.00
Power	1,162,790.00	3,920,130.00
Chemicals	18,630.00	59,090.00
Maintenance and Supplies	99,010.00	331,220.00
PVC Liner	1,260.00	1,410.00
Total	1,306,680.00	4,336,840.00
Total Yearly Costs		
Yearly Operating Cost	1,306,680.00	4,336,840.00
Yearly Investment Cost Recovery	118,020.00	386,860.00
Depreciation	146,230.00	479,520.00
Total	1,570,930.00	5,203,220.00

Source: Effluent Guidelines Division, Environmental Protection Agency

Itemized cost summary for waste water treatment chain design efficiency ... 98.7 percent BOD reduction

Treatment Modules:

B... Pumping Station
E1.. Screening & Grit Chamber
C... Equalization Basin
F... Acid Neutralization
H... Nitrogen Addition
L... Aerated Lagoon
N... Dual Media Pressure Filtration

VI ECONOMIC IMPACT ANALYSIS

The impacts considered in this analysis are as follows:

A. Price effects
B. Financial effects
C. Production effects
D. Other effects

The resulting direct impacts from the imposition of effluent controls on the Malt Beverage Industry for existing breweries are expected to be negligable as all but three of the industry's breweries discharge their effluent to municipal treatment systems. The impacts on the three direct dischargers are expected to be slight as according to EPA all the plants presently meet the proposed BPT standards and one meets BAT. Thus the potential direct impacts will primarily be limited to those plants which are yet to be constructed and will discharge their effluent to navigable waters (hereafter referred to as New Source). While the direct impacts are limited primarily to the new source breweries, there exists the possibility that existing breweries may be indirectly impacted due to the imposition of effluent controls. These indirect impacts stem from existing breweries' experiences of increasing changes for municipal waste treatment (described in Chapter II) which have instigated some breweries to explore the alternative of constructing their own treatment system and breaking their dependence on the municipal system. As municipal charges increase, in some cases, this may become a viable alternative.

Thus this impact analysis will address itself to both the direct (new source) and indirect (existing) impacts described above. These impacts are analyzed for the model breweries described in Chapter III. Impacts are based on the production and financial characteristics of the model breweries and the pollution control costs as presented in Chapter V.

It should be noted that in Chapter V, two sets of control costs were described for each model; the recommended treatment system and an optional system. For purposes of this impact analysis, only the recommended treatment system will be utilized. This treatment alternative consists of an activated sludge system and according to cost estimates furnished by the EPA, is considerably less expensive than the optional aerated lagoon system.

A. Price Effects

1. Required Price Increases

An implicit indication of the expected price effects of effluent controls used in this report is the amount of sales price increase necessary to

maintain a brewery's profitability, after effluent control expenditures, at a level the same as the same plant without the control expense. The method of computation was described in Part I, Chapter II (Methodology), Section F, under subsection 2 of this report. The ability of breweries to pass on such price increases is evaluated in this section of the report.

The amounts of sales price increases necessary to offset the estimated effluent control costs for the model breweries range from 0.8 percent to 3.4 percent and are shown in Table VI-1. For the existing models, both the required price increases for BPT and BAT are shown. For the new source breweries, the required price increases to offset NSPS standards are shown. Also shown are sensitivity ranges of required price increases when control costs vary plus or minus 20 percent from the original estimated cost.

2. Expected Price Increases

Although Table VI-1 illustrates what the model breweries would require to offset expenditures for effluent controls, it is doubtful breweries would be able to pass on the additional expense to customers in the form of higher prices. This is due to the (1) very limited number of direct dischargers in the industry and (2) the market characteristics of the industry.

As discussed previously, all but three known breweries discharge directly to municipal facilities. Of the three known direct dischargers, the largest is already meeting BAT standards while the remaining two already meet BPT standards.

As a result, if a direct discharger attempted to pass their added costs forward, they would meet buyer resistance and the buyers could easily switch to other brands.

Municipal charges have and are expected to continue to increase. As a result, the direct dischargers and new source breweries will be able to pass on incremental cost increases equivalent to the new general price equilibrium established by the municipal dischargers. If these end-of-pipe treatment costs extend the general price level, the direct dischargers will have to absorb these added costs in the form of reduced earnings.

In some local situations, a brewery may find it economically attractive to switch from a municipal system to their own end-of-pipe system as a result of increased municipal user charges or anticipated increases in user charges. The price increase required will not be attributed to the proposed Guidelines but would be the result of future municipal cost increases. The extent of this impact is beyond the scope of this report.

The market characteristics of the Malt Beverage Industry may provide some opportunities for impacted plants to pass on effluent control costs but these will be limited to those plants which by location or production efficiency can establish a competition advantage over other breweries.

Table VI-1. The Malt Beverage Industry, Required Price Increases Necessary to Offset Control Costs.

Model Brewery	Barrels Produced Per Day	REQUIRED PRICE INCREASE Percent Proposed Control Costs 80%	100%	120%
		----------PERCENT----------		
EXISTING				
Small-Older	2,700			
BPT		1.7	2.2	2.9
BAT		1.7	2.2	2.9
Medium-Order	11,000			
BPT		2.6	3.3	3.9
BAT		2.6	3.3	4.0
Large-Older	22,000			
BPT		2.7	3.3	4.0
BAT		2.7	3.4	4.1
Modern	14,000			
BPT		1.6	2.0	2.3
BAT		1.6	2.0	2.4
NEW SOURCE				
Small	7,500			
NSPS		2.7	3.4	4.1
Large	25,000			
NSPS		1.1	1.3	1.6

In other words, an impacted brewery which can produce and/or deliver its malt beverages for lower prices than its competitors, may be able to utilize its greater margin to absorb control costs and still remain competitive.

However for those impacted breweries (either directly or indirectly) which cannot achieve a competitive advantage, it is probable that such breweries will not be able to pass on the required price increases. As discussed in earlier chapters of this report, the Malt Beverage Industry has experienced relatively low returns and as shown below in Section B, Financial Effects, the high costs of new source construction are not offset by significant lower operating costs through improved technology. This results in new source breweries having the same to lower income ratios then existing breweries and negative net present values of cash flow when discounted at the estimated industry after-tax cost of capital (8.8 percent).

Therefore, price increases by new source breweries to offset the costs of effluent controls and the high costs of construction are not expected to occur. In the following analysis, no price change was assumed to occur as a result of the entire industry increasing prices to offset effluent controls and accordingly the economic viability of the breweries was based on financial characteristics of the models without added revenue stemming from aggregated effluent controls effluent on industry prices.

B. Financial Effects

Based on model brewery profiles described previously and costs of pollution control provided by EPA, the following financial indicators were computed under baseline (without pollution controls) and with pollution controls:

1. After-tax income
2. After-tax return on sales
3. After-tax return on invested capital
4. Cash flow and cash flow as a percent of invested capital
5. Net present value

The above were computed according to the discounted cash flow (DCF) and return on investment (ROI) procedures outlined in the methodology.

Furthermore, a sensitivity analysis was performed using pollution control cost estimates at levels of 80 percent and 120 percent of the costs provided by EPA.

The results of the model brewery analysis of the proposed effluent guidelines are summarized in Tables VI-2 and VI-3 for the existing and new source models respectively. These results are discussed below.

Table VI-2. Key Values of Impact Analysis for Malt Beverages: BPT and BAT.

Key Value	Size	Baseline Case	Percent of Proposed Control Costs					
			BPT			BAT		
			80%	100%	120%	80%	100%	120%
	bbl/day							
After Tax Income ($000)	S 2,700	152	-185	-301	-418	-196	-315	-434
	M 11,000	1,388	590	391	191	566	361	155
	L 22,000	4,737	3,116	2,711	2,306	3,067	2,650	2,232
	MD 14,000	4,074	3,468	3,317	3,165	3,451	3,296	3,140
After Tax Return on Sales (%)	S 2,700	0.8	-1.0	-1.6	-2.2	-1.1	-1.7	-2.3
	M 11,000	1.8	0.8	0.5	0.3	0.7	0.5	0.2
	L 22,000	3.1	2.0	1.8	1.5	2.0	1.7	1.5
	MD 14,000	4.2	3.6	3.4	3.3	3.5	3.4	3.2
After Tax Return on Inv. Cap. (%)	S 2,700	1.7	-1.9	-3.1	-4.2	-2.0	-3.2	-4.3
	M 11,000	3.5	1.4	0.9	0.4	1.4	0.9	0.4
	L 22,000	5.6	3.4	2.9	2.5	3.4	2.9	2.4
	MD 14,000	4.7	3.9	3.7	3.5	3.9	3.7	3.5
Est. Cash Flow ($000)	S 2,700	450	187	90	-8	178	79	-21
	M 11,000	3,074	2,517	2,378	2,239	2,502	2,360	2,217
	L 22,000	9,291	8,212	7,942	7,672	8,182	7,905	7,627
	MD 14,000	8,904	8,501	8,400	8,299	8,490	8,387	8,283
Cash Flow as % of Inv. Cap.	S 2,700	5.1	2.1	1.0	-0.1	2.0	0.9	-0.2
	M 11,000	7.9	6.4	6.1	5.7	6.4	6.0	5.7
	L 22,000	10.9	9.6	9.3	9.0	9.6	9.3	9.0
	MD 14,000	10.3	9.8	9.7	9.6	9.8	9.7	9.6
Net Present Values ($000)	S 2,700	550	-2,157	-2,995	-4,114	-2,197	-3,071	-4,204
	M 11,000	9,511	628	-1,593	-3,813	465	-1,797	-4,059
	L 22,000	38,108	19,752	15,163	10,574	19,421	14,749	10,077
	MD 14,000	31,670	24,808	23,093	21,378	24,692	22,947	21,203

Table VI-3. Key Values of Impact Analysis for Malt Beverages: NSPS

Key Value	Size	Baseline Case	Percent of Projected Control Cost 80%	100%	120%
	bbl/day				
After Tax Income ($000)	L 25,000	9,495	8,690	8,489	8,287
	S 7,500	2,582	1,894	1,723	1,551
After Tax Return on Sales (%)	L 25,000	5.5	5.0	4.9	4.8
	S 7,500	5.0	3.6	3.3	3.0
After Tax Return on Inv. Cap. (%)	L 25,000	3.5	3.2	3.1	3.0
	S 7,500	3.2	2.3	2.1	1.9
Est. Cash Flow ($000)	L 25,000	25,095	24,570	24,439	24,307
	S 7,500	7,240	6,642	6,492	6,342
Cash Flow as % of Inv. Cap.	L 25,000	9.3	9.1	9.1	9.0
	S 7,500	9.0	8.2	8.0	7.9
Net Present Values ($000)	L 25,000	-113,508	-122,690	-124,985	-127,280
	S 7,500	-36,719	-43,709	-45,457	-47,204

1. After Tax Income

As shown in Table VI-2, the imposition of BPT standards severely reduces the after-tax income in the existing small older brewery model from $152,000 in the baseline case to -$301,000 after controls. The after-tax income of the existing medium older brewery is reduced by nearly $1 million; the existing large older brewery by over $2 million. The after-tax income for the existing modern brewery is reduced, but not to the critical levels as for the existing older breweries.

BAT standards further depress profits, however, the relative significances of these additional reductions are nominal compared to those incurred by the BPT standards.

The imposition of NSPS on new source breweries effects after-tax income in that the standards reduce the small new source brewery's profits by 33.3 percent and the large new source brewery's profits by 10.6 percent (Table VI-3).

2. Return on Sales

The after-tax return on sales for the existing model breweries were also shown in Table VI-2. Basically the returns follow the same general pattern as after-tax income. As was explained in Chapter II, Financial Profile, the Malt Beverage Industry has experienced a deterioration in earnings in recent years. This deterioration is exemplified in that the baseline model breweries' after-tax return on sales are relatively low. The imposition of BPT standards with the following BAT standards contribute significantly to the further deterioration of returns.

The NSPS do not significantly affect the after-tax return on sales of the large new source model as its after-tax return on sales decreases by 0.6 percent from 5.5 percent to 4.9 percent (Table VI-3). The new source small brewery, however, incurs impacts which reduce its after-tax return on sales by 1.7 percent, from 5.0 percent to 3.3 percent.

3. Return on Invested Capital

As shown in Tables VI-2 and VI-3 for the existing and new source models, pre controls after-tax returns on invested capital range from 1.7 to 5.6 percent for the existing models and from 3.2 to 3.5 for the new source model breweries. As is the trend in most food related industries, the return on invested capital is substantially lower for the small breweries than for the medium, large and modern breweries.

After the imposition of BPT standards, the after-tax returns on invested capital declined by 1.0 to 4.8 percent with the most significant impact occurring on the small brewery. The additional requirement of BAT standards cause no further decline in the existing model returns except for the small brewery which revealed its return on invested capital declined by another 0.1 percent.

For the new source model breweries, the imposition of NSPS reduced the small new source model brewery's return by 34 percent from 3.2 percent to 2.1 percent. The large new source plant declined slightly from 3.5 percent in the baseline case to 3.1 percent in the after controls case.

4. Cash Flow

Estimated cash flows (after-tax income plus depreciation on total invested capital for the model breweries) are shown in Tables VI-2 and VI-3 for the existing and new source models respectively. In the baseline case, cash flows range from 5.1 to 10.9 percent for the existing models and 9.0 to 9.3 for the new source models. For the ranges, the higher percentages correspond to the large existing and new source breweries and the lower percents to the small models.

After the imposition of BPT, BAT and NSPS standards, all cash flows remain positive. However, the existing small model's cash flow is reduced to 1.0 percent for BPT and 0.9 percent for BAT.

5. Net Present Values

The computed net present values (NPV) for the existing model breweries indicate that in the baseline case, all NPV's were positive. The imposition of BPT reduces the NPV's such that the existing large and modern remain positive, however the existing small and medium turn negative. This suggests that the small and medium existing breweries would have difficulty handling the cost of effluent controls and may be forced to shut down, particularly if a large debt financing for pollution control was necessary.

The imposition of BAT standards further reduces the NPV, however, the existing large and modern still remain positive and thus are considered still to be viable operations.

The NPV's for the NSPS model breweries are negative both before and after the imposition of controls (Table VI-3). As discussed in Part I, Chapter II, Methodology, large negative net present values would cause most firms to discard plans for building a new brewery. Since the NPV are negative before controls are imposed, it is concluded that very few breweries, classified as new source, would be built if it assumed the same characteristics as those of the new source models. However, it should be noted that the negative net present value indicates that the associated brewery

would earn less than the estimated 8.8 percent industry cost of capital. Thus, a NSPS brewery may be built in the future provided the firm has been well established in the industry, has or has expectations to capture a major market share at profitable prices and has an excellent financial performance record (e.g. lower cost of capital). Should a NSPS brewery be built it can expect its NPV to decline due to the requirements for pollution controls.

C. Production Effects

Due to the limited number of direct dischargers in the Malt Beverage Industry, it is doubtful that the current levels of production achieved by the existing breweries would be affected by the imposition of effluent controls. However, while new source performance standards will not affect current production levels, future growth in the industry could be affected by the imposed NSPS controls. This is because point source category firms could be deterred from entry due to the differential impacts of waste treatment requirements.

However, as described in the above financial description, future growth from new sources is expected to be restrained by the high costs of construction not being offset by lower costs of production. In addition, new sources may be further restrained by their limited ability to pass through the additional costs of controls, assuming the rest of the industry does not pass on any additional municipal charges.

This does not completely rule out the possibilities for new sources. It is foreseeable that some operations, those primarily representing established brands and which could be classified as optimal producers, could construct and successfully operate a new brewery (in fact, two such new breweries are scheduled for completion this year (1976)).

D. Other Effects

Other types of economic impact such as employment, community and balance of payments deficit effects are normally assessed when there are plant closures due to pollution controls. However, these other effects are not meaningful nor quantifiable in a report in which no closures are projected. Although employment is an important consideration to a potential new firm and increases in employment and local business are important to surrounding communities of a potential new plant, these effects are more related to the decision to construct a new plant. Thus, in this report, these related effects were not pursued.

PART III

MALT

PART III: SIC 2083 - THE MALT INDUSTRY

I. INDUSTRY STRUCTURE

The Census of Manufactures defines the Malt Industry as an industry comprised of establishments primarily engaged in manufacturing malt or malt by-products from barley or other grains. The industry furnishes the majority of its product to either the Malt Beverage Industry or the Distilled Spirits Industry which utilize malt in the production of alcoholic beverages. At the present, the Malt Industry has only one known establishment which is not connected to a municipal treatment system and this plant meets the proposed BPT guidelines and is very close to meeting the proposed BAT guidelines. As such, the Malt Industry will incur very few, if any, immediate impacts due to the imposition of effluent controls. The potential does exist, however, that plants which are yet to be constructed could be impacted if they utilize their own treatment system and thus have to meet the proposed new source performance standards (NSPS). In view of this, this analysis will primarily concentrate on the economic characteristics of the industry with some discussions pertaining to potential new source impacts.

A. Characteristics of the Industry

The Malt Industry is generally highly competitive and, accordingly, industry members do not readily release information regarding the operational and financial data of their facilities. As a result, information concerning the industry is limited to the traditional sources of information such as the Census of Manufactures and periodic industrial reports. These sources do have their limitations; however, when supplemented with the limited information provided by the industry, they will provide an adequate description of the industry.

1. Number and Size of Firms and Plants

The Census of Manufactures states that in 1972 there were 30 firms in the Malt Industry operating some 40 establishments. Thus, in 1972, 25 percent of all establishments were owned or controlled by firms which operated more than one facility. This percentage has remained relatively constant since 1963 at which time 29 firms operated 42 establishments.

According to Census data, the number of maltsters has remained relatively constant with 46 establishments in 1958, 42 in 1963, 43 in 1967 and 40 in 1972. The number of establishments by employment size group are depicted in Table I-1 for the years 1963, 1967 and 1972. Also shown are the employment classes' respective value of shipment and corresponding percentage of

Table I-1. The malt industry, by employment size group, number of establishments and value of shipments 1963-1972

Number of Employees	1963 Establishments Number	1963 Establishments Percent of Total	1963 Value of Shipments Million Dollars	1963 Value of Shipments Percent of Total	1967 Establishments Number	1967 Establishments Percent of Total	1967 Value of Shipments Million Dollars	1967 Value of Shipments Percent of Total	1972 Establishments Number	1972 Establishments Percent of Total	1972 Value of Shipments Million Dollars	1972 Value of Shipments Percent of Total
1-4	2	4.8			4	9.3			5	12.5		
							0.7	0.3			0.4	0.2
5-9	1	2.4	10.4	5.7	1	2.3			1	2.5		
10-19	8	19.0			8	18.6	10.1	4.7	8	20.0	11.0	4.9
20-49	16	38.1	47.5	25.9	15	34.9	55.0	25.4	16	40.0	71.7	31.7
50-99	11	26.2	71.4	38.9	11	25.6	81.9	37.9	6	15.0	55.7	24.6
100-249	4	9.5	54.2	29.5	4	9.3	68.6	31.7	4	10.0	87.4	38.6
250-499												
500-999												
1,000-2,499												
2,500 +												
TOTAL	42	100.0	183.5	100.0	43	100.0	216.3	100.0	40	100.0	226.2	100.0

Source: U.S. Department of Commerce, Census of Manufactures, 1967 and 1972.

percentage of the total. From this table, it is evident the majority of the maltsters are small (compared to other manufacturing industries) and that the larger maltsters account for a substantial portion of the total industry's production.

2. Value of Shipments

Value of shipments and other receipts of the Malt Industry in 1972 totaled $226.3 million. This included shipments of malt (primary products) valued at $211.1 million, shipments of other products (secondary products) valued at $6.7 million, and miscellaneous receipts (mainly resales) of $8.5 million.

Estimates of the 1975 value of shipments for the industry are expected to total $530.0 million, 50 percent above the estimated shipments for 1974 and 134 percent above the 1972 value (Table I-2). Historically, the value of shipments increased by an average of 1.2 percent between the years 1958 to 1972, from $195.3 million in 1958 to $221.6 million in 1972. If the estimates for 1973 through 1975 are included, this annual rate of change increases to 6.9 percent per year.

Shipments of malt (primary products) in 1972 represented 97 percent (specialization ratio) of the industry's total product shipments (primary and secondary). The industry specialization ratio in 1967 was also 97 percent. Secondary products shipped by this industry in 1972 consisted mainly of malt beverages ($5 to $10 million).

Shipments of malt (primary products) from establishments classified in industry 2083 in 1972 represented 99 percent (coverage ratio) of these products valued at $212.8 million shipped by all industries. In 1967, the coverage ratio was 100 percent.

3. Level of Integration

The Malt Industry can be characterized as containing varying levels of integration with forward integration being the most common. This trend for forward integration is resultant of the large quantities of malt required by breweries which has caused a few of the brewers to acquire their own malt operation. As such, while there were 39 malsters in 1972, some of these were owned by the larger brewers and the major proportion of their product went to that brewers' brewing operations.

4. Level of Diversification

The Census of Manufactures shows the Malt Industry with a very high specialization ratio of 97 percent in 1972. This indicates 97 percent of the sales of establishments classified in SIC 2083 are in the primary SIC code. Thus, the Malt Industry does not consist of highly diversified operations.

Table I-2. The malt industry, value of shipments, 1958-1972

Year	Value of Shipments ($ Million)	Percent Change (%)
1958	195.3	-
1959	203.3	4.1
1960	205.5	1.1
1961	207.5	1.0
1962	190.8	-8.0
1963	183.5	-3.8
1964	215.5	17.4
1965	204.4	-5.2
1966	205.5	0.5
1967	216.3	5.3
1968	216.6	0.1
1969	221.6	2.3
1970	210.1	-5.2
1971	217.5	3.5
1972	226.2	4.0
1973	272.0	20.0
1974	408.0	50.0
1975	530.0	30.0

Source: Census of Manufactures, for years 1958 to 1972, U.S. Department of Commerce, estimates for 1973, 1974, and 1975, U.S. Industrial Outlook.

While the operations may not be diversified, establishment in the Malt Industry may be owned or controlled by highly diversified conglomerates. Often, the diversification of these conglomerates will be limited to some aspect of the food processing industry and, as stated previously, some malsters are owned by breweries.

5. Location of Maltsters

Maltsters are primarily concentrated in the north central region of the United States as this area produces the majority of the barley grown. In 1972, 30 of the 40 plants were located in this region with 15 plants being in Wisconsin and 7 plants being in Minnesota.

B. Employment Characteristics

Total employment in the Malt Industry has decreased by over 29 percent from 2,400 in 1958 to 1,700 employees in 1972 (Table I-3). Production workers during the same time period represented approximately 75 percent of the total employees and also decreased from 1,800 in 1958 to 1,300 in 1972.

Overall, the output per production worker has increased rather significantly (at least in dollar terms), with the value of shipments per production worker increasing by 60 percent between 1958 and 1972 and the value added per worker increasing by 45 percent. Portions of this increase may be attributable to inflation; however, the remaining portions are attributable to the modernization and up-dating of already existing facilities and, to some extent, the better utilization of the workers.

The malt production worker can be basically classified as semi-skilled, with much of the labor being involved with monitoring of equipment and grain handling. The average annual hours worked by production workers have remained relatively constant with the average being 1,923 hours in 1972. Hourly wages have nearly doubled since 1958, with the 1972 average hourly rate being $5.92.

As would be expected, the majority of the employees are concentrated in the larger size operations (Table I-4) with nearly 60 percent of all employees being employed by firms with over 50 employees.

C. Other Considerations

Only one plant in the Malt Industry is known to discharge waste water other than to a municipal sewage system. For this reason, aggregate effects of water pollution controls are expected to be small. However,

Table I-3. The Malt Industry, employment statistics 1958-1972

Year	All Employees		Production Workers			Value of Shipments per Production Worker	Man-Hour per Production Worker	Wage per Production Worker Man-Hour	Value Added per Production Worker Man-Hour
	Number	Payroll	Number	Man-Hrs.	Wages				
	(000)	($Mil.)	(000)	(Mil.)	($Mil.)	($000)		($)	($)
1958	2.4	16.3	1.8	3.6	10.9	108.5	2,000	3.03	15.31
1959	2.5	17.2	1.8	3.6	11.5	112.9	2,000	3.19	14.25
1960	2.7	19.2	2.0	4.0	13.1	102.8	2,000	3.28	10.00
1961	2.5	18.5	1.8	3.5	12.2	115.3	1,944	3.49	9.11
1962	2.3	17.1	1.7	3.3	11.6	112.2	1,941	3.52	14.73
1963	1.9	15.1	1.5	3.0	10.8	122.3	2,000	3.60	14.67
1964	2.1	17.2	1.6	3.3	12.5	134.7	2,062	3.79	17.67
1965	1.9	15.8	1.4	3.0	11.6	146.0	2,143	3.87	16.87
1966	1.8	15.3	1.4	2.8	11.1	146.8	2,000	3.96	17.32
1967	2.0	17.1	1.5	3.1	12.7	144.3	2,067	4.10	15.32
1968	2.0	18.1	1.5	3.1	13.3	144.4	2,067	4.29	17.42
1969	2.1	19.8	1.6	3.3	14.7	138.5	2,062	4.45	17.48
1970	1.9	19.4	1.4	3.0	14.7	150.1	2,143	4.90	19.27
1971	1.8	19.8	1.4	2.9	15.0	155.4	2,071	5.17	21.00
1972	1.7	20.0	1.3	2.5	14.8	174.1	1,923	5.92	22.00

Source: U.S. Department of Commerce, Census of Manufactures.

Table I-4. The Malt Industry employment 1972

Employment Size	All Employees	Percent of Total	Production Workers	Percent of Total
1-4 }	100	5.9		
5-9		}	300	15.4
10-19	100	5.9		
20-49	500	29.4	400	30.8
50-99	400	23.5	300	23.1
100-249	600	35.3	400	30.8
TOTAL	1,700	100.0	1,300	100.0

Source: U.S. Department of Commerce, Census of Manufactures, 1972.

aggregate impacts could be significant if other economic impacts to be expected in the next two to eight years, such as would be imposed by other Federal, State and local regulations are brought to bear upon the industry. The increasing cost of energy of all types and the possible limitations on natural gas consumption are also of concern.

These other economic impacts include but are not necessarily limited to the following:

OSHA;
Air pollution controls;
Solid waste controls;
Energy;
State and local waste water regulations; and,
Municipal system user charges.

II. FINANCIAL PROFILE OF THE INDUSTRY

Within the limits of information available, this chapter will present the financial characteristics of the Malt Industry. Very little specific data exists on the Malt Industry as malt data are usually combined with data from the Malt Beverage Industry. To attempt to use these aggregated data to reflect the Malt Industry would be misleading as the Malt Beverage Industry's value of shipments is approximately 24 times the Malt Industry's shipment. Thus, the aggregated data reflect characteristics predominately of the breweries.

A. Sales

Sales of malt, in terms of the Census value of shipment, fluctuated in the 1967 to 1971 period and then in 1973 and 1974 substanital increases occurred (Table II-1). However, when the value of shipments is adjusted by the wholesale price index for malt, the resulting values reflect real dollars. When viewed in this context, the sales trend has been much more constant, with annual sales averaging $221.6 million.

The 1972 Census of Manufactures' value of shipment was based on information provided by 40 establishments. This gives the shipment for the average plant to be $5.7 million (Table II-2). This compares to an average of $5.0 million in 1967.

While the average malt plant had shipments of $5.7 million in 1972 with 42 employees, the actual plants in the industry varied considerably in size. Actual plants in 1972 ranged from very small operations with less than 10 employees and $66,670 to extremely large plants employing over 100 employees and having annual shipment of $21.85 million.

B. Distribution of Sales Dollar

Some slight changes have occurred in the distribution of the sales dollar for the Malt Industry from 1967 to 1972. As can be seen below, these changes were most significant for the raw material's portion which decreased from 77.8 percent to 74.5 percent. This decrease was coupled with a slight increase in labor's portion and a relatively large increase in the other operating costs' portion. This may be partially explained by the fact that energy costs are included in this latter category.

Table II-1. The Malt Industry, annual sales

Year	Value of Shipments	Malt Wholesale Price Index	Adjusted Value of Shipments
	($Mil.)	(1967=100)	($Mil.)
1967	216.3	100.0	216.3
1968	216.6	97.1	223.1
1969	221.6	97.1	228.2
1970	210.1	94.6	222.1
1971	217.5	98.5	220.8
1972	226.2	94.2	240.1
1973	272.0	121.3	224.2
1974	408.0	206.2	197.9

Source: U.S. Department of Commerce and U.S. Department of Labor.

Table II-2. The Malt Industry, value of shipments, value added, and employees census years 1963, 1967 and 1972

Item	Units	1963		1967		1972	
		Industry Total	Per Establishment	Industry Total	Per Establishment	Industry Total	Per Establishment
Establishments	No.	42	--	43	--	40	--
Value of Shipments	$Mil.	183.5	4.37	216.3	5.03	226.2	5.66
Value Added	$Mil.	44.0	1.05	47.5	1.10	55.0	1.38
Total Employees		1,900	45	2,000	46	1,700	42

Source: U.S. Department of Commerce, Census of Manufactures, 1967 and 1972.

Distribution of Sales Dollars (Percent)

	1967	1972
Sales	100.0	100.0
Raw Materials	77.8	74.5
Payroll	7.9	8.8
Other operating costs, interest and profits	14.3	16.7

Census data since 1972 are not available, however according to industry sources, the significance of raw material costs has changed and is estimated by some to approximate 85 percent of the cost of goods sold.

C. Earnings

No earnings data were available which isolated malt from the malt beverage portion of the Malt Industry.

D. Ability to Finance New Investment

The ability of a firm to finance new investment for pollution abatement is a function of several critical financial and economic factors. In general terms, new capital must come from one or more of the following sources: (1) funds borrowed from outside sources, (2) equity capital through the sale of common or preferred stock, (3) internally generated funds -- retained earnings and the stream of funds attributed to depreciation of fixed assets.

For each of the three major sources of new investment, the most critical set of factors is the financial condition of the individual firm. For debt financing, the firm's credit rating, earnings record over a period of years, stability of earnings, existing debt-equity ratio and the lender's confidence in management will be major considerations. New equity funds through the sale of securities will depend upon the firm's future earnings potential. The firm's record, compared to others in its own industry and to firms in other similar industries, will be a major determinant of the ease with which new equity capital can be acquired. In the comparisons, the investor will probably look at the trend of earnings for the past five or so years.

Internally generated funds depend upon the margin of profitability and the cash flow from operations. Also, in publicly held corporations, stockholders must be willing to forego dividends in order to make earnings available for reinvestment.

The condition of the firm's industry and general economic conditions are also major considerations in attracting new capital. The industry will be compared to other similar industries (i.e., other processing industries) in terms of net profits on sales and on net worth, supply-demand relationships, trends in production and consumption, the state of technology,

impact of government regulation, foreign trade and other significant variables. Declining or depressed industries are not good prospects for attracting new capital. At the same time, the overall condition of the domestic and international economy can influence capital markets. A firm is more likely to attract new capital during a boom period than during a recession. On the other hand, the cost of new capital will usually be higher during an expansionary period. Furthermore, the money markets play a determining role in new financing.

Based on the previous discussion in this chapter and Chapter I, it appears that it will not be difficult for the majority of firms to acquire sufficient new capital to finance the required investment for effluent controls. In most instances, these plants are owned by large conglomerates with adequate abilities to finance the new investments.

E. Cost of Capital - After Tax

Return on invested capital is a fundamental notion in U.S. business. It provides both a measure of actual performance of a firm as well as expected performance. In this latter case, it is also called the cost of capital. The cost of capital is defined as the weighted average of the cost of each type of capital employed by the firm, in general terms equities and interest bearing liabilities. There is no methodology that yields the precise cost of capital, but it can be approximated within reasonable bounds.

The cost of capital was determined for purposes of this analysis by estimating performance measures of the industry. The weights of the two respective types of capital for the Malt Industry were estimated at 23 percent debt and 77 percent equity. The cost of debt was assumed to be 10.0 percent. The cost of equity was determined from the ratio of earnings to net worth and estimated to be 9.8 percent.

To determine the weighted average cost of capital, it is necessary to adjust the before tax costs to after-tax costs (debt capital only in this case). This is accomplished by multiplying the costs by one minus the tax rate (assumed to be 48 percent). These computations are shown below and result in the estimated after-tax cost of capital being 8.8 percent.

Weighted Average After Tax Cost of Capital

Item	Weight	Before Tax Cost	Tax Rate	After Tax Cost	Weighted Cost
Debt	.23	10.0	.48	5.2	1.2
Equity	.77	-	-	9.8	7.6
					8.8

III. MODEL PLANTS

The model plant described in this chapter represents the operational and financial characteristics of a plant which is likely to be built after the promulgation of the guidelines and, hence, is called a NSPS (New Source Performance Standard) model plant. The model was not constructed to describe existing plants which are direct dischargers.

The operating and financial data contained in this chapter pertain to a plant which is representative of actual plants in the industry and does not reflect information pertaining to specific plants or firms. The data were obtained from industry contacts, and published sources.

A. The Malting Process

Malsters can vary in the procedures they use to produce malt to differentiate their product from each other (to the extent that it is possible); but, yet, the basic process is the same for most all plants. The following describes the basic steps which take place in the production of malt 1/.

Malt is a primary raw material for the processes of brewing and distilling. Fermentation depends upon the action of enzymes, and the purpose of malting barley is to produce those enzymes which bring about the eventual conversion of starch into fermentable sugars. Essentially, the process of manufacturing malt from barley consists of steeping, germinating, and kilning.

After preliminary cleaning and grading, barley is stored in grain bins. Differences in types of barley utilized relate primarily to kernel size, two common designations being two-row and six-row. Once the proper type of barley has been selected, it is conveyed to the malt house for steeping. The barley is placed in large hopper-bottomed steep tanks where it is kept submerged in cool water for 40 to 72 hours. The purpose of this process is to impart moisture to the grain and to remove undesirable colors and tannins. This is accomplished by changing the water in the steep tanks three to four times while compressed air is bubbled through the mixture. The wastewater discharged during these changes forms the principal part of the total malt house load.

After steeping, the barley is transferred to germinating drums or compartments for a period of four to eight days. It is during this period that the formation of enzymes occurs along with the creation of heat and carbon dioxide. Temperature and humidity controlled air is forced through the malt while it is being turned. After a few days additional moisture is

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1/ Development Document for Effluent Limitation Guidelines and New Source Performance Standards, Miscellaneous Foods and Beverages, U.S. Environmental Protection Agency, March, 1975.

added to accelerate germination, usually by spraying. The portion of this water which is later drained from the germinating drums or compartments forms the second part of the total wastewater discharge.

The malt is now ready for kilning. During this procedure, the malt is conveyed to drying floors where it is kept for three to four days. Furnaces under the floors provide controlled temperature conditions to dry the malt to the desired moisture content. The floors are normally situated vertically so that the malt may be dropped from level to level while the temperature is increased. Upon completion of drying, the malt is stored or shipped.

B. NSPS Model Malt Plant

Based on information provided in the Development Document, the new source model plant (that is, the plant which has yet to be built and will treat its own effluent) was determined to consume approximately 16,000 bushels of barley a day. Using Census data to develop a factor for conversion to annual production of malt, the model plant is estimated to produce 187,680,000 pounds of malt per year. This annual production was predicted on an assumed conversion of 45.3 pounds of malt produced per bushel of barley input and the plant operating 300 days per year. The basic descriptive information concerning the operational characteristics as well as an estimation of the plants' financial profile are shown in Table III-1. These model plant profiles have primarily developed utilizing Census of Manufactures' data and financial data do have limitations as they reflect consolidated data for both the Malt Beverage Industry and the Malt Industry.

Table III-1. New source model malt plant

Operational Information		
Bushels barley per day	16,000	
Days per year	300	
Pounds malt per year	187,680,000	
Financial Profile	($000)	(Percent)
Sales (4.7¢/lb)	19,331.0	100.0
Less		
Materials	14,498.3	75.0
Labor	1,720.5	8.9
Other	572.4	3.0
Total Costs	16,791.2	86.9
Cash Earnings	2,539.8	13.1
Less		
Depreciation	1,380.0	7.1
Interest	193.3	1.0
Pre-tax Income	966.5	5.0
Income Tax	457.4	2.4
After-tax Income	509.1	2.6
Cash Flow	1,889.1	9.8
Total Invested Capital	27,600	
Salvage Value	4,140	
Returns		
After-tax return on sales (percent)		2.6
After-tax return on investment (percent)		1.8
Cash Flow		
Percent of Sales		9.8
Per-ent of Total Invested Capital		6.8

IV. PRICING PATTERNS

The industry impact of increased processing costs associated with imposition of requirements for effluent pollution controls on the Malt Industry will be directly influenced by the ability of processors to pass pollution control costs forward to the consumer in the form of higher prices for finished products or backward to suppliers in terms of lower prices for raw materials and purchased services. To the extent that such cost transference opportunities are limited, the costs of effluent controls will have to be absorbed by processors, profits will be reduced, and the impact on the industry will be more severe. The reversal of this situation would tend to reduce the severity of the impact on the industry.

This chapter will examine those industry and product characteristics which affect the ability of the Malt Industry to make the required pricing adjustments.

A. Price Determination

The determination of prices for malt products involves the complex interaction of demand, the available supply and the returns sought by industry members.

1. Demand

The demand for malt and malt products is based primarily on the quantities required by the breweries and the quantities which are exported. In 1972, brewers consumed nearly 3.5 billion pounds of barley. Total domestic production amounted to 4.5 billion pounds. Additionally, in 1972, 26.5 million pounds were imported to the United States and 109.3 million pounds were exported (Table IV-1). Thus, considering the imports and exports of malt, the largest purchasers of malt (by a substantial amount) was the breweries. As such, the demand for malt is predicted on demand for beer which has shown a relatively steady rate of increase since 1960 (Table IV-2). Accordingly, it can be assumed that the demand for malt also has increased at a relatively steady rate.

2. Supply

Malt production is primarily constrained by the supply of available barley and the capacities of the malt plants. As maltsters utilize only a very small portion of the total supply of barley, the constraint attributable to availability of barley does not seem threatening. Thus, the real constraint on malt production is the capacity of the plants. According to industry sources, historically, the Malt Industry has always been able to meet the quantities demanded in a timely fashion. Therefore, it can be assumed that the supply of malt can usually meet demand and, thus, is not considered a critical factor in the price determination process.

Table IV-1. Imports and exports of malt, 1965-1974

Year	Imports of Barley Malt	Exports of Malt
	(Million Pounds)	(Million Pounds)
1965	49.2	71.2
1966	41.9	90.1
1967	48.6	62.9
1968	49.5	65.9
1969	42.1	59.7
1970	52.9	63.3
1971	26.5	78.4
1972	26.5	109.3
1973	29.6	126.4
1974	47.9	86.5

Source: U.S. Department of Agriculture.

Table IV-2. Consumption of beer, total and per capita

Year	Taxable Withdrawals		Per Capita Consumption 1/	
	1,000 Barrels	Percentage Change from Previous Year	Gallons	Percentage Change from Previous Year
1960	88,928.9	---	15.4	---
1961	87,925.8	(1.1)	14.9	(3.2)
1962	90,693.3	3.1	15.1	1.3
1963	91,493.6	0.9	15.0	(0.7)
1964	96,247.4	5.2	15.6	4.0
1965	100,305.7	4.2	16.0	2.6
1966	101,510.3	1.2	16.1	0.6
1967	107,301.4	5.7	16.8	4.3
1968	107,470.4	0.2	16.7	(0.6)
1969	111,866.6	4.1	17.2	3.0
1970	122,550.2	9.6	18.7	8.7
1971	123,850.4	1.1	18.6	(0.5)
1972	130,740.6	5.6	19.5	4.8
1973	133,960.5	2.5	19.8	1.5
1974	142,312.0	6.2	20.9	5.6

Source: United States Brewers Association

1/ Based on total population regardless of age.

3. Market Structure

Malt is a highly undifferentiated product that is produced by only 30 firms. In 1972, the largest four firms accounted for 48 percent of the industry's shipment. For the same year, the next four largest, accounted for an additional 26 percent; thus, the 8 largest firms accounted for 74 percent of the entire industry's shipment. In addition, malt can be characterized as a bulky commodity with a low per unit value and high transportation costs. Furthermore, as mentioned previously, some malt plants are owned by brewers, which are the largest purchaser of malt products. Because of these facts, the Malt Industry can be characterized as oligopolistic with a few plants furnishing malt products to those brewers who do not have their own malt plant.

In an oligopolistic industry, the pricing decision is subject to a greater uncertainty because of interdependent reaction, i.e., if a price increase does not succeed the firm may experience a substantial loss in sales, profit, and prestige. Therefore, the oligopolistic firm is likely to possess more discretion, and therefore to view the pricing decision in a longer-term perspective and is less likely to attempt to equilibrate supply and demand in the short run. When demand rises, more of the burden of market adjustment will fall on rationing and backlogs of orders, particularly since purchases have fewer alternative sources of supply. When demand falls, more of the adjustment will be on lower production instead of cutting of price 1/.

According to interview studies, a common principle of long-term pricing appears to be to set price to earn a target rate of return on capital at a standard volume of output 2/. Price is altered if the cost of producing the standard output changes, either because of changes in prices of the main inputs or because of technological progress. According to this practice, for a level of output at or above breakeven point, average direct cost per bushel of malt is estimated and a given percentage of direct cost is added to direct cost to cover both fixed cost per unit of malt and the desired target rate of return. The price based on this formula may be called the normal price. The actual price of malt that a firm seeks to charge in a given location is the normal price, plus the published freight charge to the given customer location, minus any discounts or allowances.

The firm that ordinarily sets the price as price leader usually has a cost advantage based on location and scale and is usually large in terms of local market share. Other firms that have less of a cost advantage and produce lower volumes of output will charge an actual price close to that

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1/ Eckstein, Otto and From, Gary, "The Price Equation," The American Economic Review, December, 1968.

2/ Kaplan, A.D.H., Dirlam, J.B., and Lazzilotti, R.R., Pricing is Big Business - A Case Approach, 1958.

of the actual price charged by the price leader. The normal price determined by the price leader in a given location is the price at which it presumably maximizes its profits (or minimizes its losses) 3/.

It should also be noted that malsters not owned by breweries must price their malt sold to breweries in such a way that a brewer without malting capacity will not be put at a disadvantage to the brewer who has malting capacity. Otherwise breweries may be inclined to invest in a malting operation which could, in turn, hurt the independent malsters.

B. Price Trends

There are very limited data concerning the price trends of malt and malt products. One indicator of price trends was found, the Wholesale Price Index for malt. As can be seen in Table IV-3, the index for malt prices remained relatively stable between the years 1967 and 1972, with the index remaining between 90 and 100 for these years. In 1973, the malt price index increased by nearly 29 percent and this increasing trend continued into 1974. During 1974, the malt price index increased steadily month by month and by December 1974, the index was 113.4 percent above the level it had been for the 1973 average. As also can be seen in Table IV-3, a major contributing factor to the malt price increase may be the fact that barley prices increased also during the same period with the December 1974 barley price being 77.6 percent above its average 1973 price.

3/ Environmental Protection Agency, Economic Analysis of Proposed Effluent Guidelines Cement Industry, August, 1973.

Table IV-3. Wholesale Price Index, selected products

	Malt	Barley, No. 3 or better Minneapolis Index	Barley, No. 3 or better Seasonal Price
	(1967 = 100)	(1967 = 100)	$ / bushe
1967	100.0	100.0	
1968	97.1	91.1	
1969	97.1	83.4	1.06
1970	94.6	88.0	1.18
1971	98.5	91.6	1.13
1972	94.2	92.1	1.44
1973	121.3	138.7	2.75
1974	206.2	214.0	4.07
January	163.2	199.6	
February	171.4	237.8	
March	177.2	216.6	
April	190.6	131.6	
May	204.3	176.6	
June	204.2	193.6	
July	204.2	189.0	
August	204.2	239.5	
September	221.4	196.2	
October	237.4	259.0	
November	237.4	282.4	
December	258.8	246.3	

Source: U.S. Department of Labor, Bureau of Labor Statistics and U.S. Department of Agriculture, Feed Situation.

V. EFFLUENT CONTROL COSTS

The effluent control system requirements and costs depicted in this chapter were provided by the Effluent Guideline Division of the Environmental Protection Agency as provided by the technical contractor, Environmental Science Engineering. The recommended treatment alternative for the NSPS model malt plant was the same as presented in the Development Document. 1/ However, the associated investment and annual operating costs were developed by the technical contractor in accordance with the model plant's production characteristics previously described in Chapter III.

A. Pollution Control Requirements

Three effluent control levels for point source categories (direct dischargers) were originally considered:

BPT - Best Practical Control Technology Currently Available, to be achieved by July, 1977

BAT - Best Available Pollution Control Technology Economically Available, to be achieved by July, 1983

NSPS - New Source Performance Standards are recommended to be equal to the BAT control level and to apply to any source for which construction starts after the publication of the proposed regulations.

As was stated in Chapter I of this report, the Malt Industry presently has only one known establishment which does not utilize a municipal sewage system for effluent discharge and this plant meets the proposed BPT guidelines and is very close to meeting the proposed BAT guidelines. Accordingly, only an NSPS model plant was developed and subsequently cost data provided pertained only to the NSPS model.

The flow for the NSPS model malt plant was determined to be 685,000 gallons per day with a waste load of 615 mg/l biological oxygen demand (BOD) and 104 mg/l suspended solids (SS).

The recommended effluent limitation guidelines for NSPS malt plants are as follows (expressed in kg/metric ton of barley processed):

1/ Development Document for Effluent Limitation Guidelines and New Source Performance Standards, Miscellaneous Foods and Beverages, Point Source Category, Draft Report prepared by Environmental Science and Engineering, Inc., for the U.S. Environmental Protection Agency.

NSPS RECOMMENDED NSPS MALT GUIDELINES

	Max. 30-day Average	Max. Day
BOD	0.110	0.270
SS	0.065	0.160

B. Discharge Status of the Industry

At the present, all known plants except one in the Malt Industry discharge their effluent to municipal treatment facilities.

C. Pollution Control Costs

The cost estimate in 1972 dollars and the components of the recommended treatment alternative (activated sludge) for the NSPS model malt plant are shown in Table V-1. Shown in Table V-2 are the costs for an optional treatment alternative (aerated lagoon) which could be implemented if it was determined desirable. From the information provided, total investment and annual costs were modified so as to be consistent with the model plant characteristics described in Chapter III. These modifications, however, did not change the technical cost basis of the costs provided by the EPA.

Modifications made to the treatment alternatives' costs for the NSPS Malt plant consisted primarily of inflating investment and annual costs from 1972 to 1974 dollars by use of the Engineering News Record Construction Cost Index (1.205 times the EPA provided costs). The resulting treatment costs in 1974 dollars for both the recommended and optional treatment alternatives are summarized below:

	Investment Costs	Annual Operating Costs	Total Yearly Costs
Recommended System	$ 918,000	$145,600	$237,400
Optional System	$1,501,120	$568,540	$718,635

Investment costs depicted above include costs for construction, land, engineering and a contingency fee. Annual operating costs include labor, power, chemicals, maintenance and supplies. Total yearly costs include annual operating costs, depreciation and interest (based on 10 percent of one half the total investment costs). For purposes of the impact analysis, the depreciable life of the pollution control equipment was determined to be 20 years.

TABLE V-1

ITEMIZED COST SUMMARY FOR MALT - NSPS [1/]
(ALTERNATIVE A19-V)

ITEMIZED COST SUMMARY FOR WASTEWATER TREATMENT CHAIN
DESIGN EFFICIENCY... 97.5 PERCENT BOD REDUCTION

TREATMENT MODULES:

B1..CONTROL HOUSE
B...PUMPING STATION
C...EQUALIZATION BASIN
H...NITROGEN ADDITION
K...ACTIVATED SLUDGE
G...SLUDGE THICKENER
R...AEROBIC DIGESTOR
Y...HOLDING TANK
U...SPRAY IRRIGATION
B...PUMPING STATION
N...DUAL MEDIA PRESSURE FILTRATION

INVESTMENT COSTS:		
1.	CONSTRUCTION	600560.00
2.	LAND	41150.00
3.	ENGINEERING	60060.00
4.	CONTINGENCY	60060.00
TOTAL		761830.00

YEARLY OPERATING COSTS:		
1.	LABOR	37480.00
2.	POWER	68700.00
3.	CHEMICALS	3030.00
4.	MAINTENANCE&SUPPLIES	11620.00
TOTAL		120830.00

TOTAL YEARLY COSTS:		
1.	YEARLY OPERATING COST	120830.00
2.	YEARLY INVESTMENT COST RECOVERY	30470.00
3.	DEPRECIATION	36030.00
TOTAL		187330.00

1/ 1972 dollars

Source: Environmental Protection Agency

TABLE V-2

ITEMIZED COST SUMMARY FOR MALT - NSPS OPTION [1/]
(ALTERNATIVE A19-III)

ITEMIZED COST SUMMARY FOR WASTEWATER TREATMENT CHAIN
DESIGN EFFICIENCY... 97.5 PERCENT BOD REDUCTION

TREATMENT MODULES:

B1...CONTROL HOUSE
B...PUMPING STATION
C...EQUALIZATION BASIN
H...NITROGEN ADDITION
L...AERATED LAGOON
B...PUMPING STATION
N...DUAL MEDIA PRESSURE FILTRA'N

INVESTMENT COSTS:

1.	CONSTRUCTION	997680.00
2.	LAND	12740.00
3.	ENGINEERING	99770.00
4.	CONTINGENCY	99770.00
5.	PVC LINER	35780.00
TOTAL		1245740.00

YEARLY OPERATING COSTS:

1.	LABOR	24990.00
2.	POWER	407450.00
3.	CHEMICALS	3030.00
4.	MAINTENANCE&SUPPLIES	34710.00
5.	PVC LINER	1640.00
TOTAL		471820.00

TOTAL YEARLY COSTS:

1.	YEARLY OPERATING COST	471820.00
2.	YEARLY INVESTMENT COST RECOVERY	49830.00
3.	DEPRECIATION	61650.00
TOTAL		583300.00

[1/] 1972 dollars

Source: Environmental Protection Agency

Total investment costs for pollution control systems expressed as a percent of the NSPS model plant total investment and total yearly costs expressed as a percent of annual sales are depicted below:

	Total investment for pollution controls as a percent of model investment	Total yearly costs for pollution controls as a percent of annual sales
Recommended NSPS Treatment Alternative	21.8	3.0
Optional NSPS Treatment Alternative	35.7	9.2

VI. ECONOMIC IMPACT ANALYSIS

The impacts considered in this analysis are as follows:

A. Price effects
B. Financial effects
C. Production effects
D. Other effects

The resulting impact from the imposition of effluent controls on the Malt Industry for existing malsters is expected to be negligible as all but one known plant discharges their effluent to municipal sewage treatment systems. Thus, the impacts described herein will pertain only to those plants which are yet to be constructed and will discharge their effluent directly to navigable waters (hereafter referred to as New Source). These impacts are analyzed for the NSPS model plant described in Chapter III. Impacts are based on the production and financial characteristics of the NSPS model plant and pollution control costs as presented in Chapter V.

It should be noted that in Chapter V two sets of control costs were described for each model; the recommended treatment system and an optional treatment system. For purposes of this impact analysis, only the recommended treatment system will be utilized. This treatment alternative consists of an activated sludge system and according to cost estimates furnished by the EPA is considerably less expensive than the optional aerated lagoon system.

A. Price Effects

1. Required Price Increase

An implicit indicator of the expected price effects of pollution controls used in this report is the amount of sales price increase necessary to maintain a NSPS plant's profitability, after pollution control expenditures, at a level the same as a similar plant without the pollution control expense. The method of computation was discussed in Part I, Chapter II (Methodology), Section F, under subsection 2 of this report. The ability of a new plant to pass on such price increases is evaluated in this section of the report.

The amount of sales price increase necessary to offset NSPS pollution control costs for the model malt plant is depicted below. Also shown are sensitivity ranges of required price increases when pollution control costs vary plus or minus 20 percent from the estimated cost.

	Bushels Barley Per Day	Required Price Increase (%) -20%	Estimate	+20%
NSPS Malt Plant	16,000	1.2	1.5	1.8

2. Expected Price Increases

Although the above illustrated price increases indicate what the NSPS model plant would require to offset expenditures for pollution controls, it is doubtful new malt plants would be able to pass on the additional expense to customers in the form of higher prices. This is due to (1) the discharge status of the Malt Industry and (2) financial effects of building new point source malt plants relative to the market characteristics of the industry.

As stated above, it is unlikely new source malt plants will be able to pass on required price increases due to pollution controls due to, in part, the discharge status of the industry. As pointed out earlier, all but one known malsters discharge processing waters to municipal facilities. Although municipal charges have and are expected to continue to increase, the charges have usually been and are expected to be lower than private treatment costs. In general, new sources will only be able to pass on required price increases due to NSPS levels of control to the extent increased municipal charges are passed on by a majority of financially viable malsters. However, should municipal charges become higher than private costs of treatment, new sources would have a competitive advantage and would have the opportunity to pass on the increased costs of effluent controls assuming prices increased to offset the increasing municipal charges. Although not quantifiable at this time, some industry sources feel that, especially in large urban areas, this situation is likely to happen in the near future.

The market characteristics of the Malt Industry may provide some capabilities for new plants to pass on pollution control costs but these will be limited to only those plants built in an area where the location of the plant generates a competitive advantage. In other words, a plant built in an area which is "malt deficient" may be able to furnish malt for lower prices than those located oustide the area (primarily due to freight savings) and accordingly that plants margin may be able to absorb pollution control costs and still remain competitively advantaged.

But for those new plants locating in areas in which competition (although limited) prevails, it is probable that such plants will not be able to pass on required price increases. As discussed in earlier chapters of this report, the Malt Industry has experienced relatively low profit margins and as shown below in Section B, Financial Effects, the high costs of new plant construction are not offset by lower operating costs through improved technology. This results in new point sources having the same to lower income ratios than existing plants and negative net present values of cash flow when discounted at the estimated industry after-tax cost of capital (8.8 percent).

Therefore, based on the low profit margin and market structure of the Malt Industry, price increases by new point sources to offset pollution controls and high costs of construction are not expected to occur. In the following analysis, no price change was assumed to occur due to the entire industry increasing prices to offset effluent controls and, accordingly, the economic viability of the new source plants was based on financial characteristics of the model without added revenue stemming from aggregate pollution control effects on industry prices.

B. Financial Effects

Based on NSPS model plant profiles described previously and costs of pollution controls provided by EPA, the following financial indicators were computed under baseline (without pollution controls) and with pollution controls:

- After tax income
- After tax return on sales
- After tax return on invested capital
- Cash flow and cash flow as a percent of invested capital
- Net present value

The above were computed according to the discounted cash flow (DCF) and return on investment (ROI) procedures outlined in the methodology.

Furthermore a sensitivity analysis was performed using pollution control cost estimates at levels of 80 percent and 120 percent of the costs provided by EPA.

The results of the model plant analysis of the malt NSPS guidelines are summarized in Table VI-1. After the imposition of effluent controls, after-tax income, after-tax return on sales and after-tax return on invested capital are expected to decline 22 to 24 percent. If the pollution control costs are 20 percent lower than estimated, the above mentioned after-tax values of profitability would be reduced by only 17 to 20 percent instead of the 22 to 24 percent range. If control costs are 20 percent higher than estimated, after-tax values would decline an estimated 27 to 29 percent from pre-control levels. Thus, it appears that NSPS pollution control investments and annual costs are high for the new source malster in relation to rather low profit levels prior to controls. Costs for NSPS controls are expected to substantially reduce after-tax income, return on sales and return on invested capital for potential new sources.

Table VI-1. Key values of impact analysis for malt: NSPS

Key Value	Baseline	Percent Proposed Control Costs 80%	100%	120%
After tax income ($000)	509	410	385	360
After tax return on sales (%)	2.6	2.1	2.0	1.9
After tax return on inv. cap. (%)	1.8	1.5	1.4	1.3
Est. cash flow ($000)	1,889	1,827	1,811	1,796
Cash flow as % of inv. cap.	6.8	6.6	6.6	6.5
Net present values ($000)	-16,591	-17,732	-18,017	-18,302

In terms of the effect of NSPS controls on cash flow return on invested capital, the percentage return declined from 6.8 percent for the baseline case to 6.6 percent (a drop of 3 percent) for the after controls case. When costs were varied ± 20 percent, the after control return varied only slightly.

Net present values for the NSPS model malt plant are negative both before and after the imposition of controls (Table VI-1). As discussed in Part I, Chapter II, Methodology, large negative net present values would cause most firms to discard plans for building a new plant. Since the estimated net present value is negative before controls are imposed, it is concluded that very few plants, classified as a new source, would be built. However, it should be noted that the negative net present value indicates that the associated plant would earn less than the estimated 8.8 percent industry cost of capital. Thus, a NSPS plant may be built in the future provided the firm has been well established in the industry, has or has expectations to capture a major market share at profitable price levels and has an excellent financial performance record (e.g. a lower cost of capital). Should a NSPS plant be built, it can expect its net present value to decline due to the requirement for pollution controls.

C. Production Effects

Although new source performance standards will not affect current levels of production, future growth in the industry could be seriously affected by the imposed controls. Point source category firms are potentially deterred from entry because of differential impacts of effluent treatment requirements.

However, as indicated in the above financial description, future growth from new sources is expected to be restrained by the high costs of construction not being offset by lower costs of production achieved through improved technology. Also a restraint is the inability of a new source to pass through costs for controls to the consumer. This does not completely rule out the possibilities for new sources. It is foreseeable that some questions, those which could be classified as optimal producers, could construct and successfully operate a new plant. However growth for the industry as a whole, is expected from additions to or alternatives of existing plants that are discharging effluent wastes to municipalities.

D. Other Effects

Other types of economic impact such as employment, community and balance of payments deficit effects are normally assessed when there are plant closures due to pollution controls. However, these other effects are not meaningful nor quantifiable in a report assessing new sources. Although employment is an important consideration to a potential new firm and increases in employment and local business are important to surrounding communities of a potential new plant, these effects are more related to the decision to construct a new plant. Thus, in this report, these related effects were not pursued.

Table I-1. The malt industry, by employment size group, number of establishments and value of shipments 1963-1972

Number of Employees	1963 Establishments Number	1963 Establishments Percent of Total	1963 Value of Shipments Million Dollars	1963 Value of Shipments Percent of Total	1967 Establishments Number	1967 Establishments Percent of Total	1967 Value of Shipments Million Dollars	1967 Value of Shipments Percent of Total	1972 Establishments Number	1972 Establishments Percent of Total	1972 Value of Shipments Million Dollars	1972 Value of Shipments Percent of Total
1-4	2	4.8			4	9.3			5	12.5		
							} 0.7	0.3			} 0.4	0.2
5-9	1	2.4 }	10.4	5.7	1	2.3			1	2.5		
10-19	8	19.0			8	18.6	10.1	4.7	8	20.0	11.0	4.9
20-49	16	38.1	47.5	25.9	15	34.9	55.0	25.4	16	40.0	71.7	31.7
50-99	11	26.2	71.4	38.9	11	25.6	81.9	37.9	6	15.0	55.7	24.6
100-249	4	9.5	54.2	29.5	4	9.3	68.6	31.7	4	10.0	87.4	38.6
250-499												
500-999												
1,000-2,499												
2,500 +												
TOTAL	42	100.0	183.5	100.0	43	100.0	216.3	100.0	40	100.0	226.2	100.0

Source: Census of Manufactures

PART IV

WINES, BRANDY AND BRANDY SPIRITS

PART IV: SIC 2084, THE WINES, BRANDY AND BRANDY SPIRITS INDUSTRY

I. INDUSTRY STRUCTURE

The Census of Manufactures defines those establishments classified under SIC 2084, as establishments primarily engaged in the manufacturing of wines, brandy and brandy spirits. Also included are those establishments which are bonded storerooms and blend and bottle wines. The basic manufacturing process involves the fermentation of a fruit (usually grapes) to produce a wine which in turn is often matured, blended and finally bottled. The industry is comprised of three basic types of operations including wineries with stills, wineries without stills and the bonded storerooms mentioned previously. These operations are briefly described below.

Wineries with stills - These operations produce table wines, sparkling wines, dessert wines, beverage brandy and wine spirits. The beverage brandy and wine spirits are resultant of the distillation of wine and are utilized in a variety of forms including mixing with other wines and wine spirits for addition in the production of dessert wines.

Wineries without stills - These wineries primarily produce table wines. However, some of the operations do purchase wine spirits from wineries with stills and blend the spirits with their wines to produce desert wines.

Bonded storerooms - These operations utilize wines produced elsewhere to blend and bottle for eventual sale. While bonded storerooms do exist, they generate little, if any, effluent and no known such operations discharge directly to navigable waters. Subsequently, only a general description of these operations will be included in this analysis.

A. Characteristics of the Industry

As previously discussed, wineries may produce wines, brandies or brandy spirits. Usually those operations with stills produce all of the above beverages whereas wineries without stills produce predominately only table wines. Some wineries without stills do purchase wine spirits which enables them to produce dessert wines, but since no signitificant additional waste loads are added, these operations will not be discussed separately.

The Wine Industry is generally highly competitive and, accordingly, industry members do not readily release information regarding the operational data of their facilities. As a result, information concerning the industry characteristics must be derived from traditional sources of information such as the published reports of the Census of Manufactures, Internal

Revenue Service, Bureau of Alcohol, Tobacco and Firearms (BATF) and the Wine Institute. These sources do have their limitations; however, they do provide an aggregated source of the general industry characteristics. Finally, when possible, discussions with industry members were utilized to fill the voids where published data are not available.

1. Number and Size of Firms and Plants

The Census of Manufactures states that in 1972 there were 183 firms in the Wine Industry operating some 213 establishments. Thus, in 1972, just over 14 percent of all establishments (30 wineries) were owned or controlled by firms which operated more than one facility. This percentage has remained relatively constant since 1967 at which time 175 firms controlled 205 wineries.

According to the Census data, the number of wineries has fluctuated over the past years but still has remained between 205 and 239. In 1958, the Census indicates 239 establishments comprised the SIC 2084 industry. In 1963, this number had declined to 222, then in 1967, it declined to 205. Finally, it increased between 1967 and 1972 to the 213 establishment level.

The number of establishments operating by employment size group are depicted in Table I-1 for the years 1963, 1967 and 1972. These data aggregate both wineries with stills and those without stills; however, the data do provide indications of the distribution of establishments by sizes. Also shown in Table I-1 are the employment classes' respective values of shipments and corresponding percentage of the total. From this table it becomes evident that the majority of the wineries are concentrated in the smaller size categories but the major portion of the industry's shipments are accounted for by a few large wineries.

The BATF indicates that as of June 30, 1974, there were 411 bonded wineries authorized to operate. The BATF also indicated 44 tax paid wine bottling houses were authorized to operate. It should be noted that while a winery may be authorized to operate, it may not actually be in operation. Furthermore, it should be noted that when most of the wineries obtained their authorizations, they consisted of small independent operations. Now many of these smaller wineries have been consolidated into large operations, but they maintained their original authorizations. Subsequently, one major winery may actually consist of a variety of small authorized wineries. This explains the significant differences between BATF data and the Census data.

While the preceding data sources have identified the Census' number of establishments and the number of wineries authorized to operate, a comprehensive list of wineries in operation is available in the Directory of the Wine Industry in North America 1/. The Directory lists, by state,

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1/ The Hiaring Company, Wines and Vines, Volume 54, No. 12-A, 1973.

Table I-1. The Wine and Brandy Industry by employment size group, number of establishments and value of shipments 1963-1972

Number of Employees	1963 Establishments Number	1963 Establishments Percent of Total	1963 Value of Shipments 1/ Million Dollars	1963 Value of Shipments 1/ Percent of Total	1967 Establishments Number	1967 Establishments Percent of Total	1967 Value of Shipments 1/ Million Dollars	1967 Value of Shipments 1/ Percent of Total	1972 Establishments Number	1972 Establishments Percent of Total	1972 Value of Shipments 1/ Million Dollars	1972 Value of Shipments 1/ Percent of Total
1-4	73	32.9	3.1	0.8	60	29.3	3.7	0.9	74	34.7	9.2	1.0
5-9	35	15.8	12.4	3.4	35	17.1	13.3	3.2	35	16.4	17.0	2.0
10-19	44	19.8	30.8	8.4	42	20.5	29.8	7.3	30	14.1	49.3	5.7
20-49	44	19.8	92.9	25.2	36	17.6	65.2	15.9	34	16.0	79.4	9.2
50-99	15	6.8	62.7	17.0	15	7.3	58.5	14.3	18	8.5	103.7	12.0
100-249	7	3.1	68.4	18.6	13	6.3	112.1	27.3	15	7.0	192.7	22.3
250-499	3	1.4			3	1.4			4	1.9	116.2	13.4
		}	98.0	26.6			127.6	31.1				
500-999	1	0.4			1	0.5			2	0.9		
										}	297.4	34.4
1,000-2,499	-		-		-	-	-	-	1	0.5		
2,500 +	-		-		-	-	-	-				
TOTAL	222	100.0	368.2	100.0	205	100.0	410.2	100.0	213	100.0	864.9	100.0

1/ Contains extensive duplication because the products of some of the establishments are used as materials by other establishments classified in the same industry.

Source: U.S. Department of Commerce, Census of Manufactures, 1967 and 1972.

the bonded wineries and when furnished, provides various information concerning the operation of the wineries. According to the Directory, there were 369 bonded wineries, 75 distilled spirits plants which process wine products and 33 tax-paid wine bottling houses as of December 1973.

As was the case with the BATF data, the Directory lists all the bonded premises for each company and accordingly while there were 369 bonded wineries, the actual number of wineries in operation would be smaller. Also, of the 75 distilled spirits plants which processed wine products, several are actually distilleries which primarily distill grain. According to the BATF, as of July, 1975, 52 distilled spirits plants were authorized to distill only fruit (i.e. grapes) and 9 plants were authorized to distill both grain and fruit. As such, it will be assumed for purposes of this analysis that wineries with stills number 52.

2. Value of Shipments

Value of shipments and other receipts of the Wines, Brandy and Brandy Spirits Industry in 1972 totaled $865.0 million. This included shipments of wines, brandy and brandy spirits (primary products) valued at $815.5 million, shipments of other products (secondary products) valued at $15.1 million, and miscellaneous receipts (mainly resales) of $34.4 million.

Estimates of the 1975 value of shipments for the industry are expected to total $1,182.0 million, 11.2 percent above the estimated shipments for 1974 and 36.6 percent above the 1972 value of shipments (Table I-2). Historically, the value of shipments have increased by an average of 9.4 percent per year since 1958, from $264 million in 1958 to the estimated $1,182 million in 1975. This rate of increase has been significantly higher after 1970, with the average increase since 1970 being 15.8 percent.

Shipments of wines, brandy and brandy spirits (primary products) in 1972 represented 98 percent (specialization ratio) of the industry's total product shipments. The industry specialization ratio in 1967 was 97 percent. Secondary products shipped by the industry in 1972 consisted mainly of flavoring extracts and syrups ($12.7 million).

3. Level of Integration

The Wine Industry is comprised of firms which are associated with a wide range of levels of integration. In terms of forward integration, most firms do not integrate any further than their sales to distributors. Some firms may maintain their own distributorships, but these are usually limited to distributorships for export markets.

Most wineries maintain some degree of backward integration in that they own some vineyards. However, it is not unusual for some wineries to own only very few acres of grapes and these wineries purchase the additional

Table I-2. The Wine and Brandy Industry, value of shipments 1958-1972

Year	Value of Shipments ($ Million)	Percentage Change (%)
1958	264	--
1959	282	6.8
1960	*279	-1.1
1961	*304	9.0
1962	*338	11.2
1963	368	8.9
1964	385	4.6
1965	396	2.9
1966	401	1.3
1967	410	2.2
1968	446	8.8
1969	493	10.5
1970	591	19.9
1971	747	26.4
1972	865	15.8
1973	941	8.8
1974	1,063	13.0
1975	1,182	11.2

* Limited reliability (high standard errors)

Source: Bureau of the Census, Bureau of Labor Statistics, BDC.

required grapes from local growers. Also, it is not uncommon for wineries to purchase bulk wine, brandy or brandy spirits from other wineries to blend with their own wines.

Principally, those operations which only blend and bottle wines do not have the opportunity for backward integration unless the operation is owned by a firm which also operates a winery. As mentioned above, wineries usually grow part of the grapes required; however, most wineries purchase bottles and labels.

4. Number of Products

The Wine Industry generates numerous products most all of which are in the form of wines, brandy or brandy spirits. Most wine products could be categorized as table wines, dessert wines, champagne, brandy, vermouth or fruit wines. The industry also produces various forms of grape juice. For each of the above categories, wineries may have several different labels usually varying with the variety of grapes used.

5. Level of Diversification

The Census of Manufactures shows the Wines, Brandy and Brandy Spirits Industry with a very high specialization ratio of 98 percent in 1972. As stated previously, this indicates that 98 percent of the sales of the establishments classified in industry SIC 2084 are in the primary SIC code. The typical winery is not diversified as governmental restrictions limit the facility's possibilities as well as the fact that the processes and equipment are specialized, non-interchangeable and do not lend themselves to the production of other products.

It should be noted, however, that some of the establishments in the industry are owned by highly diversified conglomerates. The diversification of these conglomerates includes a variety of operations often, but not always, in the food industry. The acquisition of the winery by the conglomerate was usually resultant of the selling of a one-time family operation.

6. Location of Wineries

As can bee seen in Table I-3, the majority of the wineries, distilleries producing brandy spirits and tax-paid wine bottling houses are located in California. Of the 369 listed in the Wines and Vines Directory, 221 (60 percent) are in California. Of the 75 brandy distilleries, 58 (77 percent) are in California and of the 33 tax-paid wine bottling houses, 8 (24 percent) are also located in California.

The next most concentrated area for wineries is the state of New York with 29 establishments. Following New York is Ohio with 23 wineries.

Table I-3. The Wine Industry, location of facilities

State	Bonded Wineries	Distilled Spirits Plants Associated With the Wine Industry	Tax-Paid Wine Bottling House
	Number of Establishments		
Alabama	-	-	3
Alaska	1	-	-
Arkansas	5	-	1
California	221	58	8
Colorado	2	-	1
Connecticut	2	-	-
Florida	1	1	3
Georgia	1	-	-
Idaho	2	-	-
Illinois	5	-	2
Indiana	1	-	-
Iowa	6	-	1
Kansas	-	-	1
Louisiana	1	-	5
Maine	-	2	-
Maryland	3	-	-
Massachusetts	1	3	-
Michigan	9	2	-
Minnesota	1	-	1
Missouri	7	1	-
New Hampshire	1	-	-
New Jersey	10	2	2
New Mexico	5	-	2
New York	29	2	-
Ohio	23	-	-
Oklahoma	2	-	-
Oregon	10	-	-
Pennsylvania	6	2	-
South Carolina	-	-	-
Tennessee	-	-	1
Texas	1	-	1
Vermont	1	-	-
Virginia	4	-	1
Washington	4	2	-
Wisconsin	5	-	-
TOTAL	369	75	33

Source: Wines and Vines, Directory, 1974.

According to industry sources, all wineries with stills (distilled spirits plants) are located in California. Those remaining distilled spirits plants indicated on Table I-3 are assumed to be distilleries which are authorized to distill fruit but, yet, do not produce significant quantities. Most likely, these distilleries utilize grain for their operation the majority of the time and, thus, would be included in Part V of this report, The Distilled Spirits Industry.

The industry itself makes distinctions between eastern and western wines; however, basically, the same processes are utilized in both areas to produce wine. Some slight differences may be caused by the fact that a different variety of grape is associated with each area. The western wineries predominately use a V. vinifera varieties while the eastern wineries use a V. labrusca varieties. There are significant differences in the climatic requirements for each of the different varieties and this will be a major factor in the level of effect of effluent controls on the respective geographic areas. This will be discussed in greater detail later in this report.

7. Age of Plants and Level of Technology

Within the Wine Industry, there exists a wide variety of winery ages varying from several generations old to those which were just recently built. While many of the wineries are relatively old (many were in operation prior to prohibition in 1920) throughout their useful life, new equipment has been added or used to replace that which is worn out or technologically obsolete. As a result, most wineries in the industry represent a combination of both old and new equipment. Furthermore, it can be generally assumed that the newer the winery and its equipment, the more technologically advanced it is. Finally, it is not uncommon for wineries which are expanding to use some equipment from wineries which have closed.

There are no known measures of the ages of wineries and their equipment. However, for purposes of this report, it is assumed that all operations are about the same age. There may be a slight tendency for the smaller operations to be older as can be seen in Table I-4. This table utilizes IRS data and depicts, for variously sized operations, the firms accumulated depreciation expressed as a percent of its total depreciable assets. As can be seen in the table, those firms with less than $500,000 in total assets tend to be 60 percent depreciated while those firms with more than $500,000 in total assets tend to be depreciated between 40 and 50 percent. Thus, the larger operations have less depreciated assets than the smaller operations and as such can be assumed to have newer facilities and equipment.

8. Plant Efficiency

Wineries vary significantly in terms of efficiency. Primarily the differences among wineries' efficiency is dependent upon the technical level with which the facility operates. Furthermore, the age and condition of the equipment will significantly influence the overall efficiency

Table I-4. Alcoholic Beverages, except malt liquor and malt, accumulated depreciation as a percent of total depreciable assets; by total asset size

Fiscal Year	Size of Total Assets ($1,000)										
	0-100	100-250	250-500	500-1,000	1,000-5,000	5,000 10,000	10,000-25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000- or More
	Percent										
1968-69	93	63	--	78	50	44	45	35	50	44	48
1969-70	7	70	75	17	55	41	45	34	44	43	50
1970-71	--	69	59	46	48	44	53	35	44	44	51
1971-72	81	34	40	41	53	39	53	37	44	44	51
Average	60	59	58	46	52	42	49	35	46	44	50

Source: Department of the Treasury, Internal Revenue Service, Sourc Book of Statistics of Income, annual.

of the winery. Those with the old and neglected equipment will undoubtedly encounter many more hours of down-time due to mechanical failures. Finally, it is evident that the larger wineries have a greater potential for operating efficiently as they will usually operate more days per year and have the newer, highly automated equipment thus allowing their output per employee to be higher.

B. Employment Characteristics

Total employment in the Wine Industry has increased by almost 58 percent since 1958 when 5,900 people were employed to 1972 when 9,300 people were employed (Table I-5). Production workers represent approximately 60 percent of total employees in 1972, and increased in number from 4,300 in 1958 to 5,600 in 1972. It should be noted that the production workers' proportion has decreased from over 70 percent of all employees in 1958 to 60 percent in 1972. This decline may be resultant of the increased production required of wineries which, in turn, has transformed many wineries from small regionalized family operations to large national businesses. Thus, wineries' managements have grown and at the same time the labors' productivity increased which resulted in more total employees, higher production and proportionately fewer required laborers.

Overall the productivity of the production workers has increased significantly since 1960. The value added and the value of shipments per production worker have more than doubled. Some of this increase is attributable to inflation; however, a good portion is explained by the installation of automated equipment (especially the presses and the bottling lines) and the better utilization of those employed.

The winery production worker can be classified as predominantly union and semi-skilled. Much of the labor involves the monitoring of either the presses and associated equipment or the bottling operations. The average annual hours worked per production worker have remained relatively constant with the average being 2,107 hours in 1972. Hourly wages have nearly doubled since 1958 from $2.06 in 1958 to $4.08 in 1972. Corresponding to the wage increase, the value added per worker also has doubled during the same time period.

It should be noted that while most of the workers are employed full-time, some wineries do not operate on a year around basis. In fact, some of the smaller wineries may operate only 3 to 4 months of the year. Wineries normally press grapes for only 4 to 10 weeks each year. Those employed to operate the presses are often utilized elsewhere in the winery (maintenance of the bottling lines) the rest of the year; however, some wineries do not have the volume to utilize all its employees. For many small wineries located in rural areas, the workers have a supplemental source of income, often in some aspect of agriculture.

Table I-5. The Wine and Brandy Industry, employment statistics 1958-1972

Year	All Employees		Production Workers			Value of Shipments per Production Worker	Man-Hours per Production Worker	Wage per Production Worker Man-Hours	Value added per Production Worker Man-Hours
	Number	Payroll	Number	Man-Hours	Wages				
	(000)	($Mil.)	(000)	(Mil.)	($Mil.)	($000)		($)	($)
1958	5.9	29.0	4.3	8.6	17.7	61.4	2,000	2.06	13.28
1959	5.3	28.8	3.7	7.5	16.4	76.1	2,027	2.19	14.27
1960*	5.3	29.6	3.7	7.3	16.6	75.5	1,973	2.27	14.52
1961*	5.2	31.6	3.5	7.3	17.2	87.0	2,086	2.36	16.55
1962*	5.4	33.5	3.7	7.8	18.4	91.3	2,108	2.36	16.49
1963	6.1	35.1	4.2	8.4	20.5	87.7	2,000	2.44	16.35
1964	6.4	39.9	4.5	8.9	23.2	85.6	1,978	2.61	17.88
1965	6.4	41.8	4.2	8.5	23.2	94.3	2,024	2.73	19.61
1966	6.5	44.5	4.2	8.5	23.8	95.4	2,024	2.80	22.75
1967	6.8	47.3	4.3	8.6	25.1	95.4	2,000	2.92	22.88
1968	6.7	50.1	4.2	8.5	26.8	106.1	2,024	3.15	23.27
1969	7.0	56.4	4.5	8.9	30.5	109.5	1,978	3.43	27.57
1970	8.6	70.9	5.4	10.9	36.7	109.4	2,018	3.37	23.70
1971	10.3	85.6	6.3	11.7	42.4	118.6	1,857	3.62	32.20
1972	9.3	91.5	5.6	11.8	48.1	154.5	2,107	4.08	34.57

* Figures for these years have limited reliability.

Source: U.S. Department of Commerce, Census of Manufactures.

As can be seen in Table I-6, the majority of the employees are concentrated in the larger sized operations with 67.7 percent of all employees and 66.1 percent of the production workers being employed by establishments with more than 100 employees.

C. Segment Proportions of the Total Industry

While the preceding sections of this chapter have been concerned with establishment data for the overall Wine Industry, it is useful to segment the industry according to winery types and their respective potential impacts due to the imposition of effluent controls.

Wineries can be categorized into three different operational categories and two different location categories. As mentioned previously, there are the eastern wineries and the western wineries. Furthermore, these can be either bonded wineries, bonded wineries with stills or tax-paid wine bottling houses. As the location of the wineries will have significant influence over possible impacts, distinctions between eastern and western wineries will be made first.

Information from industry sources and published reports indicate that western wineries will incur little impact due to the imposition of effluent controls on the Wine Industry. This is due to the fact that very little effluent is generated and that which is generated is either discharged to a municipal system or applied to the land such that none reaches waterways. Those western wineries without stills which do not discharge to municipal systems usually collect the effluent in evaporation checks, add ammonia to upgrade the pH (from 3.2 to 6.0), and then what has not yet evaporated is utilized for irrigation. It should be noted that the climatic conditions for the western wineries are such that a major portion of the effluent evaporates in evaporation checks or can be disposed of to lagoons.

Those western wineries with stills have the same wastewaters except that they also generate wastewaters associated with stillage. There has been considerable research done on the effects of utilizing land application as a form of disposing of stillage wastes. According to industry sources, those wineries with stills not discharging to municipal systems already meet the proposed guidelines. This is particularly evident in that in California, where nearly all such wineries are located, the State water quality standards are as stringent, if not more, as those proposed for the guidelines.

In view of the above, the determination was made that western wineries (especially those in California) will not be impacted due to the imposition of effluent controls. As such, the major emphasis of the impact aspects of this report will be concerned with the eastern wineries.

Table I-6. The Wine and Brandy Industry employment-1972

Employment Size	All Employees	Percent of Total	Production Workers	Percent
1-4	100	1.1	50	0.9
5-9	200	2.1	150	2.6
10-19	400	4.3	300	5.4
20-49	1,000	10.8	600	10.7
50-99	1,300	14.0	800	14.3
100-249	2,400	25.8	1,400	25.0
250-499	1,200	12.9	800	14.3
500-999	2,700	29.0	1,500	26.8
1,000-2,499	9,300	100.0	5,600	100.0

Source: U.S. Department of Commerce, Census of Manufactures, 1972.

Of the three operational categories of wineries, wineries without stills will be the only type which will incur any potential impacts. The wineries with stills are almost entirely located in California and, thus, are assumed to already meet guidelines. The tax-paid wine bottling houses generate negligible effluent and subsequently have also been eliminated from any detailed impact analysis.

Therefore, the major emphasis of this impact analysis will concern the eastern wineries which do not have stills. In total, there are 148 wineries which will be subject to the impact analysis. (Note only the western wineries located in California have been eliminated; those in Alaska, Oregon, and Washington may be subject to impacts.) Of these, approximately 84 can be classified as small, 33 can be classified as medium and 31 as large.

D. Significant Impacts on the Industry

Because of the structure and competitiveness of the Wine Industry, pollution abatement standards when imposed on wineries discharging to surface waters and user charges assessed to those discharging to municipal sewers can have serious consequences on the industry itself. The magnitude of this impact will, of course, depend on the level of investment required to meet the specific standards. The smaller third -- and to some extent the middle third -- of the wineries impacted are expected to be seriously impacted. They may not be able to recover the cost of installing and operating abatement facilities or paying user charges unless they have access to lower cost facilities, expand or merge. The specific winery impacts will of course depend on many factors such as capital availability, size of operation, profitability of the winery, location and availability of low cost treatment strategies.

It is recognized that the impact of substantially increased user charges, now and in the future, to wineries discharging to or planning to discharge to municipal sewers is extremely critical to the industry, local business communities and to consumers. However, the scope of the economic impacts in this report pertain to those discharging directly to navigable surface waters.

1. Capacity of Low Cost Producers Relative to High Cost Producers

The capacity of low cost wineries connected to municipal sewers or discharging directly relative to high cost wineries in the same position is one of the more important factors in considering the impact of pollution abatement costs imposed upon the industry. In the Wine Industry, the largest fourth of the wineries produce approximately 90 percent of the total production volume. The middle two-fourths of the wineries produce about 9 percent, and the smallest fourth bottle only 1 percent of the total volume. Due to economies of scale, the larger wineries are already expected to have a definite cost advantage. The imposition of high pollution abatement costs on the smallest fourth of the wineries discharging directly and to a large extent the middle two-fourths, are expected to result

in further disadvantages of these low volume wineries. If these small wineries are forced to shut down (unless low cost abatement procedures can be utilized), the low cost-high volume wineries in the industry will most likely offset possible losses in capacity through expansion by acquisition or plant expansion assuming firms can acquire the necessary capital or by increasing the utilization of their existing facilities.

2. Factor Dislocation Within the Industry

Differential impacts from pollution abatement controls are expected within the Wine Industry, both in terms of type of firm and in regional location of affected wineries. The impacts expected and reasons for associated dislocations are as follows.

a. Types of Firms and Location

As explained earlier, the Wine Industry is comprised of many firms (multi/single plant) differing in winery operations, size (rate per hour), capacity and utilization of capacity, level of technology (new/old) and other factors. Many of these factors were considered in the preliminary analyses and one of the most critical measures in terms of assessing a plant's ability to withstand the impact of internalized pollution abatement costs is its overall throughput size.

Marginal Firms - Within the industry, marginal firms are typically the "small" firms. This is particularly true in terms of small firm's ability to financially withstand projected high capital investment requirements of pollution abatement measures. Such wineries often lack capacity to pay out such investments (at the levels given). Many small firms also lack the capital-acquiring ability of larger firms.

Within this framework, marginal firms faced with the decision to either curtail production or shutdown would most likely shut down. However, pollution abatement investment costs can be an incentive to expand production, not lower it, in order to lower per unit costs for those wineries having or able to install self-contained disposal facilities.

Winery closures are also expected to result where obsolescence together with rising operational and required regulatory capital needs cause total costs of operation to be so high that continued operation is economically unfeasible. For single winery firm closures, unemployment and loss of market for local suppliers associated with the closing winery are expected to result. For some closed wineries that belong to multi-winery firms, various proportions of production and employees will shift to other wineries belonging to the firm; due to immobility some unemployment will occur, with a corresponding loss of payroll and local business. Other closed wineries that belong to multi-winery firms may not be able to shift production and are expected to have the same effects as the single winery firm closures.

Locational Impacts - As was discussed previously, the impact due to effluent controls will definitely vary according to the location of the winery. Aside from the obvious differences between western and eastern wineries, there will exist some differences within the regions of the eastern portion. These will primarily be attributable to varying climatic conditions which could influence the type of treatment system required to meet guidelines.

It is also recognized that differences in state water quality standards and the possibility of non-uniformity of enforcement within and between states is another important factor in the impact on wineries. Even though this problem is recognized, the impact of regulatory variability is not included in this report, due to lack of quantitative and qualitative information.

3. Reasons for Dislocations

Reasons for the above type of firm and location-dependent expected dislocations within the industry have been generally described. A summary in terms of profitability and capital attainment is appropriate.

Profitability - Profitability of firms, but particularly the smaller, inefficient and undercapitalized firms, will be affected by pollution abatement measures. While average incremental costs for pollution abatement may eventually be passed through to consumers, the smaller firms are expected to have much higher than average unit costs of abatement and to drop out during the period necessary to achieve any consumer price adjustments.

Economies of scale in pollution control are apparent, and this is to the relative disadvantage of smaller firms. As previously suggested, some of the wineries discharging direct might be forced out of the industry. This would have a limited desirable impact on the remaining firms in that pollution control costs could be spread over a larger volume. Thus, the level of profitability of the surviving plants might be affected less on the average.

In-plant modifications and operational changes which will reduce effluent loads may or may not improve the profitability of those wineries which can take advantage of them. In-plant modification costs and savings must be assessed and justified by individual wineries.

Capital Availability - Capital within the industry is obtained primarily from commercial sources outside the industry and from the investment of profits. Additional capital requirements for financing pollution abatement measures will principally be sought from such sources.

In this case, ability to obtain additional capital is expected to be determined by an individual firm's projections of net returns with an expanded investment program. Consequently, capital availability is expected to be directly related to profitability--and the smaller, inefficient wineries will have difficulty raising the needed long and short term capital to stay in business. In this sense, inability to obtain capital will contribute to the shutting down of marginal wineries.

Firms which are able to pass through incremental cost of pollution abatement and maintain positive profitability will be able to acquire capital for increasing capacity--plant expansion, acquisition, etc. Currently, pass throughs of rapidly increasing and larger-than-normal proportions of costs are difficult to expedite. Costs are rising rapidly and are disproportionately large due to a nearly simultaneous inflation of operational costs (labor, materials, raw material) with new investment requirements imposed by regulatory bodies (FEA, OSHA, EPA). These increased costs are difficult to pass through due to the recession wherin consumers are tending to resist any price increases through a lowering of consumption to basic needs. Thus, plans of expansion through acquired capital will tend to be carried out to the degree incremental pollution abatement, energy, safety and inventory costs can be passed through to consumers.

The ability of firms to obtain capital will also depend on the state of the economy and the amount of money available for lending. With a large amount of available funds, many industries and firms will be encouraged to borrow funds. Competition for funds among industries is dependent upon the money supply and relative profitability of individual firms.

4. Narrowing the Study Scope

The preceding has attempted to describe an overall picture of the Wine Industry. In the remainder of this analysis, efforts will be made to concentrate on those wineries which could be subject to potential impacts due to the imposition of effluent controls. This will be accomplished utilizing representative model wineries to estimate impacts and extending these impacts by association to the wider spectrum of wineries which correspond to the model wineries.

II. FINANCIAL PROFILE OF THE INDUSTRY

Firms in the Wine Industry are primarily either family or closely held corporations or divisions or subdivisions of large, often multi-plant operations. As a result, financial information relating to a single winery is difficult to obtain. However, by relating information available from a variety of sources, a picture of the Wine Industry can be attempted. Information used to develop financial profiles was integrated from several sources, including the Census of Manufactures, Annual Survey of Manufactures and associated published industry operational and financial statistics.

A. Sales and Taxes

For 1974, the Wine Industry's value of shipments amounted to $1,063.0 million (Table II-1). This compares to $590.9 million in 1970 and $279.3 million in 1960. While the above data reflect the value of the industry's shipments, Standard and Poor's 1/ estimate consumers expenditures for all wines (domestic and imported) to be $2.6 billion in 1974. This was up about 8 percent from the $2.4 billion estimated in 1973. According to Standard and Poor's, most of the 1974 increase in sales was due to higher prices, as 1974 represented the smallest rate of volume growth (1.5 percent for all wines) experienced in recent years. For 1973 the rate was 3 percent and from 1969 to 1972 the rate of volume growth fluctuated between 10 and 16 percent.

Wineries, besides generating annual sales, also generate substantial tax revenues for the federal, state and local governments. In 1973 the federal tax revenues amounted to $192.6 million or approximately 20 percent of the total value of shipments (Table II-1). The federal taxes are collected at a rate of 17 cents per wine gallon for still wines of less than 14 percent of alcohol by volume, 67 cents per wine gallon for wines over 14 and less than 21 percent, $2.25 per wine gallon for wines over 21 but less than 24 percent, $3.40 per wine gallon for champagne and other sparkling wines and $2.40 per wine gallon for artificially carbonated wines. State and local taxes on wines vary and as such no attempt to describe these taxes will be made.

1/ Standard and Poor's, Industry Surveys - Liquor, October 16, 1975 (Section 2).

Table II-1. The Wine Industry, annual value of shipments, production, consumption.

Year	Total Value of Shipments ($ Million)	Gross Domestic Wine Production[1/] (Million Wine Gallon)	Domestic Wine Entering U.S. Distribution Channels (Million wine gallons)	Per Capita Consumption of Wine[2/] (Wine Gallons)	Federal Wine Tax Collections ($ Million)
1960	279.3	166.5	152.6	1.51	100.4
1961	304.5	169.5	159.5	1.57	97.8
1962	337.7	183.6	154.0	1.52	99.9
1963	368.3	194.1	161.5	1.58	103.7
1964	385.1	193.0	170.1	1.64	110.2
1965	396.2	219.5	173.4	1.66	112.4
1966	400.8	193.9	173.2	1.65	112.6
1967	410.2	206.1	184.0	1.74	122.5
1968	445.7	214.5	191.4	1.79	127.3
1969	492.8	270.1	210.9	1.95	157.4
1970	590.9	255.9	237.3	2.17	163.3
1971	747.3	361.9	269.1	2.43	177.3
1972	865.0	318.1	289.9	2.64	181.2
1973	941.0	333.1	292.0	2.68	192.6
1974	1,063.0	353.5	298.0	2.65	N.A.

1/ Gross wine production is quantity of wine removed from fermenters plus increases after fermentation by amelioration, sweetening and addition of wine spirits, less withdrawals for distillation. Excludes distilling material produced.

2/ For population of age 21 years and over including persons living in areas where sales of alcoholic beverages are prohibited.

Sources: Bureau of Census, the Wine Institute and the Bureau of Alcohol, Tobacco and Firearms.

In terms of domestic production of wines, the industry has experienced a tremendous growth beginning in 1969. Prior to 1969 the industry showed moderate growth from 166.5 million wine gallons in 1960 to 214.5 million wine gallons in 1968. In 1969 the gross domestic wine production increased to 270.1 million wine gallons and in 1974, there were 353.5 million wine gallons produced (Table II-1).

Another measure of production which is perhaps more indicative of the industry's sales is the quantity of domestic wine which enters the U.S. distribution channels. This is based on the fact that many wines are aged for varying periods prior to their release for sale and as such the annual production may be distributed over a period of years. For 1974, the quantity of domestic wines entering U.S. distribution channels totaled 298.0 million wine gallons. This quantity has shown a steadily increasing trend and has increased from 152.6 million wine gallons in 1960 to 237.3 million wine gallons in 1970 to the 1974 quantity.

The 1972 Census of Manufactures' estimate of value of shipments for the industry was based on information provided by 213 establishments. This gives the shipments for the average winery to be $4.06 million (Table II-2), compared to $2.0 million in 1967.

In 1972, according to Census data, the average winery had shipments of just over $4 million and 44 employees, while the actual wineries in the industry varied considerably. Actual wineries ranged from small operations with less than 5 employees and annual shipments valued at $124,000 to extremely large operations employing over 500 employees and annual shipments of nearly $100 million.

B. Distribution of Sales Dollar

Some slight changes have occurred in the distribution of the sales dollar for the Wine Industry from 1967 to 1972. These changes are most significant for the raw materials portion; its share of the sales dollar has increased from 57.5 percent to 62.0 percent (see below). This increase was coupled with proportionate decreases in payroll and other operating costs.

	Distribution of Sales Dollars (Percent)	
	1967	1972
Total Sales	100.0	100.0
Raw materials	57.5	62.0
Payroll	11.5	10.6
Other operating costs, interest, taxes and profits	31.0	27.4

Table II-2. The Wine and Brandy Industry, value of shipments, value added and employees, census years 1963, 1967 and 1972.

Item	Units	1963		1967		1972	
		Industry Total	Per Establishment	Industry Total	Per Establishment	Industry Total	Per Establishment
Establishments	No.	222	-	205	-	213	-
Value of Shipment	($ Mil.)	368.2	1.66	410.2	2.00	864.9	4.06
Value added	($ Mil.)	137.3	0.62	196.8	0.96	407.9	1.92
Total Employees	No.	6,100	27	6,800	33	9,300	44

Source: U.S. Department of Commerce, Census of Manufactures.

This change in the distribution may be attributable to rather significant increases in the costs of raw materials, proportionately higher than increases in labor costs and other expenses. Raw materials utilized by wineries consist of grapes, purchased wines for blending, glass containers and other supplies and materials. The majority of this increase may be explained by the substantial increases in the prices of grapes which wineries purchase. (As an example, Table II-3 depicts average prices paid to New York State growers for grapes.) However, increases also have been experienced in the prices of glass containers as well as the additional supplies utilized by the wineries.

C. Earnings

According to Standard and Poor's, the Wine Industry has recently experienced a decline in earnings. Up to 1973, the industry achieved impressive earnings progress which was primarily the result of volume growth. With wine consumption having grown 10 percent or more in the four years prior to 1973, offsetting price increases in recognition of higher costs were implemented without noticeable consumer resistance. However, in 1973 and on through 1975 the industry experienced a sharp reduction in the rate of consumption growth. This stagnation was partially associated with relatively large increases in food costs, particularly in 1973, and general acceleration in inflation which lowered consumers' real incomes. Aside from lowering consumers' income, inflation also accelerated increases in costs such as those for bottles, paper packaging and transportation.

The outlook for the Wine Industry at the present is somewhat unstable due to the unpredictability of the economic environment. However, Standard and Poor's indicate there is good reason to believe that consumer demand will again strengthen, particularly since the consumer category associated with wine drinkers (adults between the age of 25 and 44 years[1/]) should increase in number by about 29 percent during the next ten years. Even if demand for wine does strengthen, the overall effect on the industry's earnings will still be dependent on the effects of inflation on wineries' raw materials.

The aggregated earnings for the Wine Industry and the Distilled Spirits Industry indicate that between the years 1968 and 1971 the aggregated Alcoholic Beverage Industry (excluding malt and malt beverages) has not faired very well. According to the Internal Revenue Service data (Table II-4), the average net profits before taxes has declined from 3.7 percent of net sales in fiscal year 1968-69 to a low of 1.8 percent in 1970-71. In 1972, the latest year for which data are available, the percentage increased to 2.0 percent. While these data do reflect

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[1/] Newsweek, National Wine Survey, January, 1975.

Table II-3. Grapes: Average price paid to New York State growers by wineries and processing plants, by variety, 1967-1974

Variety	Year Purchased							
	1967	1968	1969	1970	1971	1972	1973	1974
	Dollars per ton							
Concord	101	123	158	156	139	170 1/	211 2/	213 3/
Niagra	122	127	176	179	178	187	198 1/	237 2/
Catawba	176	181	237	239	243	245	259	300 2/
Delaware	198	202	241	245	154	259	294	360
Elvira	130	134	172	173	172	172	172	210
Ives	200	215	370	370	370	370	370	400
Dutchess	200	215	305	305	305	305	335	430
Isabella	183	191	305	305	305	305	305	315
French Hybrids	172	182	255	227	239	240	245	309

1/ Revised.

2/ Preliminary

3/ Preliminary Concord price based on payments in full. It does not include plants paying advances only.

Source: USDA, SRS, in cooperation with New York Crop Reporting Service, Survey of Wineries and Grape Processing Plants, New York 1974, Release No. 2, January 1975.

Table II-4. The alcholic beverage industry, except malt liquors and malt, net profit before taxes, by asset size, 1969-1972.

Fiscal Year	Size of Assets ($000)											
	Under 100	100 - 250	250 - 500	500 - 1,000	1,000 - 5,000	5,000 - 10,000	10,000 - 25,000	25,000 - 50,000	50,000 - 100,000	100,000 - 250,000	250,000 - or more	Total Industry
	Percent of Net Sales											
1968-69	5.7	-0.6	-	-5.8	0.0	3.7	6.8	8.5	4.5	4.0	2.6	3.7
1969-70	1.7	3.8	-30.9	-3.9	4.7	5.6	3.3	7.3	5.4	4.1	0.7	2.1
1971-71	-	3.0	-36.3	-0.2	2.6	5.6	2.2	6.6	4.5	3.1	0.6	1.8
1971-72	-2.7	3.8	3.7	-5.2	4.2	4.4	5.1	4.1	5.8	3.8	0.4	2.0

Source: Department of Treasury, Internal Revenue Service, Source Book of Statistics of Income, Annual.

somewhat narrow margins it should be noted that they represent the aggregated industries and not the Wine Industry alone.

Table II-4 also indicates profits by the size of the operation. As would be expected, the smaller operations generally were associated with the lower and unstable profits and the larger firms maintained reasonably steady and higher profits.

D. Ability to Finance New Investment

The ability of a firm to finance new investments for pollution abatement is a function of several critical financial and economic factors. In general terms, new capital must come from one or more of the following sources: (1) funds borrowed from outside sources; (2) equity capital generated through the sale of common or preferred stock; (3) internally generated funds -- retained earnings and the stream of funds attributed to depreciation of fixed assets.

For each of the three major sources of new investment, the most critical set of factors is the financial condition of the individual firm. For debt financing, the firm's credit rating, earnings record over a period of years, stability of earnings, existing debt-equity ratio and the lenders' confidence in management will be major considerations. New equity funds through the sale of securities will depend upon the firm's future earnings. as anticipated by investors, which in turn will reflect past earnings The firm's record, compared to others in its own industry and to firms in other similar industries, will be a major determinant of the ease with which new equity capital can be acquired. In the comparisons, the investor will probably look at the trend of earnings for the past five years.

Internally generated funds depend upon the margin of profitability and the cash flow from operations. Also, in publicly held corporations, stockholders must be willing to forego dividends in order to make earnings available for reinvestment.

The condition of the firm's industry and general economic conditions are also major considerations in attracting new capital. The industry will be compared to other similar industries (i.e., other beverage industries) in terms of net profits on sales and on net worth, supply-demand relationships, trends in production and consumption, the state of technology, impact of government regulation, foreign trade and other significant variables. Declining or depressed industries are not good prospects for attracting new capital. At the same time, the overall condition of the domestic and international economy can influence capital markets. A firm is more likely to attract new capital during a boom period than during a recession. On the other hand, the cost of new capital will usually be higher during an expansionary period. Furthermore, the money markets play a determining role in new financing.

These general guidelines can be applied to the Wine Industry by looking at general economic data and industry performance over the recent past.

1. General Industry Situation

As was depicted in Table II-4, the Alcoholic Beverage Industry has experienced a declining trend in its profits during the past few years. However, Standard and Poor's have projected that the industry has good earnings potential from the increasing number of adults in the wine drinking age group.

Total assets and liabilities of the alcoholic beverage industry are shown in Table II-5 for the years 1968-1969 through 1971-72. From the table, it is apparent that the industry's fixed assets represent approximately 42 percent of all assets and that current assets represent approximately 58 percent. Also, it is apparent that of the total liabilities, long term debt represents approximately 26 percent, current liabilities represent 30 percent and net worth represents 44 percent.

2. Expenditures for Plant and Equipment

New expenditures as reported by the Annual Survey of Manufactures and the Census have increased from $5.1 million in 1960 to $44.4 million in 1972 (Table II-6). The yearly expenditures have fluctuated from year to year, but overall have been increasing.

A closer look at the $44.7 million spent as capital expenditures in 1972 (depicted below) reveals $11.7 million were spent for new structures and addition to plants, $32.0 million for new machinery and equipment and the remainder, $0.7 million, was spent to purchase used plants and equipment.

As also depicted below, comparable data for 1967 reveal that the industry utilized a greater portion of its capital expenditures for new machinery and equipment, and a smaller portion for new structures and additions to existing plants and for used plants and equipment. This can be interpreted to suggest that the industry is moving toward the upgrading of existing facilities instead of the construction of new facilities.

Expenditures for Plants and Equipment

	1967		1972	
	$ Million	Percent	$ Million	Percent
Total	10.6	100.0	44.4	100.0
New Structures & Additions to plants	3.5	33.0	11.7	26.3
New Machinery & Equipment	6.8	64.2	32.0	72.1
Used Plants and Equipment	0.3	2.8	0.7	1.6

Table II-5. The alcoholic beverage industry, except malt liquor and malt, assets and liabilities, 1969-1972

	1968-69		1969-70		1970-71		1971-72	
	($ Mil.)	(Percent)	($ Mil.)	(Percent)	($ Mil.)	(Percent)	($ Mil.)	(Percent)
Assets								
Current Assets	1,683.3	55	3,207.5	58	3,278.1	58	3,418.4	59
Fixed Assets	1,352.0	45	2,288.1	42	2,380.8	42	2,343.8	41
Total Assets	3,035.3	100	5,495.7	100	5,658.9	100	5,762.2	100
Liability & Equity								
Long Term Debt	690.2	23	1,488.4	27	1,464.8	26	1,592.2	28
Current Liabilities	757.6	25	1,756.7	32	1,785.9	32	1,629.8	28
Net Worth	1,587.4	52	2,250.5	41	2,408.2	42	2,540.1	44
Total Liabilities and Equity	3,035.3	100	5,495.6	100	5,658.9	100	5,762.2	100

Source: Department of Treasury, Internal Revenue Service, Source Book of Statistics of Income, annual.

Table II-6. The Wine and Brandy Industry, Capital Expenditure 1960 through 1972

Year	Capital Expenditure ($ Million)
1960	*5.1
1961	*6.7
1962	*10.0
1963	7.3
1964	*11.3
1965	11.3
1966	11.8
1967	10.3
1968	14.0
1969	15.8
1970	*36.2
1971	40.4
1972	44.4

* Limited reliability.

Source: U.S. Department of Commerce, Census of Manufactures.

3. Capital Availability

In summary, it would appear that the Wine Industry can be categorized into two types of financial positions in terms of the availability of capital to utilize for expenditures on pollution controls. First, there are the large diversified firms who have experienced reasonably steady profits and through diversification have been able to maintain adequate cash flows. For these firms the acquisition of additional capital for pollution controls may be of concern but should not be a major problem.

The other financial position will be encountered by the smaller firms who do not have the available sources from which additional capital can be readily generated. These firms will primarily have to rely on internally generated capital (if available) or attempt to borrow it. Depending on the firm's potential and the industry's outlook, some of the smaller firms may encounter significant problems in obtaining capital.

E. Cost of Capital - After Tax

Return on invested capital is a fundamental notion in the U.S. business. It provides both a measure of actual performance of a firm as well as expected performance. In this latter case, it is also called the cost of capital. The cost of capital is defined as the weighted average of the cost of each type of capital employed by the firm, in general terms equities and interest bearing liabilities. There is no methodology that yields the precise cost of capital, but it can be approximated within reasonable bounds.

The cost of capital was determined for purposes of this analysis by estimating performance measures of the industry. The weights of the two respective types of capital for the Wine Industry were estimated at 37 percent debt and 63 percent equity. The cost of debt was assumed to be 10.0 percent. The cost of equity was determined from the ratio of earnings to net worth and estimated to be 9.5 percent.

To determine the weighted average cost of capital, it is necessary to adjust the before tax costs to after tax costs (debt capital only in this case). This is accomplished by multiplying the costs by one minus the tax rate (assumed to be 48 percent). These computations are shown below and result in the estimated after-tax cost of capital being 7.9 percent.

Weighted Average After-Tax Cost of Capital

Item	Weight	Before Tax Cost	Tax Rate	After Tax Cost	Weighted Cost
Debt	.37	10.0	.48	5.2	1.9
Equity	.63	-	-	9.5	6.0
					7.9

III. MODEL PLANTS

The Wine Industry is comprised of many wineries which utilize slight variations of a basic process to produce differentiated types of wines. As stated previously, the industry consists of establishments primarily engaged in the manufacturing of wines, brandy or brandy spirits utilizing processes involving fermentation, maturing, blending and bottling. As this chapter is concerned with the development of economic model plants representative of those wineries which potentially could be effected by the imposition of effluent controls, the primary emphasis of this chapter will be those wineries without stills located primarily in the East. This determination has been made since the western wineries (California) utilize land application for the release of their effluent and according to the Development Document, no effluent is discharged to navigable waters. Wineries with stills have also been excluded from further analysis as these are all located in California and the above situation applies. Finally, those establishements which blend and bottle wines and brandy have also been excluded as they generate little effluent and none are known which discharge to navigable waters.

A. Types of Plants

Those establishments without stills can typically be categorized into two different types of wineries. First, and perhaps the most common, are those which manufacture only table wines, utilizing only wines produced at the facility. The second category is characterized by those wineries which produce not only table wines but also purchase brandy and wine spirits to produce dessert or fortified wines. While these latter wineries do exist, their initial processes and effluent characteristics are not significantly different from those wineries which produce only table wines. As such, the model wineries developed represent those wineries which produce table wines only.

The winery produces wine products utilizing six basic steps. These steps include: (1) destemming and crushing; (2) fermenting; (3) pressing; (4) clarification; (5) maturation; and (6) bottling. Each of these steps will be discussed briefly.

1. Destemming and crushing - After picking, grapes are transported to the winery in large containers or trucks which after their arrival are sampled and weighed. These then are dumped into the destemmer/crusher which separates the grape from the stem and crushes the grape, There are several different types of destemmer/crushers but basically the end result is the same. (It should be noted the Garolla type removes the leaves and stems from the grapes and thus only the crushed grapes are transferred to the fermenters."

2. Fermentation - The juice, seeds and skins, now known as "must", are then pumped to the fermentation vats where small amounts of sulfur dioxide are added to inhibit the growth of wild yeast and then a pure yeast starter is added. The fermentation process begins in which the grape sugars are converted into nearly equal parts of alcohol and carbon

dioxide. When the fermenting must has attained the desired amount of color and tannin, then it is drawn off the pomace as "free-run" juice and pumped to a finishing tank where fermentation may be processed to completion. Usually within about six weeks after crushing the final fermentation is complete.

Slight differences do exist between the fermentation practices utilized by western and eastern wineries. The above description typifies the western practice. In the east, however, most wines are produced by "hot pressing." In this process, pulp from the stemmer-crusher is heated to about 140° F and held for 30 to 60 minutes. During this holding period, the pigment or coloring matter is extracted from the skins. The heated pulp is then pressed, the juice cooled and fermented.

Finally to produce white wines, both in the east and west, the pulp from the stemmer-crusher is pressed and only the juice fermented.

3. Pressing - The pressing operation is utilized to extract any remaining liquid from the pomace once the "free-run" wine has been removed. The resulting "press-run" may be used for the production of less expensive wines or it may be recombined with the original free-run. The remaining pressed pomace is usually hauled and spread on the vineyards or is dried and sold as livestock feed.

4. Clarification - Once completely fermented, the liquid now called wine, is decanted or "racked" off the sediment of yeast pulp and tartarates known as lees. This procedure may take place three or four times. During this time the wine usually also proceeds through a series of clarification processes which consist of a variety of filtration systems.

5. Maturation - The aging process varies in length and consists primarily of the wine being placed in wooden, stainless steel or concrete containers which usually are kept at low temperatures. This reduced temperature is necessary to hasten the precipitation of tartarates which otherwise might be deposited after the wine has been bottled. As the cost of refrigeration is expensive the use of ion exchange resins as an alternative process to aging has come into limited practice. In this process potassium and calcium ions are replaced with sodium or hydrogen ions.

6. Bottling - Most wineries find it more practical to bottle their own wines, although wine may be shipped in tank cars to plants where the only operation is bottling. The bottles are filled and corked under sterile conditions. There is little spillage involved except in the case of breakage. The wine is inspected for clarity prior to labeling and casing, and this operation for the most part, is entirely automated.

B. Sizes of Wineries

The value of shipments of the Wine Industry in 1972 was $865 million according to the Census. This gives an average for the 213 establishments of $4.1 million. This figure, however, is misleading as it reflects the average of all wineries (East and West) as well as all wineries regardless of whether or not they operate a still.

According to the Wines and Vines Directory in 1974, there were 369 wineries comprising the Wine Industry. Of these, 221 were located in California which have been eliminated from this discussion and thus in 1974 there were 148 wineries which would fall under the scope of this analysis. The criterion for defining the size of the model wineries is the average annual quantity of wine produced at the winery. Three sizes of existing model wineries were developed, being labeled, small, medium and large and two new source wineries, medium and large.

The model wineries are depicted in Table III-1. For the models, the annual quantity of wine produced was 27,200 wine gallons for the small winery, 194,000 gallons for the medium model winery and 2,511,000 wine gallons for the large winery. The annual quantities of wines produced for the new source wineries correspond to the sizes of the medium and large existing wineries. Other relevant information concerning the winery models are also shown on Table III-1.

The financial profiles for each of the model wineries are shown in Table III-2. These profiles were derived from information available from a variety of sources including the Census of Manufactures, Wines and Vines, Internal Revenue Service and the Bureau of Alcohol, Tobacco and Firearms.

C. Investment

The estimated book value and salvage value for each model winery are shown in Table III-3. Also shown are current assets, current liabilities and net working capital.

1. Book Value of Investment

The estimates of book value of assets were developed from data available from published sources as well as limited data from industry sources. The estimates were computed utilizing a derived estimate of asset value per gallon of wine produced. The values per wine gallon were $6.50, $4.00 and $2.50 for the small, medium and large existing model wineries, respectively. The value for both the new source models were estimated to be $8.50 per gallon of wine produced.

2. Salvage Value

The salvage value of wineries will vary widely from facility to facility, depending upon the age of the equipment and its condition, the age of the plant and its condition and the location of the facilities. In some situations, the salvage value of old, obsolete, wineries will be equal to site value plus the scrap value of the equipment.

Table III-1. The Wine Industry, model wineries, descriptive information

Size	Existing			New Source	
	Small	Medium	Large	Medium	Large
Annual Production (wine gallons)	27,200	194,000	2,511,400	194,000	2,511,400
Fermenting Capacity (wine gallons)	11,600	59,800	500,000	59,800	500,000
Days Crushing per Year	50	60	60	60	60
Hours Crushing per Day	12	12	18	12	18
Number of Corresponding Establishments	84	33	31	--	--

Table III-2. The Wine Industry, model wineries financial profiles ($000)

	Existing			New Source	
	Small	Medium	Large	Medium	Large
Annual Production (1,000 wine gallons)	27.2	194.0	2,511.4	194.0	2,511.4
Sales ($3.00/gal.)	81.6	582.0	7,534.2	582.0	7,534.2
Costs					
Materials	44.9	335.8	4,502.5	291.0	3,767.1
Labor	18.8	87.3	828.8	50.0	480.8
Other	8.8	81.0	994.5	49.0	503.0
Total Costs	72.5	504.1	6,325.8	390.0	4,750.9
Cash Earnings	9.1	77.9	1,208.4	192.0	2,783.3
Less					
Depreciation	5.3	34.9	376.7	98.9	1,427.2
Interest	0.8	5.8	75.3	5.8	75.3
Pre-Tax Income	3.0	37.2	756.4	87.3	1,280.8
Income Tax	0.7	11.4	356.6	35.4	608.3
After-Tax Income	2.3	25.8	399.8	51.9	672.5
Cash Flow	7.6	60.7	776.5	150.8	2,099.7

Table III-3. The Wine Industry, estimated capital costs for model wineries

	Existing						New Source			
	Small		Medium		Large		Medium		Large	
	Book	Salvage	Book	Salvage	Book	Salvage	Book	Salvage	Book	Salvage
	($1,000)									
Total Fixed Assets	176.8	35.4	776.0	155.2	6,278.5	1,225.7	1,649.0	399.8	21,346.9	4,269.4
Current Assets	81.6	81.6	517.6	517.6	4,187.8	4,187.8	436.5	436.5	5,650.6	5,650.6
Current Liabilities	45.3	45.3	323.5	323.5	2,991.3	2,991.3	272.8	272.8	4,036.2	4,036.2
Net Working Capital	36.3	36.3	194.1	194.1	1,196.5	1,196.5	163.7	163.7	1,614.4	1,614.4
Total Invested Capital	213.1	71.7	970.1	349.3	7,475.0	2,422.2	1,812.7	563.5	21,910.4	5,883.8

There is a market for certain types of used machinery and equipment, however, this is limited primarily to modification of existing operations as virtually all new wineries begin with all new equipment. As no data are available on actual salvage values for wineries and only a limited market exists for used equipment, it is difficult to estimate the salvage value of plants closed due to the added costs of effluent controls. For purposes of this analysis, the estimated salvage value has been determined based on 20 percent of the book value of the winery's assets.

3. Operating Capital

Current assets, current liabilities and net working capital were also shown in Table III-3. Current assets were estimated to represent 100 percent of sales for the small winery model, 90 percent for the medium sized model, 55 percent for the large model and 75 percent for the NSPS models.

Current liabilities were estimated utilizing a current ratio (current assets divided by current liabilities) of 1.8 for the small model, 1.6 for the medium models and 1.4 for the large model wineries.

D. Model Winery Capacity and Utilization

As wineries vary from one to another, there appears to be no industry rule by which the model wineries' capacity or utilization can be established. The limiting factors for most wineries are the capacity of the fermentation and wine storage as well as the availability of grapes.

With the recent gain in popularity of wines, the industry has experienced rather significant increases in the overall capacity of wine which can be stored. This storage capacity still can be a limiting factor as was the case in 1975 when the industry experienced an unusually large grape crop. This large crop caused the grape price to drop and accordingly most wineries utilized all available storage to take advantage of the cheaper grapes.

While the 1975 grape situation may be out of the ordinary, it is foreseen by some industry members that wineries will continue to expand (primarily in storage capacity). This expansion is in expectation of future increased demand.

In view of the recent industry situation, it was determined that the model wineries would operate at near capacity levels with the primary limitation being storage capacity.

The Wine Industry can be characterized as having a highly seasonal production with the ripening of the grape being the primary factor.

In terms of seasonal sales, as can be seen in Table III-4, the months of September and October represented 64 percent of the industry's yearly still wine withdrawals. The major reason for these large monthly withdrawals is that the largest months for wine sales are November and December, the holiday season. Thus, the high withdrawal rate for September and October reflects shipment from wineries to wholesalers and retailers in preparation for the peak holiday months.

E. Cost Structure of Model Plants

The cost structures for the model wineries were shown in Table III-2. Major items are discussed below.

1. Materials

The majority of the model's expenditures for materials is attributable to the purchasing of grapes. In 1972, grapes represented 33 percent of the industry's materials consumed. According to the Census, the next most significant material purchased was wines to be used for blending. Following purchased wines, the industry's major purchases were for glass containers and all other materials, containers and supplies.

2. Labor

Labor represented one of the more difficult costs to estimate as wineries are highly seasonal and accordingly many wineries (especially the smaller ones) do not employ their people throughout the year. Many employees will work only 3 or 4 months per year during the peak season. These part-time individuals are often women however some are men.

3. Supplies and Other Costs

This cost classification includes miscellaneous other costs as well as costs for fuels and indirect costs (i.e., administrative costs).

4. Depreciation and Interest

Depreciation was derived from IRS data and determined to be, expressed as a percent of the book value of assets, 3 percent for the small winery, 4.5 percent for the medium model and 6.0 percent for the large existing as well as the new source wineries. These varying percentages are based on the assumption that most wineries data back prior to prohibition (1919 to 1933) and although wineries have updated, there has been a trend for the larger wineries to modernize at a greater rate than the smaller wineries. Thus the portion of assets depreciable would vary.

Interest was estimated to be one percent of the annual sales.

Table III-4. The Wine Industry, monthly withdrawals of still wines, FY 1974

Month	Total Still Wine Withdrawals (Million Wine Gallons)
July	3.4
August	28.9
September	146.7
October	153.0
November	49.2
December	30.6
January	11.9
February	11.2
March	4.8
April	9.6
May	7.9
June	11.3

Source: Department of the Treasury, Bureau of Alcohol, Tobacco and Firearms, Summary Statistics, 1974.

5. Total Costs

Material costs for the existing wineries ranged from 55 percent of total sales for the small winery to 60 percent for the large model winery. Labor represented the greatest percentage for the small winery, being 23 percent. Labor for the medium winery represented 15 percent of the sales dollar and for the large winery model, labor represented 11 percent. Finally, the expenses for supplies and other costs ranged from 10.8 percent for the small model to 13.9 and 13.2 for the medium and large winery models, respectively.

Thus for the model wineries, total costs for the small model were estimated to represent 88.8 percent of its sales dollar. For the medium and large model wineries, total costs were estimated to be 86.6 and 84.2 percent, respectively.

The costs for the new source winery models differed in that they were assumed to operate on a more efficient utilization rate with fewer employees. This was based on the assumption that these new wineries would have the latest equipment and utilize the most up-to-date techniques.

F. Annual Profits

After-tax income, return on sales, both pre-tax and after-tax, and return on total invested capital for the various sized model wineries are depicted in Table III-5. It should be noted that the model wineries were based on average 1973-74 conditions as no later published sources of information were available.

G. Annual Cash Flows

Estimated annual cash flows for the different sizes of models wineries are shown in Table III-6. Cash flow as calculated represents the sum of after-tax income plus depreciation. In the table it is shown in absolute dollars, as a percent of sales, and as a percent of total invested capital.

As a percent of sales the existing models' cash flows range from a low of 9.3 percent to a high of 10.4 percent, or about 10 percent for all three models.

Cash flows as a percent of total invested capital for the models reveal a larger range; increasing as the size of the model wineries increase.

Table III-5. The Wine Industry, net income, returns on sales and investments for model wineries

Size of Model Winery	After-tax Income	Return on Sales		Return on Total Invested Capital	
		Pre-tax	After-tax	Pre-tax	After-tax
	(Dollars)	Percent			
Existing					
Small	2,300	3.7	2.8	1.4	1.1
Medium	25,800	6.4	4.4	3.8	2.7
Large	399,800	10.0	5.3	10.1	5.3
New Source					
Medium	51,900	15.0	8.9	4.8	2.9
Large	672,500	17.0	8.9	5.8	3.1

Table III-6. The Wine Industry, annual cash flows for the model wineries

Size of Model Winery	Annual Cash Flow	Cash Flow as a percent of sales	Cash Flow as a percent of Total Invested Capital
	(Dollars)	(Percent)	(Percent)
Existing			
Small	7,600	9.3	3.4
Medium	60,700	10.4	6.3
Large	776,500	10.3	10.4
New Source			
Medium	150,800	25.9	8.3
Large	2,099,700	27.9	9.6

IV. PRICING PATTERNS

Historically the price of wine has shown a relatively constant annual increase. This increase is attributable to several factors with the more significant being increased ingredient costs and increased consumer demand.

A. Price Determination

The determination of prices for wines involves a complex interaction of consumer demand and attitudes, the available supply and government taxes. While the supply and taxes influence the overall determination of prices, consumer demands and attitudes dominate the actual price determination process.

1. Consumer Demand and Attitude

Consumer demand can be defined as the quantity of wine consumers are willing to purchase at the current level of prices. Historically wine demand (consumption) has increased since 1960 at an annual average rate of 5.1 percent. This increase, however, has not been steady as the annual rate of increase has fluctuated between a low of minus 3.1 percent in 1962 to a high of 13.4 percent in 1971 (Table IV-1). During the most recent six years, the average annual increase has been much higher than for the preceding years, with an average increase for 1969 to 1974 of 7.8 percent. This recent rate of increase would have been even higher if consumption had not drastically stabilized in 1973 and 1974.

These trends are reinforced when the wine per capita consumption is viewed (Also in Table IV-1). The per capita quantity of wine consumed has increased from 1.508 wine gallons in 1960 to 2.647 wine gallons in 1974, with an average annual increase of 4.2 percent. In addition, the average annual increase for the 1969 to 1974 period was larger, being 6.8 percent.

Thus, it appears the demand for wine has increased rather steadily during the past fifteen years with a significant increase between 1969 and 1972. This recent increase is primarily explained by an increased popularity by consumers for wines. The sudden drop in the rate of increase after 1972 has coincided with the sharp rise in food costs in 1973 which caused consumers to cut back spending for non-essentials. In 1974, the further reduction in wine purchases reflected acceleration in inflation, which lowered consumers real incomes even further.

Table IV-1. The Wine Industry, consumption since 1960.

Year	Wine Entering Distribution Channels[1/] (1,000 wine gallons)	Percentage Change from Previous Year (Percent)	Per Capita Consumption[2/] (Wine gallons)	Percentage Change from Previous Year (Percent)
1960	152,616	-	1.508	-
1961	159,479	+4.5	1.568	+4.0
1962	154,041	-3.1	1.521	-3.0
1963	161,549	+4.9	1.575	+3.6
1964	170,069	+5.3	1.639	+3.9
1965	173,391	+2.0	1.655	+1.0
1966	173,197	-0.1	1.650	-0.3
1967	184,027	+6.3	1.738	+5.3
1968	191,447	+4.0	1.793	+3.2
1969	210,936	+10.2	1.946	+8.5
1970	237,327	+12.5	2.169	+11.5
1971	269,065	+13.4	2.432	+12.1
1972	289,942	+7.8	2.638	+8.5
1973	292,041	+1.0	2.676	+1.4
1974	298,009	+2.0	2.647	-1.1

1/ Represents all U.S. produced wines entering distribution channels in the U.S.

2/ For population of age 21 years and over including persons living in areas where sales of alcoholic beverages are prohibited.

Sources: Wine Advisory Board, Economic Research Report No. ER-29, Wine Industry Statistical Report, Part II, 1974.

Demand for individual brands and wine types is predominantly dependent upon consumers' preferences and attitudes. Competition between brands is often based on the price of a particular brand in relation to its image in the consumer's mind. Generally consumers can be classified as brand conscious within a given price range. That is, they seek what they consider the best brand for their money. Furthermore, consumers are sometimes reluctant to try new brands and usually purchase brands with which they are familiar.

With the increase in consumption of wine, consumers have caused the distribution of the wine market to change. As can be seen in Table IV-2, the percentage table wine represents of total wines consumed has increased from 31.1 percent of the market in 1960 to 52.7 percent in 1974. While this increase has not caused the annual quantity of other wines to decrease it has caused the other wines' percentage of the total wine market to drop. The wine type most seriously impacted by the increased table wine share are the dessert wines, which have decreased their market share from 56.6 percent in 1960 to 21.3 percent in 1974.

2. Supply of Wines

The supply of wine is constrained by the annual production of grapes and the capacities of the wineries in terms of their fermentation and storage facilities. Most wines do require a maturation period and this too can act as a constraint on the available supply of wine.

Until 1973, the industry had been operating at near capacity levels in efforts to meet the increasing consumer demands. Now many wineries have constructed additional facilities which should expand their capability to produce wines. These additional facilities, the slight decrease in demand and bumper grape crops have enabled wineries to again establish inventories such that they can meet the demanded quantities.

3. Market Structure

The markets in which wineries must sell range from highly competitive open markets to restricted "control state" markets. In addition regardless of the market, wineries are subject to numerous controls and regulations by the Federal government as well as by the states.

As of 1974, there were 18 states which were classified as control or monopoly states in terms of the distribution of distilled spirits and wines. These states are Alabama, Idaho, Iowa, Maine, Michigan, Mississippi, Montana, New Hampshire, North Carolina, Ohio, Oregon, Pennsylvania, Utah, Vermont, Washington, West Virginia and Wyoming. In these states, commissions have been set up which purchase alcoholic beverages from distillers, importers, or vintners either directly or through brokers to sell to state-owned package stores or to bars, taverns or restaurants. In 11 of the monopoly states wine is sold in grocery stores.

Table IV-2. U.S. produced wine entering distribution channels in the U.S. by type of wine.

Year	Table	Dessert	Vermouth	Sparkling	Other Special Natural Wines	Total
	Percent of Total					
1960	31.1	56.6	2.6	2.2	7.5	100.0
1961	31.8	55.1	2.7	2.3	8.1	100.0
1962	33.6	52.5	2.7	2.5	8.8	100.0
1963	34.8	51.8	2.6	2.6	8.1	100.0
1964	36.3	49.4	2.8	3.1	8.4	100.0
1965	37.6	47.1	2.8	3.6	9.0	100.0
1966	39.4	44.5	2.8	4.3	9.0	100.0
1967	41.6	42.1	2.9	4.8	8.7	100.0
1968	43.2	40.7	2.6	5.4	8.1	100.0
1969	46.0	35.7	2.4	6.5	9.4	100.0
1970	47.5	30.1	2.2	8.6	11.7	100.0
1971	48.4	26.4	1.8	8.2	15.2	100.0
1972	47.0	24.2	1.8	7.0	20.0	100.0
1973	50.0	22.7	1.8	6.5	19.0	100.0
1974	52.7	21.3	1.8	6.0	18.1	100.0

Source: Wine Advisory Borad, Wine Industry Statistical Report, Part II, Economic Research Report No. ER-29, 1974.

The remaining 32 states plus the District of Columbia are classified as open states which allow wholesale dealers to purchase wines and spirits. These wholesale dealers in turn sell to licensed outlets, bars, taverns and restaurants.

Thus, wineries must operate in markets where they must be competitive as well as meet requirements imposed by individual states and counties. Furthermore, wineries must rely on their own national advertising or advertising by distributors or retail outlets' (where permitted) to promote the purchase of their particular brands.

B. Price Trends

The prices of wines have historically remained relatively stable until 1970. The wholesale price index for all wines increased from 92.2 in 1960 to 108.1 in 1970 (Table IV-3). However, after 1970 the prices of wines experienced significant increases, increasing from a wholesale price index of 108.1 in 1970 to 147.4 in 1974. These price trends are in part explained by rather significant increases in grape prices, which have increased by as much as 100 to 200 percent (Table IV-3).

These upward trends in wine prices have been acceptable to consumers as their demand increases coincided with the price increases. However, beginning in 1973 and carrying over to 1974, consumers began to shrink away from wines and accordingly the relatively high rate of consumption growth slowed.

According to Standard and Poor's, the upward price trend appears to have ended in 1975 and the implication for volume should be favorable. After rising 9.3 percent in 1974, wholesale prices for table wines increased by 3.0 percent through May, 1975, and should not exceed 5.0 percent for the entire year. This slowdown in the price trend is resultant of large grape crops in the past two years which have increased wine inventories and now wineries are in a more favorable position in terms of their inventory stocks and thus are less affected by short-run variations in costs.

Table IV-3. The Wine Industry, wholesale price index for selected products.

Year	All Wines	Red Table Wine	Dessert Wine	California Wine Grapes[1/]	New York All Grapes[1/]
	1967 = 100.0				
1960	92.2	91.2	92.7		
1961	92.8	93.2	9.25		
1962	99.0	97.5	99.8		
1963	98.7	96.9	99.7		
1964	97.0	96.2	97.5		
1965	99.8	99.1	100.1	77.8	99.1
1966	98.5	97.8	98.7	90.8	103.6
1967	100.0	100.0	100.0	100.0	100.0
1968	103.3	103.3	103.2	114.5	118.8
1969	104.3	105.4	103.6	129.6	156.3
1970	108.1	107.5	108.4	190.0	150.9
1971	117.2	110.6	121.1	223.8	142.9
1972	125.3	127.3	124.0	357.5	166.1
1973	133.7	137.1	131.5	333.3	197.3
1974	147.4	155.6	142.4	235.1	209.8

[1/] Average grape price received by grower.

Source: U.S. Department of Labor, Bureau of Labor Statistics and U.S. Department of Agriculture, Statistical Reporting Service.

Finally, it should be noted, that while the wine wholesale price index has increased during recent years, wineries have also marketed large quantities of lower priced wines. Instead of lowering the price of a particular type wine, wineries have recently begun to introduce a lower priced wine and to gear their marketing campaign toward the younger more price conscious consumer. This has resulted in a significant increase in the number of wines marketed and is considered wineries' major tool in maintaining their market share.

V. EFFLUENT CONTROL COSTS

The effluent control system requirements and costs depicted in this chapter were provided by the Effluent Guidelines Division of the Environmental Protection Agency as provided by the technical contractor, Environmental Science Engineering. The recommended and optional treatment alternatives for the model wineries were the same as presented in the Development Document.[1/] However, the associated investment and annual costs have been revised by the technical contractor to reflect the model wineries production characteristics previously described in Chapter III.

A. Pollution Control Requirements

Three effluent control levels for point source categories (direct dischargers) were originally considered:

BPT - Best Practicable Control Technology Currently Available, to be achieved by July, 1977.

BAT - Best Available Control Technology Economically Achievable, to be achieved by July, 1983.

NSPS - New Source Performance Standards are recommended to be equal to the BAT control level and to apply to any source for which construction starts after the publication of the proposed regulations.

Raw waste loads for the existing model wineries as well as the new source wineries are depicted in Table V-1. From this table it can be seen that variations in flow in gallons per day do exist, however, the concentration expressed in milligrams per liter (mg/l) of wastewater, of biological oxygen demand (BOD) and suspended solids (SS) are constant regardless of winery size. The concentration of fats, oils and grease (FOG) are not present. The recommended effluent limitation guidelines for the model wineries as proposed in the Development Document are shown in Table V-2.

1/ Development Document for Effluent Limitation Guidelines and New Source Performance Standards, Miscellaneous Foods and Beverages, Point Source Category, Draft Report prepared by Environmental Science and Engineering, Inc. for the U.S. Environmental Protection Agency.

Table V-1. Raw waste loads for model wineries.

Model	Production	Flow	BOD	SS	FOG
	Wine gallons per year	gallons per day	mg/l	mg/l	mg/l
Existing					
Small	27,200	657	2,337	759	N.A.
Medium	194,000	4,670	2,337	759	N.A.
Large	2,511,400	72,600	2,337	759	N.A.
New Source					
Medium	194,000	3,733	2,645	404	N.A.
Large	2,511,400	51,700	2,645	404	N.A.

Source: Effluent Guidelines Division, Environmental Protection Agency.

Table V-2. Recommended effluent limitation guidelines for the Wine Industry

	BPT	BAT	NSPS
	---- kg/Kkg Grapes crushed		------
BOD			
Max 30-day ave.	0.280	0.380	0.230
Max Day	0.830	1.100	0.690
SS			
Max 30-day ave.	0.410	0.054	0.031
Max Day	1.200	0.160	0.093

Source: Development Document, Environmental Protection Agency.

B. Current Status of the Industry

As was explained in Chapter I of this report, the Wine Industry can be divided into two separate categories based on geographical location; the western wineries and the eastern wineries. Furthermore, as also described in Chapter I, the western wineries were exempted from consideration in the impact analysis as it has been determined that the treatment methods practiced by western wineries not connected to municipal sewage systems resulted in no effluent reaching navigable waters (e.g., land application).

During this emphasis, the discharge status of the eastern wineries was established through the utilization of a survey of eastern wineries conducted by the technical contractor. The survey was completed by 99 eastern wineries and of these only one was found to be a direct discharger. Of the remaining wineries contacted, 42 discharged to municipal systems, 27 utilized septic tanks, 15 used settling ponds and 14 used spray irrigation or open drainage. These methods of treatment have been determined to be satisfactory by the EPA and thus the imposition of effluent controls on existing wineries will be negligible. Accordingly only the impacts on new source wineries were considered.

C. Pollution Control Costs

The costs estimates, in 1972 dollars, and the components of the recommended and optional (if considered possible) treatment alternatives for the model wineries are shown in Table V-5 and Table V-6. From the information provided, total investment and annual costs were inflated so as to be consistent with the costs associated with the models. Investment and annual costs were inflated from 1972 to 1974 dollars by the use of the Engineering News Record Construction Cost Index (1.205 times the provided EPA costs). The resulting treatment costs in 1974 dollars for both the recommended and optional treatment alternatives are summarized in Table V-3.

Investment costs include costs for construction, land, engineering and a contingency fee. Annual operating costs include expenditures for labor, power, chemicals, maintenance and supplies. Total yearly costs include annual operating costs, depreciation and interest. Depreciation was based on a 20 year depreciable life for the pollution controls for the large new source model and 10 years for the medium model. Interest was based on a 10 percent rate which was then computed as 10 percent of one half the total pollution control investment costs.

Total investment costs for pollution controls expressed as a percent of book value of the model wineries fixed assets and the total annual costs expressed as a percent of annual sales are depicted in Table V-4.

Table V-3. Effluent control costs for winery models
(1974 Dollars)

Model	Treatment Alternative	NSPS Investment costs	NSPS Annual Operating Costs	NSPS Total Yearly Costs
Medium	Recommended	41.5	2.2	6.3
Large	Recommended	482.2	82.4	131.6
	Optional	310.3	71.3	102.3

Table V-4. Investment costs and yearly costs expressed as percentage of model wineries investments and sales

Model	Treatment Alternative	Total Investment as % of Book Value	Total Yearly Costs as % of Annual Sales
Medium	Recommended	2.5	1.1
Large	Recommended	2.3	1.7
	Optional	1.5	1.4

Table V-5. Itemized cost summary for wineries, alternative (NSPS)

	Medium		Large
Investment Costs			
Construction	26,800		304,390
Land	2,320		34,930
Engineering	2,680		30,440
Contingency	2,680		30,440
Total	34,480		400,200
Yearly Operating Costs			
Labor	1,250		37,400
Power	0		20,620
Chemicals	0		4,060
Maintenance & Supplies	540		6,200
Total	1,790		68,360
Total Yearly Costs			
Yearly Operating Cost	1,790		68,360
Yearly Investment Cost Recovery	1,379		16,010
Depreciation	1,608		18,260
Total	4,777		102,630
Treatment Alternative	A20-IV		A20-XI
Treatment Modules:	Septic Tank System	B1..Control House B..Pumping Station C..Equalization Basin F..Acid Neutralization H..Nitrogen Addition I..Phosphorus Addition K..Activated Sludge Q..Slude Thickener R..Aerobic Digestor Y..Holding Tank U..Spray Irrigation N..Dual Media Pressure Filtration N..Dual Media Pressure Filtration	
Treatment chain design efficiency (%BOD reduction)	100.0		97.8

Source: Effluent Guidelines Division, Environmental Protection Agency

Table V-6. Itemized cost summary for wineries, alternative A2O-X (NSPS-option)

	Medium	Large
Investment Costs		
Construction	No Option Considered	208,550
Land		3,490
Engineering		20,860
Contingency		20,860
PVC Liner		3,770
Total		257,530
Yearly Operating Costs		
Labor		12,490
Power		38,190
Chemicals		4,060
Maintenance & Supplies		4,300
PVC Liner		140
Total		59,180
Total Yearly Costs		
Yearly Operating Cost		59,180
Yearly Investment Cost Recovery		10,300
Depreciation		12,700
Total		82,180

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 97.8 percent BOD reduction.

Treatment Modules:

B1...Control House
B....Pumping Station
C....Equalization Basin
F....Acid Neutralization
H....Nitrogen Addition
I....Phosphorus Addition
L....Aerated Lagoon
N....Dual Media Pressure Filtration
N....Dual Media Pressure Filtration

VI. ECONOMIC IMPACT ANALYSIS

The impacts considered in this analysis are as follows:

A. Price effects
B. Financial effects
C. Production effects
D. Other effects

The resulting impacts from the imposition of effluent controls on the Wine Industry for existing wineries are expected to be negligible. This determination is based on the information exempting the western wineries discussed in Chapter I of this report and the results of a recent survey of the eastern wineries conducted by the technical contractor as described in Chapter V. The survey, concluded that there were very few wineries which could be classified as direct dischargers to navigable waters and thus fall under the requirements of effluent guidelines. Therefore, the impacts described herein will pertain only to those wineries which are yet to be constructed and will discharge their effluent directly to navigable waters (hereafter referred to as New Source). These impacts are analyzed for the NSPS model wineries described in Chapter III. Impacts are based on the production and financial characteristics of the NSPS models and the NSPS pollution control costs as presented in Chapter V.

It should be noted that in Chapter V, for each model, two sets of control costs were presented, the recommended treatment system and an optional treatment system. For purposes of this impact analysis, only the recommended treatment system will be utilized, with the optional system's costs being provided only for informational purposes.

A. Price Effects

1. Required Price Increases

An implicit indicator of the expected price effects of pollution controls used in this report is the amount of sales price increase necessary to maintain a NSPS plant's profitability, after effluent control expenditure, at a level the same as a similar plant without the control expense. The methodology of computation was discussed in Part I, Chapter II (Methodology), Section F, under subsection 2 of this report. The ability of a new plant to pass on such price increases is evaluated in this section of the report.

The amount of sales price increases necessary to offset NSPS pollution control costs for the model wineries are depicted below. Also shown are sensitivity ranges of required price increases when pollution control costs vary plus or minus 20 percent from the estimated control costs.

NSPS Model Winery	Annual Production (Wine Gallons)	Required Price Increase (%) -20%	Estimate	+20%
Medium	194,000	1.1	1.4	1.7
Large	2,511,000	1.6	2.0	2.4

2. Expected Price Increases

Although the above illustrated price increases indicate what the NSPS model wineries would require to offset expenditures for effluent controls, it is doubtful new wineries would be able to pass on the additional expense to customers in the form of higher prices. This is due to (1) the discharge status of the wine industry, and (2) financial effects of building new point source wineries relative to the market characteristics of the industry.

As stated above, it is unlikely new source wineries will be able to pass on required price increases due to effluent controls due to, in part, the discharge status of the remaining existing industry. As pointed out earlier, the potential impacts attributable to effluent controls on the existing wineries have been determined negligible due to their present discharge method. Subsequently, the abilities of new source wineries to recoup their control expenditures are limited as any such increase would be necessary only by the new source winery and if their prices are increased, the wineries will deteriorate their competitive places within the wine markets.

However, if the Wine Industry as a whole experiences increased costs for their treatment (e.g., higher municipal treatment charges and/or higher expenditures for operation and maintenance of private treatment systems), then the new source wineries may be able to pass on their required price increase to the extent that the rest of the industry increases prices. This situation, at the present, is not projectable and if it should occur, the ability of new sources to pass on all the required costs will be limited to the extent by which increases are required by the industry as a whole.

The market characteristics of the Wine Industry may provide some opportunities for new source wineries to pass on effluent control costs but these will be limited to those wineries which by location or production

efficiency can establish a competitive advantage over other wineries. In other words, new source wineries which can produce and/or deliver its wine products at lower costs then its competitors, may be able to utilize its greater margin to absorb control costs and still remain in competition.

However, for these new source wineries which do not achieve a competition advantage, it is probable that such wineries will not be able to pass on the required price increase. As discussed in earlier chapters of this report, the Wine Industry has not experienced high rates of return and as shown below in Section B, Financial Effects, the high costs of new source construction are not offset by significant lower operating costs through improved technology. This results in new source wineries having the same to lower income ratios than existing wineries and negative net present values of cash flow when discounted at the estimated industry after-tax cost of capital (7.9 percent).

Therefore, price increases by new source wineries to offset effluent controls and the high costs of construction are not expected to occur. In the following analysis, no price change was assumed to occur as a result of the entire industry increasing prices to offset effluent controls and accordingly the economic viability of the wineries was based on financial characteristics of the models without added revenue stemming from aggregated effluent control effects on industry prices.

B. Financial Effects

Based on NSPS model plant profiles described previously and costs of pollution controls provided by EPA, the following financial indicators were computed under baseline (without pollution controls) and with pollution controls:

- After tax income
- After tax return on sales
- After tax return on invested capital
- Cash flow and cash flow as a percent of invested capital
- Net present value

The above were computed according to the discounted cash flow (DCF) and return on investment (ROI) procedures outlined in the methodology.

Furthermore, a sensitivity analysis was performed using pollution control cost estimates at levels of 80 percent and 120 percent of the costs provided by EPA.

The results of the NSPS model winery analyses are summarized in Table VI-1. After the imposition of effluent controls, after-tax income, after-tax return on sales and after-tax return on invested capital all decline only slightly for the medium NSPS winery model. For the large NSPS model these

Table VI-1. Key values of impact analysis for wineries: NSPS

Key Value		Size	Baseline	Percent Proposed Control Costs 80%	100%	120%
		1,000 gallons per year				
After Tax Income ($000)	M	194	52	49	49	48
	L	2,511	673	618	605	591
After Tax Return on Sales (%)	M	194	8.9	8.5	8.3	8.2
	L	2.511	8.9	8.2	8.0	7.8
After Tax Return on Invested Capital (%)	M	194	2.9	2.7	2.6	2.6
	L	2,511	3.1	2.8	2.7	2.7
Estimated Cash Flow ($000)	M	194	151	150	150	149
	L	2,511	2,100	2,065	2,065	2,047
Cash Flow as % of Invested Capital	M	194	8.3	8.3	8.3	8.2
	L	2,511	9.6	9.4	9.4	9.3
Net Present Values ($000)	M	194	-795	-829	-838	-846
	L	2,511	-8,493	-9,131	-9,291	-9,450

profitability indicators are reduced by 10 to 16 percent. If the control costs varied by plus or minus 20 percent, the indicators of profitability would vary accordingly in their respective decreases.

In terms of the effect of NSPS controls on cash flow return on invested capital, the percentage remains constant at 8.3 percent for the medium NSPS model and declines from 9.6 percent to 9.4 percent for the large NSPS model. When control costs were varied by 20 percent, the cash flow return varied only slightly for the winery models.

Net present values for the NSPS model wineries are negative both before and after the imposition of controls (Table VI-1). As discussed in Part I, Chapter II, Methodology, large negative net present values would cause most firms to discard plans for building a new winery. Since the estimated net present values are negative before controls are imposed, it is concluded that very few wineries classified as a new source, would be built. However, it should be noted that the negative net present value indicates that the associated winery would earn less than the estimated 7.9 percent of industry cost of capital. Thus, a NSPS winery may be built in the future provided the firm has been well established in the industry, or has expectations to capture a major market share at profitable price levels and has an excellent financial performance record (e.g., a lower cost of capital). Should a NSPS winery be built, it can expect its net present value to decline due to the requirement for pollution controls.

C. Production Effects

Although new source performance standards will not affect current levels of production, future growth in the industry could be seriously affected by the imposed controls. Point source category firms are potentially deterred from entry because of differential impacts of effluent treatment requirements.

However, as indicated in the above financial description, future growth from new sources is expected to be restrained by the high costs of construction not being offset by lower costs of production achieved through improved technology. Also, a restraint is the inability of a new source to pass through costs for controls to the consumer. This does not completely rule out the possibilities for new sources. It is foreseeable that some operations, those which could be classified as optimal producers, could construct and successfully operate a new winery. However, growth for the industry as a whole, is expected from additions to or alterations of existing plants that are discharging effluent wastes to other than navigable waters.

D. Other Effects

Other types of economic impact such as employment, community and balance of payments deficit effects are normally assessed when there are plant closures due to pollution controls. However, these other effects are not meaningful nor quantifiable in a report assessing new sources. Although employment is an important consideration to a potential new firm and increases in employment and local business are important to surrounding communities of a potential new plant, these effects are more related to the decision to construct a new plant. Thus, in this report, these related effects were not pursued.

PART V

DISTILLED SPIRITS

PART V: SIC 2085. THE DISTILLED SPIRITS INDUSTRY

I. INDUSTRY STRUCTURE

The Census of Manufactures defines the Distilled Spirits Industry (SIC 2085) as an industry comprised of establishments primarily engaged in manufacturing alcoholic liquors by distillation and rectification, and in manufacturing cordials and alcoholic cocktails by blending processes or by mixing liquors and other ingredients. Thus, the distilled spirits industry consists of those establishments which produce alcoholic beverages by distillation and rectification as well as those establishments which do not utilize a distillation process but yet do rectify and/or blend liquors to produce alcoholic beverages. This interpretation differs from that of the Development Document in that the Census definition includes those establishments that do not distill but do rectify and/or blend in SIC 2085 and not in SIC 5182 as the Development Document did. This was resultant of the fact that the Census definition implies rectifiers and blenders do fall within SIC 2085 and also the fact that the Census definition of SIC 5182 states that establishments in SIC 5182 are those which are primarily engaged in the wholesale distribution of distilled spirits. Therefore, SIC 5182 will not be discussed in this report; however, the establishments included in the Development Document under SIC 5182 will be discussed in SIC 2085.

The overall industry consists primarily of establishments which are engaged in distilling, rectifying, blending or bottling or any combination of these to produce a variety of alcoholic beverages including whiskey, vodka, gin, rum, cordials and liqueurs. Those establishments which utilize a still usually use grain, fruit and/or molasses to produce the alcohol spirits. It should be noted that distilleries utilizing only fruit are primarily engaged in the production of brandy which is not considered a product of establishments in SIC 2085. Establishments producing brandy are classified in SIC 2084, Wines, Brandy and Brandy Spirits, and are discussed in Part IV of this report.

This analysis will be primarily concerned with those establishments which utilize some form of distillation process. Establishments which rectify, blend or bottle will also be discussed; however, as the Development Document states, little effluent is generated by these establishments and no known plants discharge effluent to navigable waters; the discussion of these operations is limited to only a general industry description.

A. Characteristics of the Industry

As previously discussed, the Distilled Spirits Industry consists of establishments which distill grain, fruit and/or molasses to produce alcoholic spirits which in turn are rectified, blended and/or bottled either by the same distillery or another establishment. The industry can be basically classified into three categories: (1) those which distill grain or some combination of ingredients including grain to produce the common types of beverages such as whiskey, vodka and gin; (2) those which distill molasses to produce rum; and (3) those which purchase distilled spirits for possible rectification, blending or bottling. It should be noted that the first two categories may also contain the functions of the third category but the third category does not have stills, which the first two do have.

Those establishments which operate within the Distilled Spirits Industry, but do not utilize a still, will be discussed throughout this report. However, due to their limited wastes problems, the discussion will be primarily confined to a description of the characteristics of the establishments.

The Distilled Spirits Industry is generally highly competitive and accordingly, industry members do not readily release information regarding the operational data of their plants. As a result, information concerning the industry characteristics must be derived from traditional sources of information such as published reports of the Census of Manufactures, Internal Revenue Service, Bureau of Alcohol, Tobaccos and Firearms (BATF) and the Distilled Spirits Council of the United States (DISCUS). These sources do have their limitations; however, they do provide an aggregated source of the general industry characteristics. Finally, when possible, discussions with industry members were utilized to fill the voids where published data are not available.

1. Number and Size of Firms and Plants

The Census of Manufactures states that in 1972 there were 76 firms in the Distilled Spirits Industry operating some 121 individual establishments. Thus in 1972 just over 37 percent of all establishments (45 plants) were owned or controlled by firms which operated more than one plant. This percentage has remained relatively constant since 1967 at which time 70 firms owned or controlled 112 establishments.

According to the Census data, the number of distilled spirits plants has remained relatively constant during the past years. In 1958, the Census indicates 122 establishments comprised the SIC 2085 industry. In 1963, this number declined to 107, then in 1967, it increased to 112 establishments. In 1972, the Census indicated there were 121 establishments.

The BATF agrees with the Census data for 1972 in that there were 121 facilities operating. For 1974, BATF indicates 120 plants operated. BATF also maintains a list of all plants which are authorized to operate in the distilled spirits industry. However, as it is common in the industry for plants to "shut down" for periods of years and then reopen, the number of plants authorized does not necessarily agree with number of plants operating. In that this analysis is concerned with all plants which could operate in the industry, it will be assumed that the total number of plants authorized represents the number of plants in the industry. It should be noted, however, that much of the historical data available reflect those plants which did operate and as such these data will also be used in conjunction with the analysis of the industry. Distinctions, when necessary, will be made concerning the application of the data and the number of plants. The distilleries which are authorized to operate as of July 1, 1975 are listed in Exhibit I-1. Rectifiers authorized are listed in Exhibit I-2.

The number of establishments operating by employment size group is depicted in Table I-1 for the years 1963, 1967 and 1972. These data aggregate both distillery operations and rectifiers; however, the data do provide indications of the distribution of establishments' sizes. Also shown in Table I-1 are the employment classes' value of shipments and the corresponding percentage of the total. From this table, it becomes apparent that a major portion of the establishments are concentrated in the larger size categories and accordingly, these larger categories represent the greater share of the industry's value of shipments. It should also be noted that the number of establishments comprising most of the categories have increased in number since 1963.

2. Value of Shipments

Value of shipments and other receipts of the distilled liquor industry in 1972 totaled $1,797.9 million. This included shipments of distilled liquor, except brandy, (primary products) valued at $1,542.5 million, shipments of other products (secondary products) valued at $34.9 million, and miscellaneous receipts (mainly resales) of $220.5 million.

Estimates of the 1975 value of shipments for the industry are expected to total $1,932 million, 3.4 percent above estimated shipments of $1,868 million in 1974, and 7.5 percent above the shipments in 1972. Historically, the value of shipments have increased by an average of 3.8 percent per year since 1958, from $941 million in 1958 to the estimated $1,932 million in 1975 (Table I-2).

Exhibit I-1. Distilled spirits plants authorized to operate, July 1, 1974.

State and City	Distillery	TYPE OF OPERATION: Distiller Industrial 1	Distiller Beverage Grain 2	Distiller Beverage Fruit 3	Distiller Beverage Rum 4	Bonded Whse. Industrial 5	Bonded Whse. Beverage 6	Rectifier and Bottler 7	Bottler--Non-Rectifier 8	Bottler--In-Bond 9	Denaturer 10	Denaturer-Rum 11	Bottler Industrial 12	Number Employees	Primary SIC
California															
1. Union City	The American Distilling Co.		X				X	X		X				125	20851
2. Menlo Par	Heublein, Inc.		X			X		X					X	160	20353
3. Los Gatos	Novitiate of Los Gatos		X	X			X								
4. San Martin	San Martin Vineyards Co.		X	X			X							50	20840
Connecticut															
5. Hartford	Heublin, Inc.		X			X	X	X		X			X	900	20353
Florida															
6. Lake Alfred	Todhunter Internat'l. Inc.*	X	X	X	X	X	X				X		X		
7. Auburndale	Jacquin-Florida Dist. Co.*	X	X	X	X	X	X	X			X	X	X		
Georgia															
8. Albany	Viking Distillery Inc.	X	X		X	X	X	X						50	20853
9. Atlanta	Fulton Distillery Inc.		X				X		X						
10. Atlanta	Colony Distilling Inc.		X				X		X						
Illinois															
11. Pekin	The American Distilling Co.	X	X			X	X	X		X	X			750	20860
12. Peoria	Hiram Walker & Sons, Inc.	X	X			X	X	X		X	X		X	1,600	20853
Indiana															
13. Lawrenceburg	Joseph E. Seagram & Sons	X	X			X	X	X						1,700	20853
14. Lawrenceburg	Schenley Distillers, Inc.	X	X			X	X	X		X	X			800	20850
Iowa															
15. Muscatine	Grain Processing Corp	X	X			X	X				X		X	850	20463
16. Clinton	Fleischmann Distilling Corp.	X	X			X	X								
Kansas															
17. Atchison	Midwest Solvents Co., Inc.	X	X			X	X						X	280	20851

* Rum

continued...

Source: Department of Treasury, Bureau of Alcohol, Tobacco and Firearms, Distilled Spirits Plants.

Exhibit I-1. Distilled spirits plants authorized to operate, July 1, 1974 (continued)

State and City	Distillery	TYPE OF OPERATION: Distiller Industrial 1	Distiller Beverage Grain 2	Distiller Beverage Fruit 3	Distiller Beverage Rum 4	Bonded Whse. Industrial 5	Bonded Whse. Beverage 6	Rectifier and Bottler 7	Bottler-- Non-Rectifier 8	Bottler-- In-Bond 9	Denaturer 10	Denaturer-Rum 11	Bottler Industrial 12	Number Employees	Primary SIC
Kentucky															
18.Louisville	Schenley Distillers, Inc.		X				X	X		X				400	20351
19.Louisville	Schenley Distillers, Inc.		X												
20.Louisville	National Dist. & Chemical		X				X							1,000	20353
21.Bardstown	James B. Beam Distilling		X				X		X	X					
22.Lawrenceburg	Joseph E. Seagram & Sons		X				X							65	20853
23.Owensboro	Fleischmann Distilling		X				X							125	20853
24.Bardstown	Barton Brands, Ltd.		X				X	X						450	20853
25.Beam	James B. Beam Distilling		X				X								
26.Frankfort	Old Grand Dad Distillery		X				X		X	X				233**	20853
27.Cynthiana	Joseph E. Seagram & Sons		X				X							70	20853
28.Shiveley	Old Fitzgerald Distillery		X				X		X	X				250	20853
29.Louisville	National Dist. & Chemical		X				X							1,000	20353
30.Hodgenville	Joseph E. Seagram & Sons		X		X		X								
31.Owensboro	Glenmore Distilleries Co.		X				X	X	X					385	20853
32.Frankfort	Old Crow Distillery Co.		X				X		X	X				233**	20853
33.Frankfort	Old Taylor Distillery Co.		X						X					234**	20853
34.Bardstown	Heaven Hill Distilleries		X				X	X		X				275	20853
35.Louisville	Joseph E. Seagram & Sons		X				X	X		X				600	20853
36.Meadowlawn	Old Boone Distillery Co.		X				X		X	X				100	20353
37.Bardstown	Willett Distilling Co.		X				X		X	X				40	20853
38.Loretto	Makers Mark Distilling Co.		X				X	X		X				45	20853
39.Owensboro	Medley Distilling Co.		X				X	X		X				200	20853
40.Lawrenceburg	Austin, Nichols Distilling Co.		X				X	X		X					
41.Stanley	Ben F. Medley & Co.		X				X	X		X					
42.Fairfield	Joseph E. Seagram & Sons		X				X							37	20853
43.Lawrenceburg	Hoffman Distilling Co.		X				X		X	X				33	20853
44.Frankfort	Schenley Distillers, Inc.		X				X	X		X				500	20353
45.Deatsville	T.W. Samuels Distillery Inc.		X				X	X		X				150	20853
46.Clermont	James B. Beam Distilling		X				X	X		X				600	20353
47.Louisville	Glenmore Distilleries Co.		X				X							150	20853
48.Louisville	Brown-Farman Distillers		X				X							1,200	20353
49.Louisville	Brown-Farman Distillers		X				X	X		X					

** Three-plant average was derived from a total given of 700 employees for three operations

continued...

Source: Department of Treasury, Bureau of Alcohol, Tobacco and Firearms, Distilled Spirits Plants.

Exhibit I-1. Distilled spirits plants authorized to operate, July 1, 1974 (continued)

State and City	Distillery	TYPE OF OPERATION: Distiller Industrial 1	Distiller Beverage Grain 2	Distiller Beverage Fruit 3	Distiller Beverage Rum 4	Bonded Whse. Industrial 5	Bonded Whse. Beverage 6	Rectifier and Bottler 7	Bottler-- Non-Rectifier 8	Bottler-- In-Bond 9	Denaturer 10	Denaturer-Rum 11	Bottler Industrial 12	Number Employees	Primary SIC
Maryland															
50.Baltimore	Joseph E. Seagram & Sons		X	X			X	X						650	20853
51.Lansdowne	Majestic Distilling Co.		X				X	X		X				100	20853
Massachusetts															
52.So. Boston	Felton & Sons, Inc.*	X	X		X	X	X	X			X	X	X	60	20860
Missouri															
53.Weston	McCormick Distilling Co.		X				X	X		X				75	20853
New Jersey															
54.Linden	Distillers Company Limited		X				X	X						300	20851
New York															
55.Peekskill	Fleischmann Distilling Corp.		X				X	X						500	20997
Ohio															
56.Cincinnati	National Dist. & Chemical		X			X	X	X		X				1,400	20853
Pennsylvania															
57.Philadelphia	Continental Distilling	X	X	X	X	X	X							400	20853
58.Philadelphia	Publicker Industries	X	X	X	X	X	X							100	20853
59.Schaefferstown	Pennco Distillers, Inc.		X	X			X	X		X				25	20851
60.Philadelphia	Publicker Industries	X	X	X		X	X			X	X		X		
Tennessee															
61.Lynchburg	Jack Daniel Distillery		X				X		X	X				300	20853
62.Tullhoma	Tennessee Dickle Distilling		X				X	X						100	20853
Virginia															
63.Sunset Hills	A. Smith Bowman Distillery		X				X		X	X				50	20853

*Rum

continued...

Source: Department of Treasury, Bureau of Alcohol, Tobacco and Firearms, Distilled Spirits Plants.

Exhibit I-2. Distilled Spirits Plants authorized to operate (Rectifiers only) as of July 1, 1975

State & City	Rectifier & Bottler	Authorized Operation							
		Bonded WHSE Industrial (5)	Bonded WHSE Beverage (6)	Rectifier Bottler (7)	Bottler Non-Rectifier (8)	Bottler in Bond (9)	Denaturer (10)	Denaturer-Rum (11)	Bottler Industrial (12)
California									
1-Fresno	Schenley Distiller, Inc.		X	X		X			
2-So San Francisco	E. Martinoni Co.		X	X					
3-San Francisco	Chas. Segales & Co.			X					
4-San Francisco	Lewis-Westco & Co.		X	X					
5-Los Angeles	L. Hirsch & Son			X					
6-San Francisco	Terminal Liquors Ltd.		X	X					
7-No Hollywood	Bohemian Dist Co.		X	X					
8-San Francisco	R. Torre & Co.			X					
9-San Jose	Franklin Distillers Products, Ltd.		X	X					
10-Summyvale	A. Giurlani & Bros.			X					
11-Los Angeles	Trojan Dist. Co., Ltd.		X	X					
12-Compton	Associated Liquor Products, Ltd.		X	X					
13-So San Francisco	Joseph E. Seagrams & Sons, Inc.		X	X					
14-Los Angeles	NDC Distributors, Inc.		X	X		X			
15-Los Angeles	Maison Chambly			X					
16-El Segundo	Barton Brands		X	X					
17-Newark	Janich Bros., Inc.		X	X					
18-Burlingame	Hiram Walker & Sons, Inc.		X	X		X			
19-Vernon	Royal Himmel Distilling Co.		X	X					
20-Union City	Distillers Co., Ltd.		X	X					
21-Cerritos	Tri-L Dist., Inc.		X	X					
22-Union City	Premium Products, Inc.		X	X					
Florida									
23-Jacksonville	Castelton Beverage Corp.		X		X				

Continued...

Source: Dept. of the Treasury, Bureau of Alcohol, Tobbacco and Firearms, Distilled Spirits Plants Authorized to Operate, ATF P 5,110.1 (7-75).

Exhibit I-2 (Continued)

State & City	Rectifier & Bottler	Authorized Operation							
		Bonded WHSE Industrial (5)	Bonded WHSE Beverage (6)	Rectifier Bottler (7)	Bottler Non-Rectifier (8)	Bottler in Bond (9)	Denaturer (10)	Denaturer-Rum (11)	Bottler Industrial (12)
Hawaii									
24-Honolulu	Aloha Liquerurs, Inc.		X	X					
25-Honolulu	Hawaiian Distillers			X					
Illinois									
26-Peoria	Laird Distilling Co.			X					
27-Chicago	Consolidated Distilled Products, Inc.	X	X	X		X			X
28-Chicago	Mar-Salle Chicago Co.			X					
29-Lemont	Continental Distilling Sales Co.	X	X	X		X			
30-Plainfield	Fleischmann Distilling Corp.		X	X		X			
31-Plainfield	Distillers Co., Ltd.		X	X					
Kentucky									
32-Louisville	Double Springs Distillers Inc.		X	X		X			
33-Frankfort	Double Springs Distillers Inc.		X	X		X			
34-Louisville	National Distillers & Chemical Corp.		X	X					
Louisiana									
35-New Orleans	Sazerac Co., Inc.		X	X					
Maine									
36-Lewiston	Whiterock Distillers Inc.	X	X	X					
37-Lewiston	White Rock Distillers Inc.		X	X					
Maryland									
38-Baltimore	Joseph E. Seagrams & Sons, Inc.		X	X					
39-Baltimore	Overbrook Egg Nog Corp.			X					X
40-Baltimore	Montebello Brands, Inc.			X					

continued...

Source: Dept. of the Treasury, Bureau of Alcohol, Tobbacco and Firearms, Distilled Spirits Plants Authorized to Operate, ATF P 5,110.1 (7-75).

Exhibit II-2 (Continued)

State & City	Rectifier & Bottler	Authorized Operation							
		Bonded WHSE Industrial (5)	Bonded WHSE Beverage (6)	Rectifier Bottler (7)	Bottler Non-Rectifier (8)	Bottler in Bond (9)	Denaturer (10)	Denaturer-Rum (11)	Bottler Industrial (12)
41-Baltimore	Standard Distillers Products, Inc.			X					
Massachusetts									
42-Boston	Blanchard Importing & Dist. Co., Inc.		X	X					
43-Cambridge	Federal Distillers, Inc.	X	X	X					X
44-Boston	M. S. Walker, Inc.		X	X					
45-Newton	S. S. Pierce Co.		X	X		X			
46-Boston	Mr. Boston Distiller Corp.	X	X	X		X			X
Michigan									
47-Allen Park	Heublein, Inc.	X	X	X					X
48-Detroit	Mohawk Liquer Corp.	X	X	X					
49-Troy	United Brands Inc.			X					
Minnesota									
50-Minneapolis	Ed. Phillips & Sons, Inc.		X	X		X			
51-Long Praire	Minnesota Distillers Inc.		X	X					
Mississippi									
52-Vicksburg	Southern Distilling Co.		X		X				
Missouri									
53-St. Louis	J. F. Conrad Grocer Co.		X	X		X			
54-St. Louis	Southern Combort Corp.		X	X					
55-St. Louis	David Sherman Corp.		X	X		X			
Montana									
56-Columbus	Jouene Co.			X					
57-Helena	Alpha Industries Inc.		X	X					

Continued...

Source: Dept. of the Treasury, Bureau of Alcohol, Tobbacco and Firearms, Distilled Spirits Plants Authorized to Operate, ATF P 5,110.1 (7-75).

Exhibit I-2 (Continued)

State & City	Rectifier & Bottler	Authorized Operation							
		Bonded WHSE Industrial (5)	Bonded WHSE Beverage (6)	Rectifier Bottler (7)	Bottler Non-Rectifier (8)	Bottler in Bond (9)	Denaturer (10)	Denaturer-Rum (11)	Bottler Industrial (12)
New Hampshire									
58-Manchester	Jenkins Spirits Corp, Ltd.			X					
New Jersey									
59-Clifton	Black Prince Distillery, Inc.		X	X					
60-Jersey City	William Grant & Sons Inc.		X	X					
61-Crooswicks	Whitehall Distillers Products, Inc.		X	X					
62-Dayton	Fleischmann Distilling Corp.	X	X						
63-Lawrenceville	Cointreau Ltd.			X					
64-Newark	Duggan's Distillers Products Corp.			X					
65-Teterboro	Julius Wille Sons & Co., Inc.								
66-Lawrenceville	Medley Distilling Co.		X	X					
New Mexico									
67-Albuquerque	Quality Import Co.			X					
New York									
68-Brooklyn	Dock Warehousing & Bottling Center		X	X					
69-Woodside	Distillerie Stock USA, Ltd.		X	X					
Ohio									
70-Cleveland	Bouvet Import & Liqueur Co., Inc.				X				
71-Cleveland	Paramount Distillers, Inc.		X	X					
Oregon									
72-Hood River	Hood River Distillers Inc.		X	X					

...continued...

Source: Dept. of the Treasury, Bureau of Alcohol, Tobbacco and Firearms, Distilled Spirits Plants Authorized to Operate, ATF P 5,110.1 (7-75).

Exhibit I-2 (Continued)

State & City	Rectifier & Bottler	Authorized Operation							
		Bonded WHSE Industrial (5)	Bonded WHSE Beverage (6)	Rectifier Bottler (7)	Bottler Non-Rectifier (8)	Bottler in Bond (9)	Denaturer (10)	Denaturer-Rum (11)	Bottler Industrial (12)
Pennsylvania									
73-Schenley	Schenley Distillers Inc.	X	X	X		X			X
74-Linfield	Continental Distilling Corp.	X	X	X		X			X
75-Philadelphia	Distillers Products Sales Corp.			X					
76-Philadelphia	Charles Jacquin et cit, Inc.		X	X					X
77-Philadelphia	Kasser Distillers Products Corp.		X	X					
Virginia									
78-Colonial Heights	American Distilling Co.		X	X		X			
Washington									
79-Seattle	James A. Robertson Co.		X	X					
Wisconsin									
80-Milwaukee	Ambor Distilled Products Inc.		X	X					

Source: Dept. of the Treasury, Bureau of Alcohol, Tobbacco and Firearms, Distilled Spirits Plants Authorized to Operate, ATF P 5,110.1 (7-75).

Table I-1. The Distilled Spirits Industry, by employment size group, number of establishments and value of shipments 1963-1972

Number of Employees	1963				1967				1972			
	Establishments		Value of Shipments		Establishments		Value of Shipments		Establishments		Value of Shipments	
	Number	Percent	Million Dollars	Percent	Number	Percent	Million Dollars	Percent	Number	Percent	Million Dollars	Percent
1-4	7	6.5	1.6	0.1	10	9.0	2.4	0.2	14	11.6	1.6	0.1
5-9	6	5.6	2.6	0.2	3	2.7	*	*	5	4.1	4.5	0.3
10-19	5	4.7	6.5	0.6	4	3.6	5.3	0.4	6	5.0	7.3	0.4
20-49	33	30.8	56.0	5.1	25	22.3	71.1	5.2	27	22.3	69.8	3.9
50-99	18	16.8	80.5	7.4	23	20.5	120.1	8.8	26	21.5	174.2	9.7
100-249	17	15.9	186.9	17.2	23	20.5	263.8	19.3	19	15.7	330.9	18.4
250-499	9	8.4	210.1	19.3	13	11.6	280.0	20.5	16	13.2	615.7	34.2
500 or more	12	11.2	546.2	50.1	11	9.8	621.6	45.6	8	6.6	593.9	33.0
TOTAL	107	100.0	1,090.5	100.0	112	100.0	1,364.2	100.0	121	100.0	1,797.9	100.0

* To prevent disclosure of individual data, the value of shipments for this size group has been aggregated into the next smaller size group.

Source: U. S. Department of Commerce, Bureau of Census, Census of Manufactures, 1963, 1967, 1972.

Table I-2. The distilled liquor industry, value of shipments 1958-1975

Year	Value of Shipments[1/] (Million Dollars)	Percentage Change (Percent)
1958	941.3	-
1959	959.2	1.9
1960	927.1	-3.3
1961	937.9	1.2
1962	946.0	0.9
1963	1,090.5	15.3
1964	1,133.8	4.0
1965	1,288.2	13.6
1966	1,331.6	3.4
1967	1,364.2	2.4
1968	1,515.1	11.1
1969	1,668.7	10.1
1970	1,757.5	5.3
1971	1,847.5	5.1
1972	1,797.9	-2.7
1973[2/]	1,814.0	0.9
1974[2/]	1,868.0	3.0
1975[2/]	1,932.0	3.4

[1/] Figures are for value of production rather than value of shipment.

[2/] Estimated.

Source: U. S. Department of Commerce, Bureau of Census, Bureau of Labor Statistics.

Shipments of distilled liquor, except brandy, (primary products) in 1972 represented 98 percent (specialization ratio) of the industries total product shipments (primary and secondary). The industry specialization ratio in 1967 was also 98 percent. Secondary products shipped by this industry in 1972 consisted mainly of wines, brandy and brandy spirits ($25.7 million).

Shipments of distilled liquor, except brandy, from establishments classified in industry 2085 in 1972 represented 99 percent (coverage ratio) of these products valued at $1,557.2 million shipped by all industries. In 1967, the coverage ratio was 98 percent. Other industries shipping distilled liquor, except brandy, consisted mainly of industry 2046, Wet Corn Milling ($10 to $20 million).

Finally, it was also not possible to determine what portion of the industry's value of shipments were attributable to those establishments with distilleries or to those without (i.e., to segregate distilleries from those which rectify and bottle only).

3. Level of Integration

The Distilled Spirits Industry is comprised of firms which are associated with a wide range of levels of integration. In terms of forward integration, most firms do not integrate any further than their sales to distributors. Some firms may operate their own distributorships, but these are usually limited to distributorships for export markets.

In terms of backward integration, the depth of the integration ranges from almost complete backward integration (owning sources of the major materials consumed) to that of a firm which purchases all its materials.

Principally, those operations which only rectify, blend and bottle distilled spirits do not have the opportunity for backward integration unless the operation is owned by a firm which also operates a distillery. The distillery, on the other hand, often will purchase most of the raw materials but will rectify, blend and bottle its own product. Distilleries usually purchase grains, labels and bottles. The larger firms often have their own barrell marking facility.

4. Number of Products

The basic products produced by the distilled industry include: whiskey, bourbon, rye, vodka, gin, rum, spirits, cordials, liqueurs and cocktails. From these basic products, operations will blend and manipulate the beverages to produce a wide number of various labels, each with their own distinctive characteristics. The number of products varies from plant to plant, with some plants only producing four or five sizes of one label to those which produce numerous sizes of many labels. Some grain distilleries also dry their spent grains for sale as feed supplements.

5. Level of Diversification

The Census of Manufactures shows the Distilled Spirits Industry with a very high specialization ratio of 98 percent in 1972. As stated previously, this indicates that 98 percent of sales of the establishments classified in SIC 2085 are in the primary SIC code. The typical facility is not diversified as the governmental restrictions limit the facility's possibilities as well as the fact that the processes and equipment are specilized, non-interchangeable and do not lend themselves to application to other products.

It should be noted, however, that a majority of the establishments in the industry are owned by highly diversified conglomerates. The diversification of these conglomerates includes a variety of operations often, but not always, in the food processing industry. The acquisition of the distilled spirits operations by the conglomerate was usually resultant of the selling of a one-time family operation.

6. Location of Plants

As can be seen in Exhibits I-1 and I-2, the majority of the distilleries are located in Kentucky and the majority of the rectifiers are located in California. For the 63 distilleries, the state of Kentucky accounts for 32 plants (51 percent). California and Pennsylvania follow Kentucky with four distilleries each. Thus three states account for 63 percent of all U.S. distilleries.

For the 80 independent rectifiers, California accounts for 22 plants (28 percent). New Jersey follows with 8 plants, Illinois then follows with 6 plants and Massachusetts and Pennsylvania are next with 5 plants each. In total, the above 5 states account for 46 of the industry's 80 plants. This represents 58 percent of the industry's plants.

When both rectifiers and distillers are aggregated, the South appears to contain the heaviest concentration of plants as well as generating the major portion of the industry's total value of shipments (Table I-3). The North Central region is next and has slightly increased its share of the total shipments since 1967. The South has accordingly shown a slight decrease in its share.

Table I-3. Location of Distilleries (SIC 2085) by primary state and region, 1967 and 1972

	1972				1967			
	Total Industry		Value of Shipments		Total Industry		Value of Shipments	
	Number	Percent	Million Dollars	Percent	Number	Percent	Million Dollars	Percent
Northeast Region	26	21.5	*	*	27	24.1	*	*
New England Division	10	8.3	*	*	10	8.9	*	*
Massachusetts	4	3.3	*	*	4	3.6	*	*
Connecticut	3	2.5	*	*	3	2.7	*	*
Middle Atlantic Division	16	13.2	139.3	7.7	17	15.2	*	*
New York	1	0.8	*	*	3	2.7	*	*
New Jersey	8	6.6	37.8	2.1	7	6.3	*	*
Pennsylvania	7	5.8	*	*	7	6.3	99.6	7.3
North Central Region	22	18.2	656.9	36.5	20	17.9	465.1	34.1
East North Central Division	17	14.0	615.8	34.3	15	13.4	443.5	32.5
Ohio	4	3.3	*	*	4	3.6	*	*
Indiana	2	1.7	*	*	2	1.8	*	*
Illinois	7	5.8	234.1	13.0	6	5.4	190.6	14.0
Michigan	3	2.5	*	*	2	1.8	*	*
West North Central Division	5	4.1	41.1	2.3	5	4.5	21.6	1.6
Missouri	3	2.5	*	*	--	--	--	--
Kansas	1	0.8	*	*	1	0.9	*	*
South Region	56	46.3	753.7	41.9	48	42.9	588.2	43.1
South Atlantic Division	14	11.6	*	*	8	7.1	*	*
Maryland	5	4.1	*	*	5	4.5	*	*
East South Central Division	40	33.1	*	*	39	34.8	*	*
Kentucky	35	28.9	*	*	36	32.1	448.7	32.9
Tennessee	3	2.5	*	*	3	2.7	*	*
West Region	17	14.0	*	*	17	15.2	*	*
Pacific Division	16	13.2	*	*	16	14.3	*	*
California	12	9.9	*	*	12	10.7	*	*
UNITED STATES	121	100.0	1,797.9	100.0	112	100.0	1,364.2	100.0

* Data withheld to avoid disclosing figures for individual companies.

Source: Department of Commerce, Bureau of Census, Census of Manufactures.

7. Age of Plants and Level of Technology

Within the Distilled Spirits Industry, there exists a wide variety of plant ages varying from several generations old to those which were just recently built. While many of the plants are relatively old (many distilleries were built after the repeal of prohibition in 1933) throughout their useful life new equipment has been added or used to replace that which is worn out or technologically obsolete. As a result, most plants in the industry represent a combination of both old and new equipment. Furthermore, it can be generally assumed that the newer the plant and its equipment, the more technologically advance the plant is. Finally, it is not uncommon for plants which are expanding to use equipment from plants which have closed. This is particularly true for the stills and the associated equipment. Bottling equipment, on the other hand, has advanced in recent years and accordingly, the older bottling lines have been scraped and new ones installed.

There are no known measures of the ages of plants in the distilled spirits industry. However, for purposes of this report, it is assumed that all operations are about the same age. There may be a slight tendency for the smaller operations to be older as can be seen in Table I-4. This table utilizes IRS data and depicts, for variously sized operations, the firms accumulated depreciation expressed as a percent of its total depreciable assets. As can be seen in the table, those firms with less than $500,000 in total assets tend to be 60 percent depreciated while those firms with more than $500,000 in total assets tend to be depreciated between 40 and 50 percent. Thus the larger operations have less depreciated assets than the smaller operations and as such can be assumed to have newer facilities and equipment.

8. Plant Efficiency

Distilled spirits plants vary significantly between each other in terms of plant efficiency. Primarily the differnce between plants' efficiency is dependent upon the technical level with which the plant operates. Furthermore, the age and the condition of the equipment will significantly influence the efficiency of the plant. Those plants with old and neglected equipment will undoubtedly encounter many more hours of down-time due to mechanical failures. Finally, it is evident that the larger plants have a greater potential for operating efficiently as they will usually operate more days per year and have the newer, highly automated equipment thus allowing their output per employee to be higher.

Table I-4. Alcoholic Beverages, except malt liquor and malt, accumulated depreciation as a percent of total depreciable assets; by total asset size

Fiscal Year	Size of Total Assets ($1,000)										
	0-100	100-250	250-500	500-1,000	1,000-5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000-or More
	Percent										
1968-69	93	63	--	78	50	44	45	35	50	44	48
1969-70	7	70	75	17	55	41	45	34	44	43	50
1970-71	--	69	59	46	48	44	53	35	44	44	51
1971-72	81	34	40	41	53	39	53	37	44	44	51
Average	60	59	58	46	52	42	49	35	46	44	50

Source: Department of the Treasury, Internal Revenue Service, Source Book of Statistics of Income, annual.

B. Employment Characteristics

Total employment in the Distilled Spirits Industry has decreased by over 10 percent from 20,500 employees in 1958 to 18,400 employees in 1972 (Table I-5). Production workers represent approximately 80 percent of total employees, and during the above period decreased in numbers from 16,600 in 1958 to 14,500 in 1972.

Overall, the productivity of the production workers has increased significantly since 1960. Since then both the value added and the value of shipments per production worker have more than doubled. Some of this increase is attributable to inflation, however a good portion is explained by the installation of automated equipment (especially in the bottling lines) as well as the better utilization of those employed.

The distilled spirits production worker can be classified as predominantly union and semi-skilled. Much of the labor involves the monitoring of either the stills and associated equipment or the bottling operations. The average annual hours worked per production worker have remained relatively constant with the average being 1972 hours in 1972. Since 1958, hourly wages have doubled, from $2.30 in 1958 to $4.63 in 1972. Corresponding to the wage increase, the value added per worker also has doubled during the same time period.

It should be noted that while many of the workers employed are full-time, some distilleries do not operate on a year-round basis. In fact some plants may shut down for a year or more. Often a distillery will shut down its distillation operation and attempt to utilize its people in the maintenence or bottling operations, however some plants cannot utilize all its employees. As such, especially in distilleries located in rural areas, the worker will have a supplement source of income which usually is agriculturally-related.

As can be seen in Table I-6, the majority of the employees are concentrated in the larger sized operations with 68 percent of all employees and 70 percent of the production workers being employed by firms with 250 or more employees.

C. Segment Portions of the Total Industry

While the preceding sections of this chapter have been concerned with establishment data for the Distilled Spirits Industry, concern is also warranted about the different types of operations within the overall industry.

Table I-5. The Distilled Spirits Industry, employment statistics, 1958 to 1972

Year	All Employees		Production Workers			Value of Shipments Per Production Worker	Man-Hours Per Production Worker	Wage Per Production Worker Man-Hours	Value Added Per Production Worker Man-Hours
	Number	Payroll	Number	Man-Hrs	Wages				
	(000)	($Mil.)	(000)	(Mil.)	($Mil.)	($000)		($)	($)
1958	20.5	102.6	16.6	32.2	73.9	56.7	1,937	2.30	14.23
1959	20.3	106.8	16.3	33.1	78.2	58.8	2,029	2.37	14.74
1960	20.2	110.0	15.9	33.5	79.1	58.3	2,106	2.36	13.84
1961	19.0	110.3	14.9	31.3	78.0	62.9	2,105	2.49	14.83
1962	18.7	113.3	14.5	30.6	80.4	65.2	2,113	2.63	15.18
1963	18.0	110.2	14.3	28.1	80.2	76.3	1,962	2.85	22.17
1964	17.8	115.6	14.2	28.0	84.1	79.8	1,972	3.01	23.61
1965	18.9	125.7	14.9	29.7	91.4	86.5	1,986	3.08	24.01
1966	19.0	130.0	15.2	30.1	94.5	87.6	1,974	3.14	24.04
1967	19.4	141.6	15.6	31.9	104.0	87.4	2,047	3.26	23.13
1968	20.0	152.4	15.9	32.3	110.9	95.3	2,031	3.43	26.13
1969	20.5	164.3	16.4	33.3	120.1	101.8	2,024	3.62	27.88
1970	20.5	171.0	16.3	31.4	125.6	107.8	1,926	4.00	23.25
1971	19.2	177.8	15.1	29.7	129.8	122.4	1,967	4.37	32.30
1972	18.4	183.1	14.5	28.6	132.5	124.0	1,972	4.63	35.80

Source: U. S. Department of Commerce, Census of Manufactures, 1972.

Table I-6. The Distilled Spirits Industry, employees by establishment size, 1972

Employment Size	All Employees	Percent of Total	Production Workers	Percent of Total
0-19	100	0.5	100	0.7
20-49	900	4.9	700	4.9
50-99	1,800	9.7	1,200	8.3
100-249	3,100	16.8	2,300	16.0
250-499	5,600	30.3	4,500	31.3
500-2,499	7,000	37.8	5,600	38.9
TOTAL	18,500	100.0	14,400	100.0

Source: U. S. Department of Commerce, Census of Manufactures, 1972.

Those operations classified within the Distilled Spirits Industry are primarily of two distinctively different operations. First, there are those which purchase distilled alcohol and rectify, blend and/or bottle it to produce the desired beverage. As mentioned previously in this chapter, there are 80 such operations authorized to operate in the United States and of these authorized plants there are no known plants which are considered direct dischargers. As such the major portion of the remainder of this report will be concentrated on the other type of operation.

The second type of distilled spirits operations are those which have a still and produce distilled spirits for either further processing which leads to bottling or for sale to a rectifier and/or bottler. As previously mentioned, there are 63 authorized distilleries which can operate in the United States. These plants were listed in Exhibit I-1 and from this exhibit it becomes evident that there are two basic types of distillation operations.

First and perhaps the more commonly thought of distillation operations are those which utilize grain to produce whiskeys and grain spirits. In total, there are 60 of these operations in the U.S. Of these operations approximately 24 can be classified as small, 31 as medium and 5 as large.

The second type of distillery utilizes molasses instead of grain and primarily produces rum. There are 3 of these operations with 2 in Florida and one in Massachusetts. One of the plants is considered small, however the other two plants are relatively large.

D. Significant Impacts on the Industry

Because of the structure and competitiveness of the Distilled Spirits Industry, pollution abatement standards when imposed on plants discharging to surface waters and municipal sewers can have serious consequences on the industry itself. The magnitude of this impact will, of course, depend on the level of investment required to meet the specific standards. The smaller third--and to some extend the middle third--of the plants discharging directly are expected to be seriously impacted. They may not be able to recover the cost of installing and operating abatement facilities unless they have access to lower cost facilities, expand or merge. The specific plant impacts will depend on many factors, such as capital availability, size of plant, profitability of the plant, location and availability of low cost treatment strategies.

It is recognized that the impact of substantially increased user charges, now and in the future, to plants discharge to or planning to discharge to municipal sewers is extremely critical to the industry, local business communities and to consumers. However, the scope and the economic impacts analyzed in this report pertain to those plants directly discharging to navigable surface waters.

1. Capacity of Low Cost Producers Relative to High Cost Producers

The capacity of low cost distillers connected to municipal sewers and/or directly discharging relative to high cost distillers in the same position is one of the more important factors in considering the impact of pollution abatement costs imposed upon the industry. In the Distilled Spirits Industry, the largest fourth of the plants produce approximately 73 percent of the total volume. The middle two-fourths of the plants produce about 24 percent, and the smallest fourth produce only 3 percent of the total volume. Due to economies of scale, the larger plants are already expected to have a definite cost advantage. The imposition of high pollution abatement costs on the smallest fourth of the plants discharging directly or to municipalities, and to a large extent the middle two-fourths, are expected to result in further disadvantages of these low volume plants. If these small plants are forced to shut down (unless low cost abatement procedures can be utilitzed), the low cost-high volume plants in the industry will most likely offset possible losses in capacity through expansion (acquisition, plant expansion) or by increasing the utilization of their existing distilleries.

2. Factor Dislocation Within the Industry

Differential impacts from pollution abatement controls are expected within the Distilled Spirits Industry, both in terms of type of firm and in regional location of affected plants. The impacts expected and reasons for associated dislocations are discussed below.

a. Types of Firms and Location

As explained earlier, the Distilled Spirits Industry is comprised of many firms (multi/single plant) differing in plant operations, size (rate per hour), capacity and utilization of capacity, level of technology (new/old) and other factors. Many of these factors were considered in the preliminary analyses and one of the most critical measures in terms of assessing a plant's ability to withstand the impact of internalized pollution abatement costs is its overall throughput size.

Marginal Firms - Within the industry, marginal firms are typically the "small" and single plant firms. This is particularly true in terms of small firm's ability to financially withstand projected high capital investment requirements of pollution abatement measures. Such plants often simply lack capacity to pay out such investments (at the levels given). Many single plant firms also lack the capital-acquiring ability of larger multiplant firms.

Within this framework, marginal firms faced with the decision to either curtail production or shutdown would most likely shut down. However, pollution abatement investment costs can be an incentive to expand production, not lower it, in order to lower per unit costs for those plants having or able to install self-contained disposal facilities.

Plant closures are also expected to result where obsolescence together with rising operational costs and required regulatory capital needs cause total costs of operation to be so high that continued operation is economically unfeasible. For single plant firm closures, unemployment and loss of market for local suppliers associated with the closing plant are expected to result. For some closed plants that belong to multiplant firms, various proportions of production and employees will shift to other plants belonging to the firm; some unemployment, due to immobility, with a corresponding loss of payroll and local business will occur. Other closed plants that belong to multiplant firms may not be able to shift production and are expected to have the same effects as the single plant firm closures.

Locational Impacts - Only general patterns of location of plants by size category have been assessed in this phase of the study, but from this alone, it is believed that only slight regional differences in impact will occur following standard adoption of pollution abatement controls. It is recognized that differences in state water quality standards and the possibility of non-uniformity of enforcement within and between states is another important factor in the impact on distilled spirits plants. Even though this problem is recognized, the impact of regulatory variability is not included in this report as the necessary data is not readily available.

3. Reasons for Dislocations

Reasons for the above type of firm and expected dislocations within the industry have been generally described. A summary in terms of profitability and capital attainment is appropriate.

Profitability - Profitability of firms, but particularly the smaller, inefficient and undercapitalized firms, will be affected by pollution abatement measures. While average incremental costs for pollution abatement may eventually be passed through to consumers, the smaller firms are expected to have much higher than average per unit costs of abatement and to drop out during the period necessary to achieve any consumer price adjustments.

Economies of scale in pollution control are apparent, and this is to the relative disadvantage of smaller firms. As previously suggested, many of the plants discharging direct or to municipalities might be forced out of the industry. This would have a limited desirable impact on the remaining firms in that pollution control costs could be spread over a larger volume. Thus, the level of profitability of the surviving plants might be affected less on the average.

In-plant modifications and operational changes which will reduce effluent loads may or may not improve the profitability of those plants which can take advantage of them. In-plant modification costs and savings must be assessed and justified by individual plants.

Capital Availability - Capital within the industry is obtained primarily from commercial sources outside the industry and from the investment of profits. Additional capital requirements for financing pollution abatement measures will be sought principally from such sources.

In this case, ability to obtain additional capital is expected to be determined by an individual firm's projections of net returns with an expanded investment program. Consequently, capital availability is expected to be directly related to profitability--and the smaller, inefficient plants will have difficulty raising the needed long and short term capital to stay in business. In this sense, inability to obtain capital will contribute to the shutting down of marginal plants.

Firms which are able to pass through incremental cost of pollution abatement costs and maintain positive profitability will be able to acquire capital for increasing capacity--plant expansion, acquisition, etc. Currently, pass throughs of rapidly increasing and larger-than-normal proportions of costs are difficult to expedite. Costs are rising rapidly and are disproportionately large due to a nearly simultaneous inflation of operational costs (labor, materials, raw material) with new investment requirements imposed by regulatory bodies (FEA, FDA, OSHA, EPA). These increased costs are difficult to pass through due to the recession wherein consumers are tending to resist any price increases through a lowering of consumption to basic needs. Thus, plans of expansion through acquired capital will tend to be carried out to the degree incremental pollution abatement, energy, drug, safety and inventory costs can be passed through to consumers. The ability of firms to obtain capital will also depend on the state of the economy and the amount of money available for lending. With a large amount of available funds, many industries and firms will be encouraged to borrow funds. Competition for funds among industries is dependent upon the money supply and relative profitability of individual firms.

4. Narrowing the Study Scope

The preceding has attempted to describe an overall picture of the Distilled Spirits Industry. In the remainder of this analysis, efforts will be made to concentrate on those distilleries which could be subject to potential impacts due to the imposition of effluent controls. This will be accomplished utilizing representative model distilleries to estimate impacts and extending these impacts by association to the wider spectrum of plants which correspond to the model distilleries.

II. FINANCIAL PROFILE OF THE INDUSTRY

Firms in the Distilled Spirits Industry are primarily either family or closely held corporations or divisions or subsidiaries of large, often multi-plant operations. As a result, financial information relating to a single plant is difficult to obtain. However, by relating information available from a variety of sources, a picture of the distilled spirits industry can be attempted. Information used to develop financial profiles was integrated from several sources, including the Census of Manufactures, the Annual Survey of Manufactures, Distilled Spirits Council of the United States and associated industry operational and financial statistics.

A. Sales and Taxes

For 1974, the Distilled Spirits Industry value of shipments amounted to $1,868 million (Table II-1). This compares to $1,757.5 million in 1970 and $927 million in 1960. The increase in shipments has been resultant of inflation, increasing per capita consumption and an increased population becoming of the legal drinking age.

Besides generating annual sales, distilled spirits plants also generate substantial tax revenues for the federal, state and local governments. In 1974, these tax revenues amounted to over $6.1 billion, which is over three times the value of the industry's shipments (Table II-1). The 1974 revenues represented an increase of 3.8 percent over the collections of 1973. Over 65 percent of the total public revenue received from distilled spirits in 1974 represented returns from the Federal excise tax on distilled spirits collected at a rate of $10.50 per tax gallon (one fluid gallon of 100 proof spirits). The remaining portion is attributable to various state and local taxes.

The above mentioned taxes apply to distilled spirits produced in the United States or imported from other countries. For those spirits imported, the Federal government is paid the same amount as for spirits produced in the United States, $10.50 per gallon.

In terms of domestic production of distilled spirits, the industry has shown a tendency for the annual quantity to fluctuate near 200 million tax gallons (a tax gallon represents one liquid gallon of 100 proof beverage). For 1974, the annual quantity was 162 million tax gallons.

Another measure of production which is perhaps more indicative of the industry's sales is the quantity of distilled spirits which is bottled. This is based on the fact that the distilled spirits produced, for the most part, are not immediately bottled for sale. Instead, the spirits are stored in barrells and aged from one to several years. Two of the more common products which are exceptions to this are vodka and gin

Table II-1. The Distilled Spirits Industry, annual value of shipments, production, consumption and public revenues generated, 1950-1974

Year	Total Value of Shipments (Dollars)	Production of Distilled Spirits (Tax Gallons)	Domestic Bottled Output of Distilled Spirits (Wine Gallons)	Apparent Per Capita Consumption (Wine Gallons)	Public Revenues from alcoholic beverages (Dollars)
1950	962,491,000	324,981,128	181,594,617	1.26	2,230,000,000
1951	942,489,000	322,175,789	176,062,385	1.26	2,275,000,000
1952	765,047,000	148,720,145	163,489,521	1.18	2,430,700,000
1953	901,843,000	166,182,730	177,391,900	1.23	2,568,000,000
1954	754,643,000	184,522,919	169,724,880	1.18	2,471,400,000
1955	783,427,000	213,458,552	179,404,992	1.21	2,601,156,000
1956	858,072,000	222,177,471	196,995,663	1.29	2,863,417,000
1957	867,176,000	227,300,208	183,606,943	1.25	2,671,182,000
1958	941,300,000	237,223,165	188,976,257	1.24	2,782,647,000
1959	959,200,000	184,159,327	200,943,890	1.28	2,979,134,000
1960	927,100,000	186,933,686	203,301,932	1.31	3,090,068,000
1961	937,900,000	184,186,200	211,306,968	1.32	3,247,058,000
1962	946,000,000	154,844,466	219,750,226	1.37	3,425,000,000
1963	1,090,500,000	150,060,265	223,921,486	1.37	3,518,672,000
1964	1,133,800,000	162,938,351	243,144,949	1.44	3,737,090,000
1965	1,288,200,000	185,063,827	252,708,417	1.52	3,921,064,000
1966	1,331,600,000	191,142,244	271,468,262	1.58	4,023,139,000
1967	1,364,200,000	211,765,585	286,006,801	1.64	4,411,075,000
1968	1,515,100,000	238,329,051	292,758,238	1.73	4,606,251,000
1969	1,668,700,000	230,054,089	311,291,951	1.80	5,207,451,000
1970	1,757,500,000	212,291,449	313,009,120	1.82	5,268,533,000
1971	1,847,500,000	183,274,484	325,576,423	1.85	5,462,614,000
1972	1,797,900,000	183,791,389	337,758,559	1.88	5,608,094,000
1973	1,814,000,000	183,069,499	339,541,847	1.92	5,906,390,000
1974	1,868,000,000	162,169,830	354,863,627	1.96	6,129,019,000

Sources: Bureau of the Census and Distilled Spirits Council of the United States.

which require no aging. However, for most of the products aging is considered an integral part of the product development and, in most cases, is required by law. The annual quantity of distilled spirits bottled in 1974 was 354.9 million wine gallons (a fluid gallon). The quantity bottled has maintained a steady rate of increase from 181.6 million wine gallons in 1950 to the 1974 quantity of 354.9 million gallons.

The 1972 Census of Manufactures estimate of value of shipments for the industry was based on information provided by 121 establishments. This gives the shipments for the average plant to be $14,858,700 (Table II-2). This compares to an average of $12,180,400 in 1967.

While the average plant had shipments of nearly $15 million in 1972 with 152 employees, the actual plants varied considerably in size. Actual plants ranged in size from small operations of less than 10 employees with annual shipments of $320,000 to large operations employing over 500 employees with annual shipment of $74.2 million.

B. Distribution of Sales Dollar

Relatively little change has occurred in the distribution of the sales dollar for the Distilled Spirits Industry from 1967 to 1972. Some changes can undoubtedly be attributed to disproportional price increases but as can be seen below, the basic distribution has not been significantly changed.

	Distribution of Sales Dollar (Percent)	
	1967	1972
Total Sales	100.0	100.0
Raw Materials	46.9	43.4
Payroll	10.4	10.2
Other operating costs, interest, taxes and profits	42.7	46.4

Table II-2. The Distilled Spirits Industry, value of shipments, value added and employees, 1967, 1972 and 1974.

	1967		1972		1974	
	Industry Total	Per Establishment	Industry Total	Per Establishment	Industry Total	Per Establish.
Number of establishments	112	-	121	-	120	-
Value of shipments	$1,364.2 million	$12,180,357	$1,797.9 million	$14,858,678	$1,868.0 million	$15,566,667
Value added	$ 736.7 million	$ 6,577,678	$1,023.9 million	$ 8,461,983	NA	-
Total employees	19,400	173	18,400	152	16,300	136

Source: Dept. of Commerce, Bureau of Census, Census of Manufactures, 1972 and the 1975 Industrial Outlook.

The price of grain and molasses, major raw material inputs, have experienced significant increases in the past two years. While these increases are not reflected in the 1967 and 1972 periods, they will undoubtedly contribute to a redistribution of the raw materials portion of the sales dollar. Between 1967 and 1972, the cost of raw materials increased from $639.3 million to $780.4 million with a corresponding decrease in the percentage of the sales dollar from 46.9 percent in 1967 to 43.4 percent in 1972. Thus, between 1967 and 1972, the significance of raw materials actually decreased.

The number of employees declined from 19,400 in 1967 to 18,400 in 1972. During this period, average annual wages increased from $7,299 in 1967 to $9,951 in 1972. However, during this period, industry payroll as a percent of sales declined from 10.4 percent to 10.2 percent.

The other operating costs, interest, taxes and profits increased from 42.7 percent in 1967 to 46.4 percent in 1972. This increase is attributed to the increased interest cost particularly due to the interest rate applying to the distilleries' relatively large inventories (resultant from aging requirements) as well as increased taxes.

C. Earnings

According to Standard and Poors Industry Survey 1/, the Distilled Spirits Industry has experienced four consecutive years of subpar growth particularly with respect to consumption growth. Despite this, the leading distilleries have established excellent records of consistent, though moderate, earnings growth. Standard and Poor states further that this is all the more remarkable when viewed against the background of almost stable prices for distilled spirits during a period of moderate high rates of cost inflation. The retail price of straight and blended whiskies during the five year period through 1973 period rose a modest 8 percent, compared with an increase in the cost of living of almost 30 percent. A principal reason for this price trend has been the diversification of most leading distillers, principally in wine but also in such activities as oil and gas production where, though faster volume growth or better realization, slimmer profits of the basic distilling business have been obscured.

1/ Standard and Poors Industry Survey, Liquor-Current Analysis, April 5, 1975 (Section 3).

While the above data indicate a relatively good return for the major diversified operations, the industry as a whole has not faired very well. According to the Internal Revenue Service data (Table II-3), the average net profits before taxes has declined from 3.7 percent of net sales in fiscal year 1968-69 to a low of 1.8 percent in 1970-71. In 1972, the latest year for which data are available, the percentage increased to 2.0 percent. This deterioration in recent years can be attributable to a variety of factors some of which were mentioned above. The slight improvement in profits in 1971-72 may be associated with the diversification of firms as well as the fact that in the whiskey segment, proofs were reduced usually without a proportionate decrease in price.

Table II-3 also indicates the profits by the size of the operation. As would be expected, the smaller operations generally were associated with the lower and unstable profits and the larger firms maintained reasonably steady respectable profits.

D. Ability to Finance New Investment

The ability of a firm to finance new investments for pollution abatement is a function of several critical financial and economic factors. In general terms, new capital must come from one or more of the following sources: (1) funds borrowed from outside sources; (2) equity capital generated through the sale of common or preferred stock; (3) internally generated funds--retained earnings and the stream of funds attributed to depreciation of fixed assets.

For each of the three major sources of new investment, the most critical set of factors is the financial condition of the individual firm. For debt financing, the firm's credit rating, earnings record over a period of years, stability of earnings, existing debt-equity ratio and the lenders' confidence in management will be major considerations. New equity funds through the sale of securities will depend upon the firm's future earnings as anticipated by investors, which in turn will reflect past earnings records. The firm's record, compared to others in its own industry and to firms in other similar industries, will be a major determinant of the ease with which new equity capital can be acquired. In the comparisons, the investor will probably look at the trend of earnings for the past five years.

Internally generated funds depend upon the margin of profitability and the cash flow from operations. Also, in publicly held corporations, stockholders must be willing to forego dividends in order to make earnings available for reinvestment.

Table II-3. The alcholic beverage industry, except malt liquors and malt, net profit before taxes, by asset size, 1969-1972.

Fiscal Year	Size of Assets ($000)											
	Under 100	100 - 250	250 - 500	500 - 1,000	1,000 - 5,000	5,000 - 10,000	10,000 - 25,000	25,000 - 50,000	50,000 - 100,000	100,000 - 250,000	250,000 - or more	Total Industry
	Percent of Net Sales											
1968-69	5.7	-0.6	-	-5.8	0.0	3.7	6.8	8.5	4.5	4.0	2.6	3.7
1969-70	1.7	3.8	-30.9	-3.9	4.7	5.6	3.3	7.3	5.4	4.1	0.7	2.1
1971-71	-	3.0	-36.3	-0.2	2.6	5.6	2.2	6.6	4.5	3.1	0.6	1.8
1971-72	-2.7	3.8	3.7	-5.2	4.2	4.4	5.1	4.1	5.8	3.8	0.4	2.0

Source: Department of Treasury, Internal Revenue Service, Source Book of Statistics of Income, Annual.

The condition of the firm's industry and general economic conditions are also major considerations in attracting new capital. The industry will be compared to other similar industries (i.e., other beverage industries) in terms of net profits on sales and on net worth, supply-demand relationships, trends in production and consumption, the state of technology, impact of government regulation, foreign trade and other significant variables. Declining or depressed industries are not good prospects for attracting new capital. At the same time, the overall condition of the domestic and international economy can influence capital markets. A firm is more likely to attract new capital during a boom period than during a recession. On the other hand, the cost of new capital will usually be higher during an expansionary period. Furthermore, the money markets play a determining role in new financing.

These general guidelines can be applied to the Distilled Spirits Industry by looking at general economic data and industry performance over the recent past.

1. General Industry Situation

As was depicted in Table II-3, the distilled spirits industry has experienced a declining trend in its profits during the past few years. However, Standard and Poors have projected that the industry has good earnings potential from expanding sales of American spirits abroad. Unfortunately, these type of solutions to improving profits are usually only available to the larger operations and as such firms of limited size or funds may continue to experience reduced profits.

Total assets and liabilities of the industry are shown in Table II-4 for the years 1968-69 through 1971-72. From the table, it is apparent that the industry's fixed assets represent approximately 42 percent of all assets and that current assets represent approximately 58 percent. Also, it is apparent that of the total liabilities, long term debt represents approximately 26 percent, current liabilities represent 30 percent and net worth represents 44 percent.

2. Expenditures for Plant and Equipment

New expenditures as reported by the Annual Survey of Manufactures and the Census have increased from $15.9 million in 1960 to $33.4 million in 1972 (Table II-5). The yearly expenditures have fluctuated from year to year, but overall has been increasing.

A closer look at the $33.4 million spent as capital expenditures in 1972 (depicted below) reveals $7.1 million were spent for new structures and additives to plants, $25.7 million for new machinery and equipment and the remainder, $0.6 million, being spent to purchase used plants and equipment.

Table II-4. The alcoholic beverage industry, except malt liquor and malt, assets and liabilities, 1969-1972

	1968-69		1969-70		1970-71		1971-72	
	($ Mil.)	(Percent)	($ Mil.)	(Percent)	($ Mil.)	(Percent)	($ Mil.)	(Percent)
Assets								
Current Assets	1,683.3	55	3,207.5	58	3,278.1	58	3,418.4	59
Fixed Assets	1,352.0	45	2,288.1	42	2,380.8	42	2,343.8	41
Total Assets	3,035.3	100	5,495.7	100	5,658.9	100	5,762.2	100
Liability & Equity								
Long Term Debt	690.2	23	1,488.4	27	1,464.8	26	1,592.2	28
Current Liabilities	757.6	25	1,756.7	32	1,785.9	32	1,629.8	28
Net Worth	1,587.4	52	2,250.5	41	2,408.2	42	2,540.1	44
Total Liabilities and Equity	3,035.3	100	5,495.6	100	5,658.9	100	5,762.2	100

Source: Department of Treasury, Internal Revenue Service, Source Book of Statistics of income, annual.

Table II-5. Distilled spirits industry, capital expenditures, 1960 through 1972.

Year	Capital Expenditures ($ Million)
1960	15.9
1961	14.5
1962	19.8
1963	15.5
1964	13.5
1965	23.4
1966	32.2
1967	27.0
1968	44.0
1969	38.6
1970	28.9
1971	28.6
1972	33.4

Source: Department of Commerce, Bureau of Census.

As also depicted below, comparable data for 1967 reveal that the industry utilized a greater portion of its capital expenditures for new machinery and equipment and also used plants and equipment and a smaller portion for new structures and additions to existing plants. This can be interpreted to suggest that the industry is moving toward the upgrading of existing facilities instead of the construction of new facilities.

Expenditures for Plants and Equipment

	1967		1972	
	$ Million	Percent	$ Million	Percent
Total	27.1	100.0	33.4	100.0
New Structures & Additions to Plants	9.6	35.4	7.1	21.3
New Machinery & Equipment	17.4	64.2	25.7	76.9
Used Plants and Equipment	0.1	0.4	0.6	1.8

3. Capital Availability

In summary, it would appear the Distilled Spirits Industry can be categorized into two types of financial positions in terms of the availability of capital to utilize for expenditures on pollution controls. First, there are the large diversified firms who have experienced reasonably steady profits and through diversification have been able to maintain adequate cash flows. For these firms the acquisition of additional capital for pollution controls may be of concern but should not be a major problem.

The other financial position will be encountered by the smaller firms who do not have the available sources from which additional capital can be readily generated. These firms will primarily have to rely on internally generated capital (if available) or attempt to borrow it. Depending on the firms' potential and the industry's outlook, some of the smaller firms may encounter significant problems in obtaining capital.

E. Cost of Capital - After Tax

Return on invested capital is a fundamental notion in U.S. business. It provides both a measure of actual performance of a firm as well as expected performance. In this latter case, it is also called the cost of capital. The cost of capital is defined as the weighted average of the cost of each type of capital employed by the firm, in general terms equities and interest bearing liabilities. There is no methodology that yields the precise cost of capital, but it can be approximated within reasonable bounds.

The cost of capital was determined for purposes of this analysis by estimating performance measures of the industry. The weights of the two respective types of capital for the Distilled Spirits Industry were estimated at 37 percent debt at 63 percent equity. The cost of debt was assumed to be 10.0 percent. The cost of equity was determined from the ratio of earnings to net worth and estimated to be 9.5 percent.

To determine the weighted average cost of capital, it is necessary to adjust the before tax costs to after-tax costs (debt capital only in this case). This is accomplished by multiplying the costs by one minus the tax rate (assumed to be 48 percent). These computations are shown below and result in the estimated after-tax cost of capital being 7.9 percent.

Weighted Average After Tax Cost of Capital

Item	Weight	Before Tax Cost	Tax Rate	After Tax Cost	Weighted Cost
Debt	.37	10.0	.48	5.2	1.9
Equity	.63	-	-	9.5	6.0
					7.9

III. MODEL PLANTS

The distilled spirits industry consists of distillers using several different manufacturing processes to produce a wide variety of alcoholic beverages. As stated in previous sections, the industry is comprised of establishments primarily engaged in manufacturing alcoholic beverages by distillation and rectification, and in manufacturing cordials and alcoholic cocktails by blending processes or by mixing liquors and other ingredients. As this chapter is concerned with the development of economic model plants representative of those plants in the industry which potentially could be affected by the imposition of effluent controls, the primary emphasis of this chapter will be those operations with grain distilleries. This determination was made since the rectifying, blending and bottling operations have little, if any, effluent and the fact that the Development Document states that no known rectifying, blending and bottling plants discharge effluent into navigable waters. Molasses distilleries were also eliminated from inclusion in this chapter as according to EPA the known molasses distilleries either discharge to municipal systems or have already met BAT standards.

A. Types of Plants

Those establishments which utilize the distillation operation in their production of alcoholic beverages can basically be classified into two categories: (1) those which distill grain or some combination of ingredients including grain to produce the more common types of beverages such as whiskey, vodka, gin and cordial; and (2) those which distill citrus molasses to produce principally rum. As mentioned above this latter type will be omitted from further analysis as it is anticipated impacts on molasses distilleries will be nominal, if any.

The typical grain-based distillery produces its distilled spirit products utilizing six basic steps[1/]. These steps include: (1) Grain handling and milling; (2) Mashing; (3) Fermentation; (4) Distillation; (5) Maturation; and (6) Packaging. Each of these steps will be discussed briefly.

1. Grain handling and milling - Distilleries utilize premium cereal grains and supplement these to meet their own standards. Once received, the grains are stored prior to their milling. The milling operation breaks the outer cellulose protective wall around the kernal and exposes more starch surface to the action of the cooking and conversion process.

2. Mashing - Mashing is a relatively simple operation, involving cooking (gelatinization of starch) and conversion (saccharification) changing starch to grain sugar (maltose). For the cooking operation two types of cookers are used, the batch or the continuous system. Once cooked, the grain is cooled and conversion is accomplished by the addition of barley malt meal. Once converted the mash is pumped to the fermenters.

3. Fermentation - Beverage alcohol fermentation involves the conversion of fermentable grain sugars (largely maltose), produced by the action of malt enzymes (amylases) on gelatinized starch, into nearly equal parts of ethyl alcohol and carbon dioxide. The fermentation of grain mash is initiated by the innoculation of the set mash with 2-3 percent by volume of ripe yeast prepared separately. The degree of conversion, agitation of the mash and the temperature directly affect the fermentation rate. Fermented mash set at a concentration of 38 gallons of mash per bushel of grain will be fermented to completion in 2 to 5 days depending on the set and control temperatures. Fermentation will usually result in an alcohol concentration of approximately 7 percent by volume.

4. Distillation - Distillation involves the separation, selection and concentration of the alcoholic products of yeast fermentation from the fermented grain mash (distiller's beer). This is accomplished utilizing a system which will vary from distillery to distillery. Some of the most common systems used in the United States are: the continuous whiskey separating column with or without an auxiliary doubler unit for the production of straight whiskies; the continuous multi-column, complex system used for the production of grain neutral spirits; and the batch rectifying and kettle unit, used primarily in the production of grain neutral spirits which are subsequently stored in barrels for maturation purposes.

The basic column system consists of a cylindrical shell which is divided into sections separated by 14 to 21 perforated plates. The plates are normally 22 to 24 inches apart. The perforations are usually 3/8 to 1/2 inches in diameter and take up about 10 percent of the plate area. The fermented mash is introduced near the top of the column and passes downward plate by plate while steam is introduced at the bottom of the column and rises to the top. As the mash continues downward the steam evaporates the alcohol from it and carries it to the top.

The residual mash finally reaches the base where it is either discharged or stored for eventual condensation. The vapors leaving the top of the column are condensed and form the product. The raw product will then be subjected to additional columns in which undesirable odors or tastes may be removed. Then the product is temporarily stored prior to its placement in barrels for maturation.

It should be noted that the majority of the wastewaters subject to potential discharge are generated during the distillation phase. Some of the smaller distillers do not attempt to recover spent grain and their normal course of action is to screen the courser materials for sale as wet spent grains and to discharge their remaining effluent to a municipal system or to their treatment system (if they have one). The other distilleries attempt to recover spent grain utilizing grain dryers which convert the wet grains into marketable supplemental livestock feed. The most significant source of wastewater within the feed recovery system is the condensate from the grain dryers.

5. Maturation - The maturation phase of the production of alcoholic beverages involves the storage of the beverage spirits in new, white oak barrels, whose staves and heading are charred. The duration of maturation depends on the time it takes a particular whiskey to attain the desirable ripeness. During maturation, the barrels are stored in bonded warehouses where conditions are such to optimize the necessary reactions. For most aged beverages, there is a minimum period for maturation defined by law.

It should be noted that the relatively new product, light whiskey, can be aged in used barrels whereas most all other whiskeys require new barrels. Furthermore, it should be noted that some alcoholic beverages do not require aging; vodka for example. These latter beverages can be bottled directly following their production.

6. Packaging - Besides interindustry shipments utilizing bulk containers, the majority of the distilled spirits are bottled. Since the bottling of distilled spirits is done under Federal Government supervision and the product then distributed to the various states in compliance with their laws and regulation, the packaging operation must consider many factors not involved in ordinary glass packaging. First, the product represents a high value, because it does include the Federal tax ($10.50 per gallon) at the time of bottling. Second, in addition to the problems involved with the various bottle sizes and cases, the distiller must apply to each bottle a stamp indicating that the federal tax has been paid and for shipments to 10 different states, also apply bottle stamps which indicate identification or state tax payment. Third, since this is a licensed industry, in addition to the normal record-keeping for everyday operation, federal and individual states require many records which require incorporation to their system of control.

The most common packaging operation utilizes a straight line system with a line speed of 120 to 200 bottles per minute. In brief the operation involves: (a) the removal of matured beverage spirits from bonded warehouses; (b) the emptying of the barrels and the tax determination; (c) filtering and reduction in proof of the product with distilled or deionized water; (d) the preparation of blended whiskeys where straight whiskies and grain neutral spirits are combined; (e) the new, empty bottles are uncased, then the sterile bottles proceed through a pneumatic cleanser to remove any foreign particles. The bottles continue on through a gravity-vacuum type filter, capper, labeler, strip-stamp machine, a case packer and a case sealer; (f) each case is then registered, dated and consignee's name stamped, before the case proceeds to the truck, rail car or to the distillery's warehouse.

B. Sizes of Plants

The value of shipments of the Distilled Spirits Industry in 1972 was $1,797.9 million according to the Census. This gives an average for the 121 establishments of $14,860,000. This figure, however, is misleading as it reflects the average of distilleries and rectifiers, the latter which have been eliminated from the detailed discussion.

According to the BATF, as of July 1975 there were 60 plants authorized to distill grain spirits. The criteria for defining size of model grain distilleries is the average daily quantity of bushels of grain used. Three sizes of model grain distilleries were developed, small, medium, and large. The small distillery model was determined not to operate a grain recovery system. Instead it sells its spent grains wet. The medium and large grain models were determined to operate grain recovery systems.

The model plants are depicted in Table III-1. For the existing model grain distilleries, the daily quantities of bushels consumed were 1,000 for the small model, 5,000 bushels for the medium distillery model and 15,000 bushels for the large model. For the New Source Performance Standard (NSPS) models, the daily quantities of grain consumed were 5,000 bushels for the medium NSPS model and 15,000 bushels for the large NSPS model.

If the model plant data depicted on Table III-1 are multiplied by the number of corresponding plants and summed, the aggregated totals indicate a production quantity which exceeds the industry's historical figures. This is resultant of the fact that most distilleries do not operate at full capacity or if they do, they do not operate throughout the year. Thus, it can be said the industry has a significant potential to increase output if the need arises.

The financial profiles for each of the grain distillery model plants are shown in Table III-2.

C. Investments

The estimated book value and salvage value for each model plant are shown in Table III-3 for the grain distillery models. Also shown are current assets, current liabilities and net working capital.

Table III-1. Model distilleries, descriptive information

	Existing			New Source	
	Small	Medium	Large	Medium	Large
GRAIN DISTILLERIES					
Bushels per day	1,000	5,000	15,000	5,000	15,000
Days distillation per year	150	200	240	240	240
Proof gallons per year	750,000	5,000,000	15,000,000	6,000,000	15,000,000
Average employees	100	455	1,250	340	1,150
Number of corresponding establishments	24	31	5	--	--

Table III-2. The model grain distilleries, financial profiles

	Existing			New Source	
	Small	Medium	Large	Medium	Large
Bushels per day	1,000	5,000	15,000	5,000	15,000
Days operation per year	150	200	240	240	240
Proof gallons per year	750,000	5,000,000	18,000,000	6,000,000	18,000,000
Revenue					
Sales ($2.89/proof gallon)	$2,167,500	$14,450,000	$52,020,000	$17,340,000	$52,020,000
Dried grain	-	1,053,360	3,792,096	1,264,000	3,792,096
Total Revenue	2,167,500	15,503,360	55,812,096	18,604,000	55,812,096
Costs					
Ingredients	442,500	2,950,000	10,620,000	3,540,000	10,620,000
Labor	725,000	4,512,400	14,384,000	3,944,000	13,340,000
Supplies and Other Costs	921,700	6,722,500	25,002,000	8,778,930	24,736,876
Total Costs	2,089,200	14,184,900	50,006,000	16,262,930	48,696,876
Cash Earnings	78,300	1,318,460	5,806,096	2,341,070	7,115,220
Less					
Depreciation	27,900	135,000	391,500	437,500	1,181,250
Interest (1% of sales)	21,700	144,500	520,200	173,400	520,200
Pre-Tax Income	28,700	1,038,960	4,894,396	1,730,170	5,413,770
Income Tax	7,276	492,200	2,342,810	823,982	2,592,110
After-Tax Income	21,424	546,760	2,551,586	906,188	2,821,660
Cash Flow	$49,324	$681,760	$2,943,086	$1,343,688	$4,002,910

1. Book Value of Investment

The estimates of book value of assets for the grain distillery models were developed from data available from Moody's Industrial Manual as well as data from industry sources. The estimates were computed utilizing a derived estimate of the value per proof gallon of the capacity of the model distilleries. These annual proof gallon capacities were determined utilizing the daily milling capacity and a 300 day work schedule. The values per proof gallon for the existing models were $0.31, $0.30 and $0.29, for the small, medium and large model distilleries, respectively. For the NSPS models, the estimated investment values per proof gallon were $1.00 for the medium NSPS model and $0.75 for the NSPS large model.

2. Salvage Value

The salvage value of distilleries will vary widely from plant to plant, depending upon the age of the plant and its condition, the age of the equipment and its condition and the location of the plant. In some instances the salvage value of old, obsolete plants will be equal to site value plus the scrap value of the equipment.

There is a market for certain types of used machinery and equipment, however, this is limited primarily to modification of existing operations as virtually all new plants begin with all new equipment.

As no data are available on actual salvage values for distilleries and only a limited market exists for used equipment, it is difficult to estimate the salvage value of plant closed due to the added costs of effluent controls. For purposes of analysis, the estimated salvage value has been determined based on 30 percent of the book value of the distillery's assets.

3. Operating Capital

Current assets, current liabilities and net working capital were also shown in Table III-3. Current assets were estimated to be percentages of sales which varied according to the size of the distillery. For the grain distilling models in this analysis, current assets for the small distillery were estimated to be 35 percent of sales; for the medium distilleries, 45 percent; and for the large distilleries 55 percent.

Current liabilities were estimated utilizing a current ratio (current assets divided by current liabilities) of 1.8 for the small grain model, 1.6 for the medium grain models and 1.4 for the large model grain distilleries.

Table III-3. The distilled spirits industry, estimated capital costs for model grain distilleries

	Existing						New Source			
	Small		Medium		Large		Medium		Large	
	Book	Salvage	Book	Salvage	Book	Salvage	Book	Salvage	Book	Salvage
	($1,000)									
Total Fixed Assets	465.0	139.5	2,250.0	675.0	6,250.0	1,957.5	6,250.0	1,875.0	16,875.0	5,062.5
Current Assets	758.6	758.6	6,502.5	6,502.5	28,611.1	28,611.1	7,803.0	7,803.0	28,611.1	28,611.1
Current Liabilities	421.4	421.4	4,064.1	4,064.1	20,436.5	20,436.5	4,876.9	4,876.9	20,436.5	20,436.5
Net Working Capital	337.2	337.2	2,438.4	2,438.4	8,174.6	8,174.6	2,926.1	2,926.1	8,174.6	8,174.6
Total Invested Capital	802.2	476.7	4,688.4	3,113.4	14,424.6	10,132.1	9,176.1	4,801.1	25,049.6	13,237.1

D. Model Plant Capacity and Utilization

As distilleries vary from one to another, there appears to be no industry rule by which the model plants' capacity or utilization can be established. The limiting factor for a distillery's capacity is usually the capacity of the distillation system. However, as few operations operate on a year around basis, the industry can be characterized as one with additional output capabilities.

Commonly, distilleries will operate their columns 20 to 24 hours per day, six or seven days per week, for anywhere from 100 to 300 days per year. For purposes of the grain distilleries model plant development, it was assumed the models would operate 20 hours per day with the small model operating 150 days per year, the medium model 200 days per year and the large model operating 240 days per year. Both grain NSPS models were assumed to operate 240 days per year. The remainder of the year the plant would continue to bottle its previously distilled beverages.

When distilling, the model plants were assumed to maintain a reasonably high utilization rate; approximately 85 to 90 percent of their capacity. This relatively high utilization rate was based on the fact that it takes a considerable amount of fuel to fire up the stills and thus when the stills are operating, most plants attempt to maintain near capacity operations.

The grain based distilled spirits industry does experience a slight seasonal trend in the distillation of the various beverages. As can be seen in Table III-4, the months between September and December represent slightly higher monthly production figures than for the remainder of the year. This slight seasonality may be attributable to several factors, two of which may be climatic conditions and the fact that the fall months represent that period of the year when corn is usually harvested, thus corn prices are generally lower.

E. Cost Structure of Model Plants

The cost structures for the model plants were shown in Table III-2. Major items are discussed below.

1. Ingredient Costs

The major portion of the ingredient costs for the grain distillery models are attributable to the necessary grains of which corn constitutes the major expenditure. For purposes of this analysis Number 2, yellow corn was used at an average price of $2.95 per bushel.

Table III-4. The Distilled Spirits Industry, monthly production of distilled spirits, FY 1974

Month	Total Distilled Spirits 1/
	(1,000 proof gallons)
July	63,900.7
August	69,115.6
September	73,067.9
October	78,814.4
November	77,935.5
December	71,873.1
January	66,435.1
February	63,772.9
March	60,178.1
April	70,077.7
May	69,708.3
June	56,697.8

1/ Represents net production of whiskey, brandy, rum, gin, vodka, and alcohol and spirits at distilled spirits plants.

Source: Department of Treasury, Bureau of Alcohol, Tobacco and Firearms, Summary Statistics, 1974.

2. Labor Costs

Labor represents the single most expensive costs in the operation of grain based distilleries. All the model grain distilleries were assumed to produce finished bottled alcoholic beverages with the bottling operation continuing the majority of the year. The small existing model distillery was assumed to have 100 employees of which 25 were employed year around and 75 were employed for one-half of the normal operating year. The medium existing model distillery was assumed to utilize 255 full time employees with an additional 200 employees working two-thirds of the normal year. The large existing distillery model was assumed to have 1,240 employees, all of which worked on a full-time basis. For the NSPS models, all employees were assumed to operate throughout the year with the medium NSPS model employing 340 employees and the large NSPS model employing 1,150 employees. For all model grain distilleries, the average earnings for a full-time employee were determined to be $11,600.

3. Supplies and Other Costs

This cost classification includes costs for bottles, barrels, fuels and other miscellaneous direct and indirect costs.

4. Depreciation and Interest

Depreciation was derived from IRS data and determined to be expressed as a percent of book value of assets, 6 percent for all the existing model grain distilleries. While it is acknowledged that distilleries in operation today vary with respect to the age of the facilities, the constant depreciation rate for all distillery sizes was predicted on the assumption that most distilleries incurred the majority of their respective investments following the close of prohibition (1933). The NSPS grain distillery models utilize a depreciation rate of 7 percent.

Interest was estimated to be one percent of the sales dollar.

5. Total Costs

For the existing grain distillery models, ingredient costs ranged from 19.0 percent of the sales dollar for the medium and large distilleries to 20.4 percent for the small distillery. Labor costs represented the greatest percentage for the small distillery, being 33.4 percent. Labor for the medium distillery represented 29.1 percent of the sales dollar and for the large distillery model, labor represented 25.8 percent. Finally, the expense for supplies and other costs was relatively equal proportionately for each of the models, being between 42 and 45 percent.

Thus for the existing model grain distilleries, total costs for the small model were estimated to represent 96.4 percent of its sales dollars. For the medium and large distilleries, total costs were estimated to be 91.5 percent and 89.6 percent respectively. For the NSPS models, total costs represented 87.4 percent of sales for the medium NSPS model and 87.3 percent for the large NSPS model.

F. Annual Profits

After-tax income, return on sales, both pre-tax and after-tax, and return on total invested capital for the various sized model distilleries are shown in Table III-5.

It should be noted that the model distilleries were based on average 1973/74 conditions as no later published sources of information were available. Some questions may arise concerning the return on total invested capital especially for the medium and large model distilleries. While these percentages do seem higher than other industry returns, review of the 1971/72 (the latest available) IRS data reveals that the model distilleries' returns are within the alcoholic beverage industries' average. These IRS data are depicted below.

Size of Assets ($000)	Net Income to Net Worth (Percent)
< 100	36.6
100-250	6.1
250-500	7.2
500-1,000	5.2
1,000-5,000	15.7
5,000-10,000	8.6
10,000-25,000	11.8
25,000-50,000	15.2
50,000-100,000	7.8
100,000-250,000	6.5
250,000 or more	3.5
Industry average	5.4

G. Annual Cash Flows

Estimated annual cash flows for the different sizes of model distilleries are shown in Table III-6. Cash flow as calculated represents the sum of after-tax income plus depreciation. In the table it is shown in absolute dollars as well as a percent of sales and as a percent of total invested capital.

Table III-5. The Distilled Spirits Industry, net income, returns on sales and investments for model distilleries.

Size of Model Distillery	After-tax Income	Return on Sales		Return on total invested capital	
		Pre-tax	After-tax	Pre-tax	After-tax
	(Dollars)	Percent			
Existing Grain					
Small	21,424	1.3	1.0	3.6	2.7
Medium	748,560	6.7	3.5	22.2	11.7
Large	3,278,080	8.8	4.6	33.9	17.7
NSPS - Grain					
Medium	906,188	9.3	4.9	18.9	9.9
Large	2,821,660	9.7	5.1	21.6	11.3

Table III-5. The Distilled Spirits Industry, annual cash flows for model distilleries.

Size of Model Distillery	Annual cash flow	Cash Flow as a percent of sales	Cash Flow as a percent of Total Invested capital
	(Dollars)	(Percent)	(Percent)
Existing Grain			
Small	49,324	2.3	6.1
Medium	681,760	4.4	14.5
Large	2,943,086	5.3	20.4
NSPS - Grain			
Medium	1,343,688	7.2	14.6
Large	4,002,910	7.2	16.0

As a percent of sales, cash flows for the existing grain models ranged from a low of 2.3 percent to a high of 5.3 percent. The percentage for the NSPS models was 7.2 percent. The higher cash flow percentages for the larger and NSPS distilleries may be attributable to revenues generated from the sale of dehydrated spent grains which according to most industry sources, is a profitable venture if the volume is sufficient.

Cash flows as a percent of total invested capital for the model grain distilleries reveal a relatively large range; increasing as the size of the distillery increases. This may be attributable of profits generated by dehydrating spend grains for the larger distilleries.

All factors considered, the smaller model distillery maintains an unfavorable competitive cash flow position in relation to the larger distillery models.

IV. PRICING PATTERNS

Prices for distilled spirits have remained relatively stable during recent years in spite of significant price increases for many of the inputs utilized by the industry. A major factor in this stability of prices may be attributed to the keen competition between different brands as well as the competition between the different types of distilled products.

A. Price Determination

The determination of prices for distilled spirits involves a complex interaction of consumer demands and attitudes, the available supply and governmental taxes. While the supply and taxes influence the overall determination of prices, consumer demands and attitudes dominate the actual price determination process.

1. Consumer Demand and Attitudes

Consumer demand can be defined as the quantity of alcoholic beverages consumers are willing to purchase at the current level of prices. Historically, alcoholic spirits' demand (consumption) has increased since 1960 at an annual average rate of 4.0 percent. This increase, however, has not been steady; as the annual rate of increase has fluctuated between 2.3 and 7.2 percent (Table IV-1). Furthermore, during the most recent five years, the average annual increase has been much lower than for the preceding 10 years with an average increase for 1970 to 1974 of 2.7 percent.

These trends are reinforced when the distilled spirits per capita consumption are viewed (Table IV-1). The per capita quantity of distilled spirits consumed has increased from 1.31 wine gallons in 1960 to 1.96 gallons in 1974, an average annual increase of 2.8 percent. The average increase for the 1970 to 1974 period was over one percent less, being 1.7 percent.

Thus, it appears that while demand has increased for distilled spirits since 1960, it has increased at a lower rate in recent years. This may be partially explained by the significant increase in the popularity of wines which to some extent have been substituted for distilled spirits.

Demand for individual brands and beverage type is predominantly dependent upon consumers' preferences and attitudes. Competition between brands is often based on the price of a particular brand in relation to its image in the consumer's mind. Generally, the consumers can be classified as brand

Table IV-1. The distilled spirits industry, consumption since 1960.

Year	Distilled Spirits Consumed (Wine Gallons)	Percentage Change from Previous Year (Percent)	Per Capita Consumption (Wine Gallon)	Percentage Change from Previous Year (Percent)
1960	234,714,557	-	1.31	-
1961	241,449,065	2.8	1.32	0.8
1962	253,700,966	4.8	1.37	3.6
1963	258,979,291	2.8	1.37	0.0
1964	271,861,906	4.7	1.44	4.9
1965	292,987,572	7.2	1.52	5.3
1966	307,756,120	4.8	1.58	3.8
1967	323,498,937	4.9	1.64	3.7
1968	344,067,256	6.0	1.73	5.2
1969	361,682,018	4.9	1.80	3.9
1970	370,138,126	2.3	1.82	1.1
1971	381,150,495	2.9	1.85	1.6
1972	391,937,351	2.8	1.88	1.6
1973	402,364,705	2.6	1.92	2.1
1974	413,497,553	2.7	1.96	2.0

Source: Distilled Spirits Council of the United States, 1974 Annual Statistical Review

conscious within a given price range. That is, they seek what they consider the best "brand" for their money. Furthermore, once consumers become associated with a particular brand, they are reluctant to change. According to one industry source, if a consumer's real income drops, he (or she) may decide to purchase a less expensive brand. If this occurs, after a few months, the consumer usually returns to his original brand.

Historically, consumers also have been reluctant to change the type of spirits they drink. This however has changed in the past few years as clear spirits (gin, vodka, rum and tequila) have made significant increases in their market share. Table IV-2 depicts the domestic bottled output of the major spirit types and their portion of the total domestically bottled output. From the table it can be seen that whiskey's proportion has declined significantly from 78.3 percent of the total output in 1955 to 51.0 percent in 1974. Increased consumption of vodka has been the primary reason for the decline of whiskey's portion. Vodka bottled output during the same period increased from only 3.9 percent in 1955 to 22.1 percent in 1974. Thus of the 27.3 percent drop in whiskey's portion of the market, vodka has accounted for 18.2 percent.

Gains in cordials and other spirits account for the majority of the remainder of whiskey's percentage drop, with brandy's increase in its market share next. Gin, which has shown a relatively stable position over the years, dropped slightly in its portion in recent years. Rum, which in 1955 represented only 0.3 percent of the total output has increased by 6 times to its current portion of 1.8 percent.

2. Supply of Distilled Spirits

The production of distilled spirits from the majority of the spirit types must be initiated one to several years prior to the date of the projected consumption. To protect themselves against a situation where demand exceeds the available supply, distilleries often maintain higher than required inventories. As a result, most aged beverages often are one to several years older than the minimum age required by law. As it appears the inventories require adjustments, the adjustments are made which results in little if any immediate effect on the supply.

This has been evidenced in recent years when the demand for distilled spirits did not meet the earlier projections. This resulted in excess inventories in bonded warehouses and subsequently during the past two years, distilleries have not been producing their usual quantities of spirits.

3. Market Structure

The markets in which distilleries must sell range from highly competitive open markets to restricted "control states" markets. In addition, regardless of the market, distilleries are subject to numerous additional controls and regulations by the Federal government as well as by the states.

Table IV-2. Domestic bottled output of distilled spirits, by spirit type.
(in 000 wine gallons)

Year	Total Distilled Spirits		Whiskey		Brandy		Rum		Gin		Vodka		Cordials, etc.	
	Quantity (000)	% of Total	Quantity (000)	% of Total	Quantity (000)	% of Total	Quantity (000)	% of Total	Quantity (000)	% of Total	Quantity (000)	% of Total	Quantity (000)	% of Total
1955	179,405	100.0	140,450	78.3	3,726	2.1	663	0.3	20,447	11.4	6,968	3.9	7,151	4.0
1956	196,996	100.0	151,612	77.0	3,943	2.0	629	0.3	20,942	10.6	11,875	6.0	7,994	4.1
1957	183,607	100.0	134,609	73.3	4,401	2.4	649	0.4	20,550	11.2	14,829	8.1	8,569	4.6
1958	188,977	100.0	140,304	74.2	4,645	2.5	749	0.4	19,633	10.4	15,100	8.0	8,546	4.5
1959	200,944	100.0	145,894	72.6	4,835	2.4	798	0.4	21,839	10.9	17,738	8.8	9,840	4.9
1960	203,302	100.0	145,114	71.4	5,300	2.6	804	0.4	22,001	10.8	19,406	9.5	10,677	5.3
1961	211,307	100.0	147,541	69.8	5,760	2.7	904	0.4	23,604	11.2	20,977	10.0	12,251	5.9
1962	219,750	100.0	150,693	68.6	6,202	2.8	1,041	0.5	24,823	11.3	23,026	10.5	13,965	6.3
1963	223,921	100.0	150,814	67.4	6,982	3.1	1,067	0.5	25,799	11.5	24,944	11.1	14,315	6.4
1964	243,145	100.0	160,895	66.2	7,594	3.1	1,541	0.6	28,957	11.9	28,162	11.6	15,995	6.6
1965	252,708	100.0	163,055	64.5	8,264	3.3	1,615	0.7	29,628	11.7	31,157	12.3	18,980	7.5
1966	271,468	100.0	173,290	63.8	9,288	3.4	1,710	0.6	31,633	11.7	34,704	12.8	20,843	7.7
1967	286,007	100.0	179,722	62.8	10,058	3.5	1,983	0.7	33,055	11.6	38,620	13.5	22,569	7.9
1968	292,758	100.0	181,214	61.9	10,335	3.5	2,181	0.7	33,265	11.4	41,297	14.1	24,466	8.4
1969	311,292	100.0	192,816	61.9	11,479	3.7	2,399	0.8	34,971	11.2	45,298	14.6	24,328	7.8
1970	313,009	100.0	190,510	60.9	11,795	3.8	2,909	0.9	35,122	11.2	50,172	16.0	22,500	7.2
1971	325,576	100.0	191,729	58.9	12,677	3.9	2,793	0.8	36,528	11.2	56,495	17.4	25,354	7.8
1972	337,758	100.0	193,335	57.2	13,046	3.9	4,325	1.3	36,735	10.9	62,845	18.6	27,473	8.1
1973	339,542	100.0	181,933	53.6	14,215	4.2	4,397	1.3	36,952	10.9	70,412	20.7	31,632	9.3
1974	354,864	100.0	180,919	51.0	13,875	3.9	6,448	1.8	37,175	10.5	78,447	22.1	37,999	10.7

Source: Distilled Spirits Council of the United States, Annual Statistical Review 1974.

As of 1974, there were 18 states which were classified as control or monopoly states in terms of the distribution of distilled spirits. These states are Alabama, Idaho, Iowa, Maine, Michigan, Mississippi, Montana, New Hampshire, North Carolina, Ohio, Oregon, Pennsylvania, Utah, Vermont, Washington, West Virginia, and Wyoming. In these states, commissions have been set up which purchase alcoholic beverages from distillers, importers, or vintners either directly or through brokers.

The remaining 32 states plus the District of Columbia, are classified as open states which allow wholesale dealers to purchase the spirits. These wholesale dealers in turn sell to licensed retail outlets, bars, taverns, and restaurants. For the control or monopoly states the state commissions sell the spirits to state-owned package stores[1/] or to bars, taverns or restaurants.

In addition to the above classifications several individual states maintain a variety of restrictions as to how alcoholic beverages can be sold. These restrictions may apply to the package sale of spirits or to the sale of liquor-by-the-drink, in bars, taverns, or restaurants.

Thus, the distilleries must operate in markets where they must be competitive as well as meet requirements imposed by individual states and counties. Furthermore, distilleries must rely on their own national advertising or advertising by distributors or retail outlets (where permitted) to promote the purchase of their particular brands. Therefore, the distilleries are somewhat limited as to what they can do to actively seek additional purchases of their brands.

Finally, it should also be noted that many distilleries export relatively large quantities of their products to foreign markets and subsequently must also maintain competitiveness in these markets.

B. Price Trends

The prices of distilled spirits have remained relatively stable in recent years with the wholesale price index for straight bourbon whiskey increasing only 2.0 percent from 1970 to 1974 and the index for blend whiskey spirit increasing by only 5.7 percent for the same period (Table IV-3). This stable trend has been somewhat surprising considering the wholesale price index for corn (principle raw material for grain spirits increased by 162.1 percent.

1/ In North Carolina, country-owned stores; in Wyoming and Mississippi, licensed package stores; in Michigan and West Virginia, designated distributors.

Table IV-3. The distilled spirits industry, wholesale price index for selected products

	Whiskey, Straight Bourbon	Whiskey, Spirit Blend	Corn, No. 2, Chicago
	----------1976 = 100--------		
1970	101.6	105.1	105.4
1971	101.6	108.1	107.8
1972	101.9	106.9	100.8
1973	103.6	108.0	172.3
1974	103.6	111.1	248.0
January	103.6	108.0	225.3
February	103.6	108.0	234.8
March	103.6	108.0	231.9
April	103.6	108.0	204.8
May	103.6	108.0	208.2
June	103.6	108.0	222.5
July	103.6	108.0	245.6
August	103.6	114.3	290.2
September	103.6	115.3	269.6
October	103.6	115.3	291.2
November	103.6	116.3	275.2
December	103.6	116.3	276.3

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

One practice distillers have utilized in maintaining these constant prices has been that of lowering the proof of the spirits usually from 86 to 80 proof. This allows distillers to produce a larger quantity of finished liquor from the aged spirits. Also the consumer trend for purchasing larger bottle sizes has undoubtedly been helpful in holding down the unit costs of the contents.

Finally, prices have been relatively stable as the Federal excise tax usually constitutes more than 50 percent of the average distillers' price to the wholesalers or state commission. Since the tax has not increased from $10.50 per tax gallon which was set in 1951, this eliminates better than 50 percent of the distiller's selling price from the usual reasons for price increases. Furthermore, consideration for the excise tax portion of the distillers price allows the distiller to increase his portion of the price with the resulting FOB price being raised by approximately one-half of the actual percentage increase.

Prices of distilled spirits do not always reflect the distillers costs. Often firms will produce more than one brand (label) of a particular product and price the brands differently to appeal to different consumer characteristics. Thus, some spirits are priced higher, not because they are decidedly more expensive to produce, but rather because at the higher price, the spirt may fall into a particular price category which may offer a greater sales potential.

As an example, utilizing a Midwestern state with state controlled retail prices, the price of one firm's lowest priced 6 year old, 86 proof blended whiskey is $4.37 per fifth. For the same firm, but a different label, their more expensive line costs $5.40 per fifth. For the same firm, vodka prices range from $4.12 to $4.52 per 80 proof fifth.

With this pricing mechanism, distillers are somewhat flexible in their determination of product prices, however, it should be noted that this flexibility is highly influenced by the competitive environment in which the distiller must operate.

V. EFFLUENT CONTROL COSTS

The effluent control system requirements and costs depicted in this chapter were provided by the Effluent Guidelines Division of the Environmental Protection Agency as provided by the technical contractor, Environmental Science Engineering. The recommended and optional treatment alternatives for the model distilled spirits plants were the same as presented in the Development Document 1/. However, the associated investment and annual costs have been revised by the technical contractor to reflect the model plants' production characteristics previously described in Chapter III.

A. Pollution Control Requirements

Three effluent control levels for point source categories (direct dischargers) were orginally considered:

BPT - Best Practicable Control Technology Currently Available, to be achieved by July, 1977.

BAT - Best Available Control Technology Economically Achievable, to be achieved by July, 1983.

NSPS - New Source Performance Standards are recommended to be equal to the BAT control level and to apply to any source for which construction starts after the publication of the proposed regulations.

Raw waste loads for the existing and new source model distilleries are depicted in Table V-1. As can be seen in this table, the wasteloads for the distillery models vary between model sizes.

The recommended effluent limitation guidelines for the model distilled spirits plants as proposed in the Development Document are shown in Table V-2.

1/ Development Document for Effluent Limitation Guidelines and New Source Performance Standards, Miscellaneous Foods and Beverages, Point Source Category, Draft Report prepared by Environmental Science and Engineering, Inc. for the U.S. Environmental Protection Agency.

Table V-1. Raw waste loads for model distilled spirits plants

Model	Production	Flow	BOD	SS	FOG
	Bu./day	Gal./day	mg/l	mg/l	mg/l
Grain Distilleries					
Small	1,000	12,000	210	160	N.A.
Medium	5,000	219,000	902	648	N.A.
Large	15,000	650,000	930	650	N.A.

Source: Effluent Guidelines Division, Environmental Protection Agency.

Table V-2. Recommended effluent limitation guidelines for the Distilled Spirits Industry

Models	BOD		SS	
	Max. 30 Day Ave.	Max. Day	Max. 30 Day Ave.	Max. Day
Grain Distillers	----------Kg/KKg Grain Mashed----------			
Small				
BPT	0.054	0.140	0.072	0.180
BAT	0.027	0.062	0.036	0.090
Medium				
BPT	0.260	0.650	0.320	0.800
BAT	0.130	0.320	0.160	0.400
NSPS	0.130	0.320	0.160	0.400
Large				
BPT	0.260	0.650	0.320	0.800
BAT	0.130	0.320	0.160	0.400
NSPS	0.130	0.320	0.160	0.400

B. Discharge Status of the Industry

The discharge status of the Distilled Spirits Industry as furnished by the EPA is shown below.

Currently, there are 18 grain distilleries which are known to be presently discharging effluent to navigable waters. Of the 18 grain distilleries, all have some form of treatment in place, 12 meet the proposed BPT standards and one meets the proposed BAT standards. The treatment systems of the 12 distilleries meeting BPT include:

- 2 distilleries with trickling filters and clarifiers
- 4 distilleries with aerated lagoons and stabilizing ponds
- 5 distilleries with activated sludge systems
- 1 distillery with rotating biological discs.

The distillery presently meeting BAT standards utilizes spray irrigation system and the 5 remaining grain distilleries, those which do not meet BPT standards but do have some form of treatment, all presently utilize aerated lagoon treatment systems.

Also there are two molasses distilleries in operation in the United States which are direct dischargers. Both were determined by the EPA to meet the proposed standards. Therefore no control costs or impact analyses are included in this report.

C. Pollution Control Costs

The cost estimates, in 1972 dollars, and the components of the recommended and optional (if considered desirable) treatment alternatives for the model plants are shown in Tables V-5 through Table V-9. From the information provided, total investment and annual costs were inflated so as to be consistent with the costs associated with the models. Investment and annual costs were inflated from 1972 to 1974 dollars by the use of the Engineering News Record Construction Cost Index (1.205 times the provided EPA costs). The resulting treatment costs in 1974 dollars for both the recommended and optional treatment alternatives are summarized in Table V-3.

Investment costs include costs for construction, land, engineering and a contingency fee. Annual operating costs include expenditures for labor, power, chemicals, maintenance and supplies. Total yearly costs include annual operating costs, depreciation and interest. Depreciation was based on a 20 year depreciable life for the pollution controls. Interest was based on a 10 percent rate which was then computed as 10 percent of one-half the total pollution control investment costs.

Total investment costs for pollution controls expressed as a percent of book value of the model distilled spirits plants fixed assets and the total annual costs expressed as a percent of annual sales are depicted in Table V-4.

Table V-3. Effluent control costs for model distilleries (1974 dollars)

Model	Treatment Alternative	BPT Investment Costs	BPT Annual Operating Costs	BPT Total Yearly Costs	Incremental BAT Investment Costs	Incremental BAT Annual Operating Costs	Incremental BAT Total Yearly Costs	NSPS Investment Costs	NSPS Annual Operating Costs	NSPS Total Yearly Costs
		$1,000								
Grain Distillers										
Small	Rec	149	17	32	18	3	5	--	--	--
	Opt	--	--	--	--	--	--	--	--	--
Medium	Rec	564	99	155	35	5	9	599	104	164
	Opt	648	208	273	35	6	10	683	214	282
Large	Rec	1,011	179	280	54	8	13	1,065	187	293
	Opt	1,484	594	742	54	8	13	1,538	602	755

Table V-4. Investment and total yearly costs expressed as a percent of model plants' book investments and annual sales

Model	Treatment Alternative	BPT Total Investment as % of Book Value	BPT Total Yearly Costs as % of Annual Sales	BAT Total Investment as % of Book Value	BAT Total Yearly Costs as % of Annual Sales	NSPS Total Investment as % of Book Value	NSPS Total Yearly Costs as % of Annual Sales
		(%)					
Grain Distillers							
Small	Rec	32.0	1.5	35.9	1.7	--	--
	Opt	--	--	--	--	--	--
Medium	Rec	25.1	1.0	26.6	1.1	9.6	0.9
	Opt	28.8	1.8	30.4	1.8	10.9	1.5
Large	Rec	16.2	0.5	17.0	0.5	6.3	0.5
	Opt	23.7	1.3	24.6	1.4	9.1	1.4

Table V-5. Itemized cost summary for distilled spirits (small grain) alternative A23-II (BPCTCA) and alternative A23-III (BATEA)

	BPT	BAT
Investment Costs		
Construction	97,630	110,140
Land	2,780	2,780
Engineering	9,760	11,010
Contingency	9,760	11,010
PVC Liner	3,500	3,500
Total	123,430	138,440
Yearly Operating Costs		
Labor	6,250	6,250
Power	3,010	4,250
Chemicals	30	30
Maintenance & Supplies	4,580	6,450
PVC Liner	30	30
Total	13,900	17,010
Total Yearly Costs		
Yearly Operating Cost	13,900	17,010
Yearly Investment Cost Recovery	4,940	5,540
Depreciation	6,030	6,780
Total	24,870	29,330

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 85.7 percent BOD reduction.

Treatment Modules:

BPT
B...Pumping Station
H...Nitrogen Addition
I...Phosphorus Addition
L...Aerated Lagoon

BAT
B...Pumping Station
H...Nitrogen Addition
I...Phosphorus Addition
L...Aerated Lagoon
N...Dual Media Pressure Filtra'n

Table V-6. Itemized cost summary for distilleries (grain) (medium and large) alternative A22-VI (BPCTCA)

	Medium	Large
Investment Costs		
Construction	362,200	660,510
Land	33,820	46,650
Engineering	36,220	66,050
Contingency	36,220	66,050
Total	468,460	839,260
Yearly Operating Costs		
Labor	37,480	37,480
Power	29,190	83,060
Chemicals	5,230	12,700
Maintenance & Supplies	9,860	15,130
Total	81,760	148,370
Total Yearly Costs		
Yearly Operating Cost	81,760	148,370
Yearly Investment Cost Recovery	18,740	33,570
Depreciation	21,730	39,630
Total	122,230	221,570

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 95.7 percent BOD reduction.

Treatment Modules:

B1..Control House
B...Pumping Station
C...Equalization Basin
H...Nitrogen Addition
I...Phosphorus Addition
K...Activated Sludge
Q...Sludge Thickener
R...Aerobic Digestor
S...Vacuum Filtration
Y...Holding Tank

Table V-7. Itemized cost summary for distilleries (grain) (medium and large) alternative A22-II (BPCTCA-option)

	Medium	Large
Investment Costs		
Construction	431,670	983,780
Land	6,100	12,990
Engineering	43,170	98,380
Contingency	43,170	98,380
PVC Liner	13,530	37,790
Total	537,640	1,231,320
Yearly Operating Costs		
Labor	12,490	12,490
Power	142,690	433,320
Chemicals	2,420	6,950
Maintenance & Supplies	14,390	38,420
PVC Liner	540	1,590
Total	172,530	492,770
Total Yearly Costs		
Yearly Operating Cost	172,530	492,770
Yearly Investment Cost Recovery	21,510	49,250
Depreciation	26,580	60,920
Total	220,620	602,940

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 95.7 percent BOD reduction.

Treatment Modules:

B1..Control House
B...Pumping Station
C...Equalization Basin
H...Nitrogen Addition
I...Phosphorus Addition
L...Aerated Lagoon

Table V-8. Itemized cost summary for distilleries (Grain) alternative A22-VIII (BATEA/NSPS)

	Medium	Large
Investment Costs		
Construction	386,310	697,970
Land	33,820	46,650
Engineering	38,630	69,800
Contingency	38,630	69,800
Total	497,390	884,220
Yearly Operating Costs		
Labor	37,480	37,480
Power	33,480	88,880
Chemicals	5,230	12,700
Maintenance & Supplies	10,240	15,750
Total	86,430	154,810
Total Yearly Costs		
Yearly Operating Cost	86,430	154,810
Yearly Investment Cost Recovery	19,900	35,370
Depreciation	23,180	41,880
Total	129,510	232,060

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 97.8 percent BOD reduction.

Treatment Modules:

B1..Control House
B...Pumping Station
C...Equalization Basin
H...Nitrogen Addition
I...Phosphorus Addition
K...Activated Sludge
G...Sludge Thickener
R...Aeorbic Digestor
S...Vacuum Filtration
Y...Holding Tank
N...Dual Media Pressure Filtration

Table V-9. Itemized cost summary for distilleries (Grain) alternative A22-III (BATEA/NSPS-option)

	Medium	Large
Investment Costs		
Construction	455,780	1,021,230
Land	6,100	12,990
Engineering	45,580	102,120
Contingency	45,580	102,120
PVC Liner	13,530	37,790
Total	566,570	1,276,250
Yearly Operating Costs		
Labor	12,490	12,490
Power	146,980	439,140
Chemicals	2,420	6,950
Maintenance & Supplies	14,760	39,040
PVC Liner	540	1,590
Total	177,190	499,210
Total Yearly Costs		
Yearly Operating Cost	177,190	499,210
Yearly Investment Cost Recovery	22,660	51,050
Depreciation	28,020	63,160
Total	227,870	613,420

Source: Effluent Guidelines Division, Environmental Protection Agency.

Itemized cost summary for waste water treatment chain design efficiency... 97.8 percent BOD reduction.

Treatment Modules:

B1..Control House
B...Pumping Station
C...Equalization Basin
H...Nitrogen Addition
I...Phosphorus Addition
U...Aerated Lagoon
N...Dual Media Pressure Filtration

VI. ECONOMIC IMPACT ANALYSIS

The imposition of effluent controls on the Distilled Spirits Industry will have, to some degree, both direct and indirect impacts on the industry, on consumers, on its suppliers and on communities in which impacted distilleries are located. An analysis was made of the grain distilleries for specific effluent control levels, in both quantitative and qualitative terms, of the impacts which are expected.

The following types of impacts have been analyzed:

A. Price effects
B. Financial effects
C. Production effects
D. Employment and community effects
E. Other effects

The resultant industry impacts discussed herein are concerned with those existing distilleries which presently discharge wastewaters to navigable waters and those distilleries which are yet to be constructed and who will discharge effluent wastes directly to navigable waters (hereafter referred to as new source distilleries). Currently, there are 18 grain distilleries which are known to be presently discharging effluent to navigable waters. Of the 18 grain distilleries, all have some form of treatment in place, 12 meet the proposed BPT standards and one meets the proposed BAT standards. The treatment systems of the 12 distilleries meeting BPT include:

- 2 distilleries with trickling filters and clarifiers
- 4 distilleries with aerated lagoons and stabilizing ponds
- 5 distilleries with activated sludge systems
- 1 distillery with rotating biological discs.

Thus the imposition of effluent controls on these distilleries will require the installation of additional treatment equipment such that they can meet proposed BAT standards.

The distillery presently meeting BAT standards utilizes a spray irrigation system and is considered not to incur additional expenses due to the imposition of effluent controls.

The 5 remaining grain distilleries, those which do not meet BPT standards but do have some form of treatment, all presently utilize aerated lagoon treatment systems. These distilleries will incur expenses to upgrade their systems to meet proposed BPT standards as well as additional expenses to meet BAT standards.

With regard to the sizes of the above described grain distilleries, of the 5 not meeting BPT standards, 3 are considered to correspond to the medium model and 2 to the small model. The sizes of the distilleries meeting BPT but not the BAT standards inclue 8 distilleries which correspond to the small model and 4 distilleries which correspond to the medium model.

There are also two molasses distilleries located in the U.S. that are known to be direct dischargers. These operations presently meet standards and thus were not considered in this impact chapter.

Thus, this impact analysis will address the potential impacts resulting from the imposition of effluent controls on existing grain distilleries which already have part of the required treatment systems in place and on new source distilleries. These impacts are analyzed for the model grain distilleries described in Chapter III, with the impacts being based on the production and financial characteristics of the models and the effluent control costs as presented in Chapter V.

It should be noted that in Chapter V, two sets of control costs were described for each model; the recommended treatment system and an optional system. For purposes of this impact analysis, only the recommended treatment system will be utilized, with the optional systems' costs being furnished only for informational purposes.

A. Price Effects

1. Required Price Increases

An implicit indicator of the expected price effects of effluent controls used in this report is the amount of sales price increase necessary to maintain a distillery's profitability, after effluent control expenditures, at the same level as the distillery without the control expense. The method of computation was described in Part I, Chapter II (Methodology), Section F, under subsection 2 of this report. The ability of distilleries to pass on such price increases is evaluated in this section of the report.

The amounts of sale price increases necessary to offset estimated effluent control costs for the model distilleries range from 0.6 percent to 2.2 percent and are shown in Table VI-1. For the existing model distilleries, both the required price increases for BPT and BAT are shown. However, it should be noted, these figures reflect the required price increases necessary to offset control costs for a distillery without any of the required equipment already in place. As all the known direct discharging grain distilleries already have some form of treatment in place, they would not required the full amount of the price increases depicted in Table VI-1. To determine what the actual required price increases would be for these distilleries would require a case by case analysis and unfortunately this was not possible due to the limited data available concerning these distilleries. Accordingly the price increases depicted in Table VI-1 will be used. However the use of these increases will be qualified to indicate that they represent distilleries with no controls already in place.

Finally, also shown in Table VI-1, for the new source distilleries, are the required price increases necessary to offset the costs of the NSPS standards.

Table VI-1. The Distilled Spirits Industry, required price increases necessary to offset effluent control costs

Model	Daily Capacity	Required Price Increase -20	Estimate	+20
		--------(percent)		------
Existing Grain Distilleries	Bu. Milled			
Small	1,000			
BPT		1.6	2.0	2.4
BAT		1.7	2.2	2.7
Medium	5,000			
BPT		1.0	1.3	1.5
BAT		1.1	1.3	1.6
Large	15,000			
BPT		0.5	0.6	0.8
BAT		0.5	0.7	0.8
New Source Grain Distilleries				
Medium	5,000	0.9	1.1	1.4
Large	15,000	0.5	0.7	0.8

2. Expected Price Increases

While Table VI-1 illustrates what the model distilleries would require to offset expenditures for effluent controls, it is doubtful those distilleries which require additional controls would be able to pass on the additional expense to customers in the form of higher prices. This is due to (1) the discharge status of the Distilled Spirits Industry and (2) the competitive and market characteristics of the industry.

As discussed earlier, of the 60 grain distilleries authorized to operate, only 18 discharge their effluent to other than municipal treatment facilities. Furthermore of these 18 direct dischargers, 12 already meet the proposed BPT standards and one distillery already meets the BAT standards. The 5 grain distilleries not meeting BPT standards already have aerated lagoons in place and thus while these facilities will require some additional expense to meet the BPT standards, it will not be the same magnitude as indicated in Table VI-1. The 42 grain distilleries which discharge their wastewaters to municipal systems are not expected to incur any additional costs due to the imposition of BPT or BAT standards, however, it is realized that these distilleries have incurred and are expected to continue to incure, increases in their user charges for municipal treatment. Thus, due to the limited industry-wide impact of effluent controls, it is doubtful that direct discharging grain distilleries will be able to pass on required price increases in excess of an equivalent to the general level of increases in the municipal charges experienced by the remainder of the industry.

However, should municipal charges become higher than private treatment costs, then impacted and new source distilleries would have a competitive advantage and have the opportunity to pass on increased costs of effluent controls assuming the industry as a whole increases prices to affect the increased municipal charges. Although not quantifiable at this time, some industry sources feel that this situation could happen in the future.

The market characteristics of the Distilled Spirits Industry may provide some opportunities for impacted and new source distilleries to pass on effluent control costs but these will be limited to those distilleries which by location or production efficiency can establish a competitive advantage over other distilleries. In other words, a new source or impacted distillery which can produce and/or deliver its distilled spirits for lower prices than its competitors, may be able to utilize its greater margin to absorb control costs and still remain competitive. As shown below in Section B, Financial Effects, the costs of new source construction are partially offset by lower operating costs through improved technology which results in new point sources having slightly higher income ratios than other existing distilleries; thus, these operations may be able to absorb the costs of controls.

However, for those impacted distilleries which cannot achieve a competitive advantage, it is probable that such distilleries will not be able to pass on the required price increases because of the generally high competition, low profit margin and excess capacity of the industry, and too, for the new source distilleries, the high costs of new construction. As discussed in earlier chapters of this report, the Distilled Spirits Industry has experienced relatively low profit margin and has excess capacity as evidenced by distilleries operating only part of the year and plant closures relative to an increasing output (increasing population and per capita consumption).

Therefore price increases by impacted distilleries to offset the costs of effluent controls are not expected to occur. In the following analysis, no price change was assumed to occur as a result of the entire industry increasing prices to offset effluent controls and accordingly, the economic viability of the distilleries are based on financial characteristics of the models without added revenue stemming from aggregated effluent control effects on industry prices.

B. Financial Effects

Based on model distillery profiles described previously and costs of pollution control provided by EPA, the following financial indicators were computed under baseline (without pollution controls) and with pollution controls:

1. After tax income
2. After-tax return on sales
3. After tax return on invested capital
4. Cash flow and cash flow as a percent of invested capital
5. Net present value

The above were computed according to the discounted cash flow (DCF) and return on investment (ROI) procedures outlined in the methodology.

Furthermore a sensitivity analysis was performed using pollution control cost estimates at levels of 80 percent and 120 percent of the costs provided by EPA.

The results of the model distillery analysis of the proposed effluent guidelines are summarized in Table VI-2 for the existing grain models and Table VI-3 for the new source grain distillery models. These results are discussed below. It should be noted that the impacts depicted below reflect the effects of distilleries having to install controls assuming they have no controls already in place. As all known direct discharging grain distilleries have some form of controls already in place, the actual industry impacts will no doubt be less severe than those depicted below.

Table VI-2. Key values of impact analysis for model grain distilleries: BPT and BAT

Key Value	Model Size	Baseline Case	Percent of Proposed Control Costs					
			BPT			BAT		
			80	100	120	80	100	120
			(percent)					
After Tax Income ($000)	S	21	3	-3	-9	0	-8	-15
	M	547	482	466	450	479	462	444
	L	2,552	2,435	2,405	2,376	2,429	2,399	2,368
After Tax Return on Sales (%)	S	1.0	0.1	-0.1	-0.4	0.0	-0.4	-0.7
	M	3.5	3.1	3.0	2.9	3.1	3.0	2.9
	L	4.6	4.4	4.3	4.3	4.4	4.3	4.2
After Tax Return on Invested Capital (%)	S	2.7	0.3	-0.3	-1.0	0.0	-0.9	-1.7
	M	11.7	9.8	9.4	9.0	9.7	9.3	8.8
	L	17.7	16.4	16.1	15.8	16.4	16.0	15.7
Estimated Cash Flow ($000)	S	49	36	32	27	34	28	23
	M	682	640	629	619	638	627	615
	L	2,943	2,867	2,848	2,829	2,863	2,843	2,823
Cash Flow as a Percent of Invested Capital	S	6.1	4.5	4.0	3.4	4.2	3.5	2.8
	M	14.5	13.6	13.4	13.2	13.6	13.4	13.1
	L	20.4	19.9	19.7	19.6	19.8	19.7	19.6
Net Present Values ($000)	S	-50	-213	-254	-304	-227	-275	-332
	M	3,793	3,034	2,845	2,655	3,009	2,814	2,618
	L	20,407	19,044	18,703	18,362	19,002	18,651	18,300

Table VI-3. Key values of impact analysis for new source model grain distilleries: NSPS

Key Value	Model Size	Baseline Case	Percent of Proposed Control Costs 80	100	120
			(percent)		
After Tax Income ($000)	M	906	838	821	804
	L	2,822	2,700	2,669	2,639
After Tax Return on Sales (%)	M	4.9	4.5	4.4	4.3
	L	5.1	4.8	4.8	4.7
After Tax Return on Invested Capital (%)	M	9.9	8.9	8.7	8.4
	L	11.3	10.6	10.4	10.3
Estimated Cash Flow ($000)	M	1,344	1,299	1,288	1,277
	L	4,003	3,923	3,903	3,883
Cash Flow as Percent of Invested Capital	M	14.6	14.2	14.0	13.9
	L	16.0	15.7	15.6	15.5
Net Present Values ($000)	M	1,854	1,054	854	654
	L	8,844	7,413	7,055	6,697

1. After Tax Income

As shown in Table VI-2, the imposition of BPT standards on the small grain distillery without any controls already in place reduces the after tax income from $21,000 in the baseline case to -$3,000 after the installation of the controls. The after tax income of the existing medium grain distillery is reduced by $81,000 and the existing large grain distillery by $147,000. As stated previously, since grain distilleries already have some controls in place, it is probable that the actual after tax incomes will not be decreased by the magnitude indicated above. Thus it is possible the small grain distillery, after the imposition of controls, will be able to maintain a positive after tax income.

BAT standards further depress the profits of the distillery models. However, the relative significances of these additional reductions are nominal compared to those incurred by BPT standards.

The imposition of NSPS on new source distilleries effect after tax income in that the standards reduce the medium new source grain distillery model's profits by 9.4 percent and the large new source grain distillery model's profits by 5.4 percent (Table VI-3).

2. Return on Sales

The after tax return on sales for the existing distilleries were also shown in Table VI-2 for the grain models. Basically the returns follow the same general pattern as after tax income. As was explained in Chapter II, Financial Profile, the Distilled Spirits Industry has experienced a deterioration in earnings during recent years. This deterioration is exemplified in that the baseline model distilleries' after tax returns on sales are relatively low. The imposition of BPT standards with the following BAT standards contribute to a further deterioration of returns. This is especially evident for the small grain distillery.

The NSPS do not significantly effect the after tax return on sales of the new source grain models as the medium new source model's return decreases by 0.5 percent from 4.9 to 4.4 percent and the large new source model's return decreases by 0.3 percent from 5.1 to 4.8 percent (Table VI-3).

3. Return on Invested Capital

As shown in Tables VI-2 and VI-3 for the existing and new source grain distillery models, pre-controls after tax returns on invested capital range from 2.7 to 17.7 percent for the existing grain models and from 9.9 to 11.3 percent for the new source models. As is the trend for most food or beverage related industries, the return on invested capital is substantially lower for the small distilleries than for the larger operations.

After the imposition of BPT standards, the after tax returns on invested capital for the grain models decline by 1.6 to 3.0 percent with the most significant impact occurring on the small grain model. The additional requirements of BAT standards result in a further reduction in returns with the grain models declining by an additional 0.6, 0.1 and 0.1 percent for the small, medium and large models respectively.

For the new source model distilleries, the imposition of NSPS results in a reduction of the medium new source grain model's return by 1.2 percent and 0.9 percent for the large new source grain model.

4. Cash Flow

Estimated cash flows (after tax income plus depreciation on total invested capital for the model distilleries) are shown in Table VI-2 for the existing models and Table VI-3 for the new source models. In the baseline case, cash flows range from 6.1 to 20.4 percent for the existing grain models. The new source baseline cash flows range from 14.4 to 16.0 percent for the new source medium and large grain models respectively. For the ranges, the higher percentages correspond to the larger operations and the lower percent to the small models.

After the imposition of BPT, BAT and NSPS guidelines, all cash flows remain positive. However, review of the model's after tax income reveals that the existing small and new source medium grain distillery models generate negative incomes. Thus, while all the model's cash flows are positive the small existing and medium new source grain models may not be able to remain operative.

5. Net Present Values

The computed net present values (NPV) for the model distilleries indicate in the baseline case, all the existing models, except the small distilleries as well as both new source grain models achieve positive NPV's. The small existing grain model generates a negative NPV. As discussed in Part I, Chapter II (Methodology), a negative net present value would cause most firms to cease operations or to scrap plans for building new distilleries. Since for the small existing distillery model its NPV is negative in the baseline case, it could be concluded that very few small distilleries would be in operation. However, it should be noted that a negative NPV indicate the associated distillery would earn less than the estimated 7.9 percent industry cost of capital. Thus such distilleries may remain in operation provided the firm has been well established in the industry, has expectation to capture a major market share at profitable prices and has an excellent financial performance record (e.g. lower cost of debt capital).

The imposition of BPT controls on the existing model distilleries result in all the models' NPV's being decreased, however, it should be noted, all existing models which maintained positive NPV's in the baseline case remain positive. The requirements to meet BAT standards result in further declines in the NPV's, but no changes in the signs of the values occur.

The NSPS guidelines, when imposed on the new source models, result in the models' NPV's to decline. The medium new source grain models' NPV is reduced by $1,000,000 after installation of NSPS controls from $1,854,000 to $854,000. The large new source grain model's NPV is reduced from $8,844,000 to $7,055,000 or a reduction of 20 percent.

C. Production Effects

BPT guideline requirements are not expected to significantly effect grain distilleries' production. This was based on the fact that all but 5 grain distilleries currently are capable of meeting the proposed BPT standards and that the 5 distilleries which do not meet the standards, all have aerated lagoons presently in place. Thus for the grain distilleries, only 5 operations will require expenditures to meet BPT and these will be limited to the expenses associated with establishing some form of equalization treatment. Accordingly, it is anticipated no plant closures will be incurred by the grain distilleries due to BPT requirements.

With regards to grain distilleries meeting the proposed BAT standards, it is also anticipated that no plant closures will occur. This determination is based on the fact that of the 17 grain distilleries which are not presently meeting BAT standards, all have some treatment currently in practice (12 meet BPT) and the incremental costs of achieving BAT levels from BPT levels are nominal, with the incremental annual costs ranging from $3,000 to $8,000 (See Table V-3 in the previous chapter).

The effects on new source grain distilleries of NSPS requirements, results in the new source distilleries returns being reduced. However, the size of these reductions are not of such magnitude that it could be anticipated that the NSPS requirements would restrict entry to the grain distillery industry. Accordingly, no production effects are projected.

D. Employment and Community Effects

The imposition of effluent controls on the grain distilling industry, is not expected to affect employment within the industry aside from creating a few job opportunities for persons to operate the treatment systems. Also the effects on grain distilleries' communities are expected to be negligible.

PART VI

SOFT DRINKS

PART VI: SIC 2086 THE SOFT DRINK INDUSTRY

I. INDUSTRY STRUCTURE

The Census of Manufactures defines the soft drink industry (SIC 2086) as those establishments primarily engaged in manufacturing soft drinks (nonalcoholic beverages) and carbonated waters. These consist mainly of independent franchised bottlers who purchase beverage bases, concentrate or syrup, and bottle soft drinks. Establishments primarily producing beverage bases, flavoring extracts and flavoring syrups are classified in SIC 2087 and are discussed in Part VII of this volume.

A. Characteristics of the Soft Drink Industry

The soft drink industry consists of a variety of types of firms and plant ownership ranging from family-owned, to corporations to divisions of larger comglomerates. As a result, information regarding the operating characteristics of soft drink firms and plants is closely held or else combined with operating statements of large corporations where meaningful segregation is not possible.

Information regarding the characteristics of the firms in this industry must accordingly be derived from traditional sources such as the Census of Manufactures and the published reports of the Internal Revenue Service. These sources do have their limitations; however, they do provide some insight as to the characteristics of firms in the soft drink industry. While limited data are available for 1975 for some of the characteristics, most data available in detail are reflective of 1972.

A more convenient, readily available, and in some cases a more meaningful summary is derived by segmenting the industry by plant characteristics rather than by firm characteristics. This approach is perhaps more meaningful in that operating decisions are usually based on individual plant data as opposed to firm data. As such the following sections will describe both the plant as well as the firm characteristics of the soft drink industry.

1. Number and Size of Firms and Plants

According to the Census of Manufactures in 1972, there were 2,273 firms in the soft drink bottling and/or canning industry operating some 2,687 individual establishments. Thus, the majority of the firms operate only one plant.

Considering that there were 3,400 establishments in 1967 with 3,057 firms it is evident that the multi-plant firms have increased their concentration and the independent single-plant operations have declined.

This trend is further evidenced when statistics from the National Soft Drink Association's 1973 State Soft Drink Profile are reviewed. According to the NSDA, in 1973 there were 2,468 soft drink plants with 1,585 of these plants being single plant firms. The remaining 883 plants were owned by 480 multi-plant firms. Thus, for 1973, 36 percent of all soft drink plants were owned by firms which operated more than one plant. Also, according to NSDA, there were 2,065 firms operating soft drink plants in 1973. This compares to 2,273 firms for 1972 as compiled by the Bureau of Census.

The majority of the soft drink bottlers leaving the industry are the smaller sized operations as can be seen in Table I-1. The percentage of establishments with less than 20 employees has decreased from 60.8 percent of all establishments in 1963 to 50.2 percent in 1967 and finally to 42.1 percent in 1972. Accordingly, the percentage of all establishments with more than 50 employees has increased from 12.7 percent in 1963 to nearly 27 percent in 1972.

The number of establishments engaged in bottling and/or canning of soft drinks has declined significantly in recent years. In 1958, the Census of Manufactures indicated 4,394 establishments comprised the soft drink industry; by 1972, this number had dropped 39 percent to 2,687 establishments. According to the National Soft Drink Association, the number of establishments has continued to decline with their 1973 estimate indicating 2,468 establishments and their 1975 estimate indicating 2,317 establishments in the industry.

The number of establishments by employment size group are depicted in Table I-1 for the years 1963, 1967 and 1972. Also shown in this table are the employment classes' respective value of shipments and the corresponding percentage of the totals. From this table, it becomes evident that while a majority of the establishments have less than 50 employees (87.3 percent in 1963 and 73.1 percent in 1972), the major portions of the industry's value of shipments are accounted for by those establishments with over 50 employees (56.0 percent in 1967 and 83.0 percent in 1972). Furthermore, the industry has been experiencing an exodus of the small sized establishments and an increase in the number of the larger sized plants. Part of this trend can be explained by the fact that some of the smaller establishments have expanded their operation, thus, resulting in their inclusion in a larger employment size group. However, in terms of actual numbers, those establishments with less than 50 employees declined by 1,443 plants between 1963 and 1972 while those establishments with more than 50 employees increased by only 225 plants.

Table I-1. The Soft Drink Industry by employment size group, number of establishments, and value of shipments, 1963-1972

Number of Employees	1963 Establishments Number	1963 Establishments Percent	1963 Value of Shipments Million Dollars	1963 Value of Shipments Percent	1967 Establishments Number	1967 Establishments Percent	1967 Value of Shipments Million Dollars	1967 Value of Shipments Percent	1972 Establishments Number	1972 Establishments Percent	1972 Value of Shipments Million Dollars	1972 Value of Shipments Percent
1-4	770	19.7	28.5	1.3	719	21.1	37.8	1.2	448	16.7	35.8	0.6
5-9	601	15.4	72.5	3.3	330	9.7	49.1	1.6	265	9.9	74.4	1.4
10-19	1,004	25.7	258.8	11.7	660	19.4	211.0	6.6	418	15.5	227.6	4.2
20-49	1,033	26.5	612.1	27.7	1,031	30.4	733.8	23.1	834	31.0	1,143.1	20.8
50-99	308	7.9	453.1	20.5	386	11.4	699.2	22.0	417	15.5	1,263.9	23.0
100-249	159	4.1	535.2	24.2	231	6.8	960.0	30.3	247	9.2	1,765.3	32.2
250 or more	30	0.7	250.5	11.3	43	1.2	482.2	15.2	58	2.2	976.2	17.8
TOTAL	3,905	100.0	2,210.9	100.0	3,400	100.0	3,173.2	100.0	2,687	100.0	5,486.4	100.0

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

2. Value of Shipments

Value of shipments and other receipts of the Bottled and Canned Soft Drink Industry in 1972 totaled $5,486.4 million. This includes shipments of bottled and canned soft drinks (primary products) valued at $4,657.4 million, shipments of other products (secondary products) valued at $81.1 million and miscellaneous receipts (mainly resales) of $747.9 million.

Estimates of the value of shipments for the Bottled and Canned Soft Drink Industry is expected to total $7.2 billion in 1975, 10 percent above estimated shipments of $6.5 billion in 1974, and 31 percent above the shipments in 1972. Historically, the value of shipments have increased by an average of 9.5 percent per year since 1958, from $1.5 billion in 1958 to an estimated $7.2 billion in 1975 (Table I-2).

Shipments of bottled and canned soft drinks (primary products) in 1972 represented 98 percent (specialization ratio) of the industry's total products shipments (primary and secondary products). The industry specialization ratio in 1967 was also 98 percent. Secondary products shipped by this industry in 1972 consisted mainly of flavoring extracts and syrups ($20 to $50 million), canned fruit and vegetables ($10.3 million) and metal cans ($10 to $20 million).

Shipments of bottled and canned soft drinks (primary products) from establishments classified in industry 2086 in 1972 represented 97 percent (coverage ratio) of these products valued at $4,807.2 million shipped by all industries. In 1967, the coverage ratio was 96 percent. Other industries shipping bottled and canned soft drinks consisted primarily of the fluid milk industry (SIC 2026); the flavoring extracts and syrups industry (SIC 2087); the fruit and vegetable canning industry (SIC 2033) and the frozen fruit and vegetable industry (SIC 2037).

3. Level of Integration

Soft drink bottlers could be considered to be integrated forward as most bottlers own and operate vending machines which sell the manufactured soft drinks. However, aside from their franchise arrangement with the national brands, most bottlers are not highly integrated backward. It should be noted, however, that several bottling and canning plants are owned by the national franchisers (formula owners) and these plants may be considered to have some backward integration.

Bottlers may also be integrated forward in that they serve as distributors within a geographic area. Bottlers usually also act as the supplier to other distributors who do not operate bottling facilities.

Table I-2. The Soft Drink Industry, value of shipments, 1958-1975

Year	Value of Shipments	Percentage Change
	(Million dollars)	(Percent)
1958	1,558	-
1959	1,714	10.0
1960	1,806	5.4
1961	1,911	5.8
1962	2,031	6.3
1963	2,211	8.9
1964	2,409	9.0
1965	2,505	4.0
1966	2,735	9.2
1967	3,173	16.0
1968	3,554	12.0
1969	4,064	14.4
1970	4,631	14.0
1971	5,047	9.0
1972	5,486	8.7
1973*	5,935	8.2
1974*	6,529	10.0
1975*	7,200	10.3

Source: Bureau of the Census, Bureau of Labor Statistics, BDC.

* Estimated.

4. Number of Products

The soft drink industry shipments of bottled and canned soft drinks represented 98 percent of the industries total shipments. Thus, the number of products handled by the typical bottler and/or canner are primarily limited to different varieties and sizes of soft drinks.

5. Level of Diversification

The Census of Manufactures shows the soft drink industry with a very high specialization ratio of 98 percent in 1972. As stated in the preceding section, this indicates that 98 percent of sales are in the primary SIC code. The typical production unit is not diversified because the processes and equipment are specialized and non-interchangeable and do not lend themselves to application to other products. Hence, most plants have confined production to a very limited range of products.

There are in existence some fruit or vegetable canning operations which contract with soft drink firms to can soft drinks during their off season. The number of these canners is not known, and it is doubtful if there are many.

6. Location of Plants

The locations of soft drink plants tend to be associated with concentrated population areas and warmer climate areas (Table I-3). Furthermore, it is evident that for most states, plants tend to locate in cities where often there will be another soft drink plant. This can be interpreted to imply that plants within a state tend to concentrate in major cities of that state with the remaining plants probably dispersed throughout the state in a regionalized fashion.

7. Age of the Plants and Level of Technology

The level of technology is difficult to assess in the soft drink industry. Many of the plants are relatively old; but, throughout their useful life, new equipment has been added or used to replace that which is old or technologically obsolete. As a result, most plants in the industry represent a combination of old and new equipment. Generally, the newer equipment installed represents a higher level of technology than the old. However, in the short run, considerably fewer plants than in the past are expected to update their facilities in the face of obsolescence, inflation, recession, and added investments required by governmental regulatory bodies.

There are no known measures of ages of plants in the soft drink industry. However, for purposes of this report, it was assumed that the smaller operations tend to be older than the larger plants. This assumption is predicated upon the fact that according to IRS data, the percentage that accumulated depreciation represents of total depreciable assets decreases as the size of the firms increase (Table I-4). Thus, the larger soft drink plants have less depreciated assets than the smaller plants and as such can be assumed be have newer equipment and facilities.

Table I-3. Soft drink manufacturing industry statistics by state, 1973

State	Soft Drink Plants	Plants with Less than 50 Employees	Plants with 50-99 Employees	Plants with More than 100 Employees	Soft Drink Firms	Cities with Soft Drink Plants
Alabama	55	29	14	12	49	30
Alaska	4	3	0	1	4	3
Arizona	24	17	5	2	22	8
Arkansas	42	27	13	2	35	26
California	129	86	23	20	97	67
Colorado	32	25	3	4	28	14
Connecticut	44	37	4	3	42	30
Delaware	6	5	1	0	6	4
Florida	73	41	20	12	50	31
Georgia	79	53	15	11	52	51
Hawaii	13	10	0	3	11	5
Idaho	14	6	8	0	14	7
Illinois	82	56	14	12	71	46
Indiana	66	43	16	7	53	43
Iowa	29	12	12	5	28	18
Kansas	31	20	6	5	25	19
Kentucky	52	38	8	6	39	33
Louisiana	47	30	9	8	38	27
Maine	21	18	2	1	20	15
Maryland	37	23	8	6	31	20
Massachusetts	71	47	16	8	68	48
Michigan	66	46	8	12	59	39
Minnesota	50	38	7	5	35	32
Mississippi	48	30	14	4	42	34
Missouri	62	48	7	7	54	38
Montana	20	19	1	0	19	14
Nebraska	27	22	4	1	25	17
Nevada	11	10	1	0	11	5
New Hampshire	10	7	3	0	9	9
New Jersey	68	48	11	9	61	41
New Mexico	23	20	3	0	21	15
New York	152	107	30	15	120	75
North Carolina	88	49	25	14	64	45
North Dakota	11	11	0	0	9	9
Ohio	86	48	15	23	65	36
Oklahoma	43	32	6	5	36	24
Oregon	32	28	2	2	27	18
Pennsylvania	176	147	22	7	159	104
Rhode Island	14	13	1	0	14	7
South Carolina	40	28	10	8	36	30
South Dakota	10	8	2	0	9	7
Tennessee	63	42	12	9	50	33
Texas	164	103	41	20	137	86
Utah	21	18	2	1	19	10
Vermont	6	6	0	0	6	3
Virginia	53	24	13	16	40	30
Washington	29	20	6	3	28	16
West Virginia	38	27	10	1	33	24
Wisconsin	94	75	15	4	89	63
Wyoming	6	5	1	0	5	4
TOTALS	2,468	1,705	459	304	2,065	1,413

Source: National Soft Drink Association.

Table I-4. The soft drink industry, accumulated depreciation as a percent of total depreciable assets, by total asset size

Fiscal Year	Size of Total Assets ($1,000)										
	0-100	100-250	250-500	500-1,000	1,000-5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000 +
	Percent										
1968-69	66	59	55	60	52	41	46	44	--	--	40
1969-70	70	61	56	52	48	47	44	47	33	--	38
1970-71	68	63	57	50	51	47	47	45	46	--	38
1971-72	74	60	63	56	52	53	47	48	46	30	41
Average	69.5	60.7	57.7	54.5	50.7	47.0	46.0	46.0	41.7	30	39.2

Source: Dept. of the Treasury, Internal Revenue Service, Corporation Source Book of Statistics of Income.

8. Plant Efficiency

By the historic standards of the industry, productivity of the soft drink industry has increased steadily. Output per production worker has increased from 85.4 in 1960 (based on an index where 1967 = 100) to 141.4 in 1973. This can be interpreted to mean that the average output per production worker has increased by 65.6 percent in the last 13 years. This increase in output per worker is attributable to the industry trend for larger more highly automated operations which result in higher plant operating efficiency.

B. Employment Characteristics

Total employment in the soft drink industry has increased over 25 percent from 97,100 employees in 1958 to 121,800 employees in 1972 (Table I-5). Production workers represent approximately 40 percent of total employees, and during the above period increased in numbers from 39,500 to 45,900. The relatively low proportion of production workers in the industry is explained by the industry's high requirement for driver-salesmen who sell and distribute each operation's products and are not considered as production workers.

Overall, the productivity of the production workers has increased significantly since 1960. Since then, the output per production worker has more than doubled while the value of shipments per worker has tripled. Much of this increased productivity is attributable to technological advances, particularly the improvements in the operating speed of the bottling lines.

The soft drink production workers can be classified as semi-skilled. Much of the labor involves the monitoring of bottling equipment. Average hours worked by production worker have remained relatively stable and totaled 2,013 hours in 1972. Hourly wages have steadily increased and have doubled since 1960 to an hourly rate of $3.24 per hour in 1972. Corresponding to the wage increase, the value added per production employee also more than doubled.

According to the National Soft Drink Association, there were 123,427 employees in the soft drink industry in 1973. Broken down into state figures, the states with the higher number of employees are concentrated in the more densely populated states (Table I-6). The leading five states are: 1-Texas, 2-California, 3-Ohio, 4-New York, and 5-Pennsylvania.

Table I-5. The Soft Drink Industry, Employment Statistics 1958 to 1971[1/], 1972[2/]

Year	All Employees		Production Workers			Value of shipments per production worker	Man hours per Production worker	Wage per production worker Man-hour	Value added per production worker Man hour	Output per production worker[3/]
	No. (000)	Payroll ($ Mil.)	No. (000)	Man-Hrs. (Mil.)	Wages ($ Mil.)	($000)		($)	($)	(mil. 8 oz equiv.)
1958	97.1	405.6	39.5	80.0	131.4	39.5	2,025	1.64	10.78	-
1959	100.0	433.6	40.2	83.7	135.8	42.6	2,082	1.62	11.40	-
1960	103.3	465.5	41.1	89.4	144.3	43.9	2,175	1.61	11.25	.86
1961	104.1	485.4	40.9	89.5	149.2	46.7	2,188	1.67	11.85	.89
1962	105.4	515.3	41.4	92.9	158.3	49.1	2,244	1.70	12.14	.97
1963	106.9	537.7	40.9	86.9	164.7	54.1	2,125	1.90	14.20	1.06
1964	111.1	582.6	41.0	89.2	172.8	58.8	2,176	1.94	15.56	1.14
1965	113.9	614.4	42.1	90.1	182.7	59.5	2,140	2.03	15.24	1.20
1966	117.7	667.1	43.7	93.8	201.1	62.6	2,146	2.14	15.68	1.29
1967	123.3	726.7	46.6	95.3	219.3	68.1	2,045	2.30	17.62	1.27
1968	124.1	767.4	47.7	96.5	234.1	74.5	2,023	2.43	18.67	1.40
1969	128.5	833.5	49.3	97.8	257.4	82.4	1,984	2.63	19.86	1.42
1970	128.8	915.9	49.6	103.9	279.5	93.4	2,095	2.69	20.42	1.50
1971	121.1	959.4	45.9	94.2	282.0	110.0	2,052	2.99	23.59	1.75
1972	121.8	989.5	45.9	92.4	298.9	119.5	2,013	3.24	25.46	1.85

1/ Source: U.S. Department of Commerce, Annual Survey of Manufactures, 1971.

2/ Source: U.S. Department of Commerce, Census of Manufactures, 1972.

3/ Source: National Soft Drink Association, Statistical Profile, 1974.

Table I-6. The soft drink industry employment statistics by state, 1973

State	Total Employees	State	Total Employees
		----------Continued----------	
Alabama	3,129	Nebraska	803
Alaska	240	Nevada	120
Arizona	1,104	New Hampshire	393
Arkansas	1,946	New Jersey	2,483
California	7,613	New Mexico	693
Colorado	2,031	New York	6,405
Connecticut	1,421	North Carolina	5,412
Delaware	138	North Dakota	259
Florida	4,386	Ohio	6,595
Georgia	4,806	Oklahoma	2,255
Hawaii	569	Oregon	921
Idaho	298	Pennsylvania	5,660
Illinois	5,610	Rhode Island	381
Indiana	3,521	South Carolina	2,722
Iowa	1,556	South Dakota	322
Kansas	1,523	Tennessee	4,117
Kentucky	2,843	Texas	9,875
Louisiana	3,108	Utah	735
Maine	484	Vermont	155
Maryland	2,313	Virginia	3,841
Massachusetts	2,398	Washington	1,375
Michigan	4,460	West Virginia	1,405
Minnesota	2,217	Wisconsin	2,700
Mississippi	2,231	Wyoming	113
Missouri	3,341		
Montana	401	TOTAL	123,427

Source: National Soft Drink Association, State Profiles, 1973.

As can be seen below, the majority of the soft drink industry's employees are employed in medium to large size operations with those firms employing between 20 and 249 employees maintaining some 75 percent of the total number of employees.

1972--Soft Drink Industry Employment

Employment Size	All Employees	Percent of Total
1-4	800	0.7
5-9	1,800	1.5
10-19	6,000	4.9
20-49	26,300	21.6
50-99	28,200	23.1
100-249	37,000	30.4
250-499	15,600	12.8
500-2,499	6,100	5.0
TOTAL	121,800	100.0

C. Segment Proportions of Total Industry.

While the preceding sections of this chapter have been concerned with establishment data for the soft drink industry, concern also is warranted about the different types of soft drink establishments. Unfortunately, data are limited in this area and, as such, much of the following is based on discussion with industry contacts.

Soft drink operations can be classified in three different classifications. First, the traditional type of operation consists of plants which only bottle soft drinks for sale to their customers. Second, due to changing consumer demands, the above traditional plants may have been modified such that they are also able to can soft drinks. Finally, there are those operations which only can soft drinks. This last type of operation may can only its own brands or it may also do contract canning of other private label brands (typically local or regional brands). Furthermore, some soft drink canners may actually be a fruit and/or vegetable canner, who can soft drinks during the off season.

For purposes of this analysis, those operations which bottle soft drinks and those which both bottle and can soft drinks are considered to be very closely related in terms of operating characteristics. The primary differences being that the canning operation will require a separate production line and does not require the bottle wash. Typically, operations which do both bottling and canning will tend to be the larger more modern facilities.

The operations which only can are also determined to be the larger sized establishments and have been estimated to number 225 plants in 1973.

D. Significant Impacts on the Industry

Because of the structure and competitiveness of the soft drink industry, pollution abatement standards when imposed on plants discharging to surface waters and municipal sewers can have serious consequences on the industry itself. The magnitude of this impact will, of course, depend on the level of investment required to meet the specific standards. The smaller third--and to some extent the middle third--of the plants are expected to be seriously impacted. They may not be able to recover the cost of installing and operating abatement facilities unless they have access to lower cost facilities, expand or merge. The specific plant impacts will, of course, depend on many factors such as capital availability, size of plant, profitability of the plant, location and availability of low cost treatment strategies.

It is recognized that the impact of substantially increased user charges, now and in the future, to plants discharging to or planning to discharge to municipal sewers is extremely critical to the industry, local business communities and to consumers. However, the scope and the economic impacts in this report pertain to those plants directly discharging to navigable surface waters and plants that are constructed after the promulgation of the guidelines which will be direct dischargers.

1. Capacity of Low Cost Producers Relative to High Cost Producers

The capacity of low cost bottlers, discharging to municipal sewers and/or directly discharging relative to high cost bottlers in the same position is one of the more important factors in considering the impact of pollution abatement costs imposed upon the industry. In the soft drink industry, the largest fourth of the plants bottle approximately 73 percent of the total volume. The middle two-fourths of the plants bottle about 25 percent and the smallest-fourth bottle only 2 percent of the total. Due to economies of scale, the larger plants are already expected to have a definite cost advantage. The imposition of high pollution abatement costs on the smallest-fourth of the plants discharging directly and to a large extent the middle two-fourths, are expected to result in further disadvantages to these low volume plants. If these small plants are forced to shut down (unless low cost abatement procedures can be utilized), the low cost-high volume plants in the industry will most likely offset possible losses in production through expansion (acquisition) plant expansion and new construction, assuming firms can acquire the necessary capital.

1/ Environmental Protection Agency, Guidelines Division.

2. Factor Dislocation Within the Industry

Differential impacts from pollution abatement controls are expected within the soft drink industry, both in terms of type of firm and in the regional location of affected plants. The impacts expected and reasons for associated dislocations are discussed in the following.

a. Types of Firms and Location

As explained earlier, the soft drink industry is comprised of many firms (multi/single plant) differing in plant types (canning, bottling), size (rate per hour), capacity and utilization of capacity, level of technology (new/old) and other factors. Many of these factors were considered in the preliminary analyses and one of the most critical measures in terms of assessing a plant's ability to withstand the impact of internalized pollution abatement costs is its overall through-put size.

Marginal Firms - Within the soft drink industry, marginal firms are typically the "small" and single plant firms. This is particularly true in terms of a small firm's ability to financially withstand projected high capital investment requirements of pollution abatement measures. Such plants often simply lack the capacity to pay-out such investments (at the levels given). Many single plant firms also lack the capital-acquiring ability of larger multiplant firms.

Within this framework, marginal firms faced with the decision to either curtail employment or shutdown would most likely shut down. However, pollution abatement investment costs can be an incentive to expand production, not lower it, in order to lower per unit costs for those plants having or able to install self-contained disposal facilities. This, however, may be limited due to the firm's geographic market limitations.

Other plant closures of almost any size are expected to result where obsolescence together with rising operational and required regulatory capital needs cause total costs of operation to be so high, that continued operation is economically unfeasible. For single plant firm closures, unemployment and loss of market for local suppliers associated with the closing plant are also expected to result. For some closed plants that belong to multiplant firms, various proportions of production and employees will shift to other plants belonging to the firm; some unemployment, due to immobility will occur, with a corresponding loss of payroll and local business. Other closed plants that belong to multiplant firms may not be able to shift production and are expected to have the same effects as the single plant firm closures.

As previously mentioned, downward trends in the number of soft drink plants are occurring. Pollution abatement controls are expected to accelerate this downward trend in the number of firms in the industry.

Locational Impacts - Only general patterns of location of plants by size category have been assessed in this phase of the study, but from this alone, it is believed that slight regional differences in impact will occur following standard adoption of pollution abatement controls. It is recognized that differences from state to state in Water Quality Standards and the possibility of non-uniformity of enforcement within and between states is another important factor in the impact on soft drink plants. Even though this problem is recognized, the impact of regulatory variability is not included in this report, due to lack of quantitative or qualitative information.

3. Reasons for Dislocations

Reasons for the above type of firm and location-dependent expected dislocations within the industry have been generally described. A summary in terms of profitability and capital attainment is appropriate.

Profitability - Profitability of firms will be affected by pollution abatement measures, particularly for the smaller, inefficient and undercapitalized firms. While average incremental costs for pollution abatement may eventually be passed through to consumers, the smaller firms are expected to have much higher than average per unit costs of abatement and to drop out prior to any product price adjustments which may occur.

Economies of scale in pollution control are apparent to the relative disadvantage of smaller firms. As previously suggested, many of the plants discharging directly might be forced out of the industry. This would have a limited desirable impact on the remaining firms in that pollution control costs could be spread over a larger volume. Thus, the level of profitability of the surviving plants might be affected less on the average.

In-plant modifications and operational changes which will reduce effluent loads may or may not improve the profitability of those plants which can take advantage of them. In-plant modification costs and savings must be assessed and justified by individual plants.

Capital Availability - Capital within the soft drink industry is obtained primarily from commercial sources outside the industry and from the investment of profits. Additional capital requirements for financing pollution abatement measures will also principally be sought from such sources.

In this case, ability to obtain additional capital is expected to be determined by an individual firm's projections of net returns with an expanded investment program. Consequently, capital availability is expected to be directly related to profitability--and the smaller, inefficient plants will have difficulty raising the needed long and short term capital to stay in business. In this sense, inability to obtain capital will contribute to the shutting down of marginal processing plants.

Firms which are able to pass through incremental cost of pollution abatement costs and maintain positive profitability will be able to acquire capital for increasing capacity--plant expansion, acquisition, etc. Currently, pass throughs of rapidly increasing and larger-than-normal proportions of costs are difficult to expedite. Costs are rising rapidly and are disproportionately large due to a nearly simultaneous inflation of operational costs (labor, materials, raw material)with new investment requirements imposed by regulatory bodies (FEA, FDA, OSHA, EPA). These increased costs are difficult to pass through due to the recession wherein consumers are tending to resist any price increases through a lowering of consumption to basic needs. Thus, plans of expansion through acquired capital will tend to be carried-out to the degree incremental pollution abatement, energy, safety and inventory costs can be passed through to consumers.

The ability of firms to obtain capital will also depend on the state of the economy and the amount of money available for lending. With a large amount of available funds, many industries and firms will be encouraged to borrow funds. Competition for funds among industries is dependent upon the money supply and relative profitability of individual firms.

4. Narrowing the Study Scope

The preceding narrative attempted to describe an overall picture of the soft drink industry. In the remainder of this analysis, efforts will be made to concentrate on those plants which could be subject to potential impacts due to the imposition of effluent controls. This will be accomplished utilizing representative model plants to estimate impacts and extending these impacts by association to the wider spectrum of plants which correspond to the model plant.

II. FINANCIAL PROFILE OF THE INDUSTRY

Firms in the soft drink industry are primarily either family or closely held corporations or divisions or subsidiaries of large, often multi-operation firms. As a result, financial information relating to a single plant firm is difficult to obtain. However, by relating information available from a variety of sources, a picture of the soft drink industry can be attempted. Information used to develop financial profiles was integrated from several sources including the Census of Manufactures the Annual Survey of Manufactures, National Soft Drink Association and associated industry operation and financial statistics.

A. Sales

Total sales of the soft drink industry were estimated to be $7.8 billion in 1974 (Table II-1). This compares to $4.8 billion in 1970 and $1.7 billion in 1960. The increase in total sales has resulted from both an expansion of production facilities, an increase in per capita consumption, and an increase in the overall price level. During the past two decades, the total soft drink production has increased from 1.18 billion 192-ounce cases in 1954 to 3.80 billion cases in 1974, an increase of over 200 percent.

The 1972 Census of Manufactures estimate of the value of shipments for the soft drink industry (SIC 2086) was $5,486.4 million for 2,687 plants. This gives the shipments for the average plant to be $2,041,830. This compares to $933,290 in 1967 (Table II-2). Utilizing data from the National Soft Drink Association, shipments for the average plant were $2,521,520 in 1973.

While the average plant had sales of over $2.0 million in 1972 with 45 employees, the actual plants varied considerably in size. Actual plants ranged in size from small operations employing one to four employees with annual shipments of less than $80,000 to large operations employing over 500 employees with annual shipments of nearly $26.4 million.

B. Distribution of Sales Dollars

Distinct changes have occurred in the distribution of the sales dollar from 1967 to 1972. Some changes can be attributed to price effects, but some undoubtedly reflect the changes resulting from increased capital expenditures. The price of sugar, a major raw material input, has experienced significant increases in the past two years and while these increases are not reflected in the 1967 to 1972 period, it will undoubtedly

Table II-1. The soft drink industry, estimated annual sales, production and consumption, 1950-1974

Year	Total Value $ (Wholesale)	Total Cases (192 ounce)	Per Capita (8 oz. containers)
1950	876,532,600	1,001,751,474	158.0
1951	939,442,500	1,043,825,000	162.7
1952	1,019,295,000	1,132,550,000	174.0
1953	1,089,513,000	1,177,852,000	177.5
1954	1,166,605,000	1,176,674,000	174.2
1955	1,252,276,000	1,264,925,000	184.2
1956	1,308,000,000	1,321,214,000	188.9
1957	1,347,241,500	1,360,850,000	189.2
1958	1,427,463,500	1,359,489,000	186.4
1959	1,633,015,900	1,484,560,000	199.8
1960	1,698,025,600	1,476,544,000	192.0
1961	1,829,083,200	1,524,236,000	198.3
1962	2,001,016,800	1,667,514,000	213.4
1963	2,341,189,000	1,800,915,000	227.4
1964	2,533,167,000	1,948,590,000	242.9
1965	2,735,567,000	2,104,282,000	259.1
1966	3,175,980,000	2,352,587,000	287.0
1967	3,458,632,000	2,470,452,000	298.1
1968	4,165,552,000	2,777,035,000	331.6
1969	4,369,664,000	2,913,110,000	344.4
1970	4,799,784,000	3,096,635,000	362.8
1971	5,346,960,000	3,353,615,000	388.1
1972	5,683,820,000	3,541,417,000	406.4
1973	6,223,156,500	3,771,610,000	429.6
1974	7,827,131,000	3,798,011,000	429.4

Source: National Soft Drink Association, Survey of 1974 Sales.

Table II-2. The Soft Drink Industry, Value of Shipments, Value added, and employees 1967, 1972, and 1973

	1967		1972		1973	
	Industry Total	Per Establishment	Industry Total	Per Establishment	Industry Total	Per Establishment
Number of establishments	3,400	-	2,687	-	2,468	-
Value of Shipments	$3,173.2 million	$933,000	$5,486.4 million	$2,042,000	$6,223.1 million	$2,522,000
Value Added	$1,679.4 million	$494,000	$2,352.1 million	$ 875,000	$2,787.0 million	$1,129,000
Total employees	123,300	36	121,800	45	123,427	50

Source: Department of Commerce, Bureau of Census, Census of Manufactures, 1967 and 1972.

1973, National Soft Drink Association, 1973 U.S. Soft Drink Profiles.

contribute to a further redistribution of the raw materials portion of the sales dollar. Between 1967 and 1972, the costs of raw materials increased from $1,506.0 million to $3,146.0 million with a corresponding increase in the percentage of the sales dollar from 47.5 percent in 1967 to 57.3 percent in 1972.

The number of employees declined from 123,300 in 1967 to 121,800 in 1972. During this period, average annual wages increased from $5,893.76 in 1967 to $8,123.97 in 1972. However, during this period, industry payroll as a percent of sales declined from 22.9 percent in 1967 to 18.0 percent in 1972.

Other operating costs, taxes and profits declined from 29.6 percent of the sales dollar in 1967 to 24.7 percent in 1972. This distribution of the total sales dollar derived from the Census of Manufactures for 1967 and 1972 is shown below. Also shown, for informational purposes, are the similar data for 1973 derived from U.S. Soft Drink Profile, developed by the National Soft Drink Association.

Distribution of Sales Dollar (Percent)

	1967	1972	1973
Total Sales	100.0	100.0	100.0
Raw Materials	47.5	57.3	55.2
Payroll	22.9	18.0	15.8
Other operating costs, taxes and profits	29.6	24.7	29.0

C. Earnings

According to Standard and Poor's Industry Surveys, the soft drink industry has historically been categorized by strong growth in sales and earnings, and at rates superior to industry in general. The major factors of the industry: Coca-Cola Co., Coca-Cola Bottling Co. of New York; Dr. Pepper; Pepsico and Royal Crown Cola, have, as a group, boosted their sales by an average of 13 percent per year in the five years through 1973 and their earnings by an average rate of 12.5 percent per year. This compares with growth rates of 8 percent and 7.7 percent, respectively, for industry in general. Soft drink producers were also more profitable, returning $7.49 for $100 in sales while general industry returns were $5.98 for each $100 in sales1/.

1/ Standard and Poor's Industry Surveys, Soft Drinks - Current Analysis, February 27, 1975, Volume 143, No. 9, Section 1.

While the above data indicate a relatively good return for the major soft drink producers, when the industry on the whole is considered, the return on sales is respectable but, yet, not as good as indicated above. According to Internal Revenue Service data, the net profit before taxes has declined from 6.1 percent of net sales in fiscal year 1969 to 4.2 percent in fiscal year 1972 (Table II-3). This deterioration in recent years in soft drink profits has been reflective of increased costs associated with the shift from returnable bottles to the less profitable disposable containers. Also, the industry has experienced an increased competitive environment which, in turn, has increased outlays for advertising, increased freight charges, increased packaging charges, and in the more recent years, increased sugar costs.

Table II-3 also indicates the profits by the size of operation. As would be expected in a production line operation, the smaller operations reveal significantly lower returns than do the larger operations.

In a 1973 survey of soft drink bottlers, the National Soft Drink Association indicated that of the 83 responding plants, 10 percent reported a net operating loss and 7 percent reported net operating income over 15 percent of sales. The survey results are summarized below.

Net Operating Income (Percent of net sales)	Number of Reporting Units	Percent
Less than 0	8	10
0 - 3.99	16	19
4.00 - 6.99	23	28
7.00 - 10.99	18	22
11.00 - 14.99	12	14
15.00 or higher	6	7
	83	100.0

D. Ability to Finance New Investment

The ability of a firm to finance new investment for pollution abatement is a function of several critical financial and economic factors. In general terms, new capital must come from one or more of the following sources: (1) funds borrowed from outside sources; (2) equity capital generated through the sale of common or preferred stock; (3) internally generated funds--retained earnings and the stream of funds attributed to depreciation of fixed assets.

Table II-3. The Soft Drink Industry, Net profit before tax, by asset size, 1969-1972

Fiscal Year	Size of Assets ($000)							
	Under 100	100-500	500-1,000	1,000-5,000	5,000-10,000	10,000-25,000	25,000 and Over	Total
	Percent of Net Sales							
1968-69	-5.9	2.9	7.0	4.6	1.3	8.5	8.6	6.1
1969-70	-3.6	2.5	3.6	3.8	3.9	4.6	6.5	4.8
1970-71	2.4	3.6	2.9	2.8	4.1	4.4	5.8	4.5
1971-72	-3.0	1.6	3.1	2.9	4.2	6.3	5.3	4.2

Source: Dept. of Treasury, Internal Revenue Service, Source Book of Statistics of Income, Annual.

For each of the three major sources of new investment, the most critical set of factors is the financial condition of the individual firm. For debt financing, the firm's credit rating, earnings record over a period of years, stability of earnings, existing debt-equity ratio and the lenders' confidence in management will be major considerations. New equity funds through the sale of securities will depend upon the firm's future earnings as anticipated by investors, which in turn will reflect past earnings records. The firm's record, compared to others in its own industry and to firms in other similar industries, will be a major determinant of the ease with which new equity capital can be acquired. In the comparisons, the investor will probably look at the trend of earnings for the past five years.

Internally generated funds depend upon the margin of profitability and the cash flow from operations. Also, in publicly held corporations, stockholders must be willing to forego dividends in order to make earnings available for reinvestment.

The condition of the firm's industry and general economic conditions are also major considerations in attracting new capital. The industry will be compared to other similar industries (i.e., other processing industries) in terms of net profits on sales and on net worth, supply-demand relationships, trends in production and consumption, the state of technology, impact of government regulation, foreign trade and other significant variables. Declining or depressed industries are not good prospects for attracting new capital. At the same time, the overall condition of the domestic and international economy can influence capital markets. A firm is more likely to attract new capital during a boom period than during a recession. On the other hand, the cost of new capital will usually be higher during an expansionary period. Furthermore, the money markets play a determining role in new financing.

These general guidelines can be applied to the soft drink industry by looking at general economic data and industry performance over the recent past.

1. General Industry Situation

The soft drink industry has maintained a pre-tax profit on sales above 4 percent over the recent few years (Table II-3). While there has been a downward trend in the profit margins, it is believed that the strong consumer demand will help to stabilize the downward trend.

Total assets and liabilities of the industry are shown in Table II-4 for the years 1968-69 through 1971-72. From the table, it can be determined that the industry's fixed assets represent approximately 60 percent of all assets. Furthermore, it can be determined that of the total liabilities, long term debt represents approximately 21 percent, current liabilities represent 26 percent and net worth represents approximately 53 percent.

Table II-4. The Soft Drink Industry

	1968-69		1969-70		1970-71		1971-72	
	($ mil.)	%	($ mil.)	%	($ mil.)	%	($ mil.)	%
ASSETS								
Current Assets	1,313.8	40	1,540.2	40	1,527.0	37	1,766.7	38
Fixed Assets	1,980.1	60	2,315.2	60	2,598.0	63	2,889.3	62
Total Assets	3,293.9	100	3,855.4	100	4,125.0	100	4,656.0	100
LIABILITIES & EQUITY								
Long Term Debt	689.3	21	812.9	21	884.5	21	1,076.1	23
Current Liabilities	807.2	24	1,015.6	26	1,113.8	27	1,195.9	26
Net Worth	1,797.4	55	2,026.9	53	2,126.7	52	2,387.0	51
Total Liabilities & Equity	3,293.9	100	3,855.4	100	4,125.0	100	4,656.0	100

Source: Dept. of Treasury, Internal Revenue Series, Source Book of Statistics of Income, annual.

2. Expenditures for Plant and Equipment

New expenditures as reported by the Annual Survey of Manufactures and the Census have increased from $76.4 million in 1960 to $219.3 million in 1972. There were two drops in the increasing trend in 1968 and 1971; however, overall, the trend has been upward (Table II-5).

A closer look at the $219.3 million spent as capital expenditures in 1972 shows $36 million being spent for new structures and additions to plants, $171.9 million for new machinery and equipment, with the remaining $11.4 million being used to purchase used plants and equipment.

As depicted below, comparable data for 1967 reveal that the industry utilized a greater portion of its capital expenditures for new machinery and equipment and used plants and equipment and a smaller portion for new structures and additions to plants. This can be interpreted to suggest that the industry is moving more toward upgrading existing operations instead of building new facilities.

Expenditures for Plant and Equipment

	1967		1972	
	$ Million	Percent	$ Million	Percent
Total	175.1	100.0	219.3	100.0
New Structures & Additions to Plant	40.6	23.2	36.0	16.4
New Machinery & Equipment	127.5	72.8	171.9	78.4
Used Plant & Equipment	7.0	4.0	11.4	5.2

3. Capital Availability

In summary, it would appear that the industry has been able to maintain a reasonably profitable position during the past few years and has concentrated on up-dating the production facilities to reap the benefits of the obviously present economies-of-scales.

The soft drink industry is comprised of a variety of ownership arrangements with an increasing trend toward multi-plant firms. Many of the firms are divisions of large corporations being either a diversified corporation or a major soft drink company. Sources of capital for the divisions are usually internal while the single independent plant must often rely on outside sources.

Table II-5. The soft drink industry, capital expenditures 1960 through 1972

Year	Capital Expenditures ($ Million)
1960	76.4
1961	69.4
1962	81.4
1963	100.8
1964	110.8
1965	111.0
1966	151.1
1967	175.1
1968	139.9
1969	154.8
1970	185.1
1971	168.0
1972	219.3

Source: Dept. of Commerce, Bureau of the Census.

According to Standard and Poor's, the soft drink industry has historically been categorized by strong growth in sales and earnings, and at rates superior to industry in general 1/. Predicated on this, as well as the general financial soundness of the industry, it is doubtful that the acquisition of capital for purposes of pollution control should present any major problems for the vast majority of the industry.

E. Cost of Capital - After Tax

Return on invested capital is a fundamental notion in U.S. business. It provides both a measure of actual performance of a firm as well as expected performance. In this latter case, it is also called the cost of capital. The cost of capital is defined as the weighted average of the cost of each type of capital employed by the firm, in general terms equities and interest bearing liabilities. There is no methodology that yields the precise cost of capital, but it can be approximated within reasonbale bounds.

The cost of capital was determined for purposes of this analysis by estimating perforamnce measures of the industry. The weights of the two respective types of capital for the Soft Drink Industry were estimated at 44 percent debt and 56 percent equity. The cost of debt was assumed to be 10.0 percent. The cost of equity was determined from the ratio of earnings to net worth and estimated to be 9.3 percent.

To determine the weighted average cost of capital, it is necessary to adjust the before tax costs to after-tax costs (debt capital only in this case). This is accomplished by multiplying the costs by one minus the tax rate (assumed to be 48 percent). These computations are shown below and result in the estimated after-tax cost of capital being 9.3 percent.

Weighted Average After Tax Cost of Capital

Item	Weight	Before Tax Cost	Tax Rate	After Tax Cost	Weighted Cost
Debt	.44	10.0	48	5.2	2.3
Equity	.56	-	-	9.3	5.2
					7.5

1/ Standard and Poor's Industry Surveys, Soft Drinks - Current Analysis, February 27, 1975, Volume 143, No. 9, Section 1.

III. MODEL PLANTS

A. Types of Plants

Within the soft drink industry, there are basically three types of plants, those which bottle only, those which can only,and those which both bottle and can. While other variations of plant operations exist, such as syrup plants, it is believed that the above three classifications of plants are representative of most the industry.

The plant which bottles and/or cans soft drinks is ultimately concerned with combining treated water with finished syrup to form a final product. The finished syrup received in bulk will already have been flavored, colored, acidified and sweetened. The syrup is prepared from a proprietary formula at a franchise owner bulk syrup plant. In some cases, the form of the syrup will vary and for a few independent plants, raw materials may be purchased directly from members of the flavor and extract industry and mixed at the bottling facilities.

The processes involved are basically similar for either the bottling or canning lines. Both operations require the treatment of oncoming city water to condition it so that it meets the desired specifications. Both operations also utilize bulk storage tanks for the storage of syrup prior to its use in the mixing operation which takes place in separate mixing tanks. These tanks are cleaned between flavor changes and this generates a portion of the plant's waste water.

Three types of containers are associated with the package production of soft drinks and these are cans, non-returnable bottles and returnable bottles. The cans and non-returnable bottles are normally only rinsed with city water to eliminate particles that may have accumulated during storage. The returnable bottles may contain leftover materials and these are removed automatically in a bottle washer. These machines wash, clean, sterilize and rinse all returnable bottles. Also, though not specifically addressed, plants usually produce bulk soft drinks (pre-mix or post-mix) and these are packaged in returnable stainless steel pressurized cannisters which require washing when returned. Both washing processes are considered to be the major contributors to the plant's waste water load and contain the major portion of the plant's pollutants.

Finished syrup from the storage tanks or mixing tanks is then combined with treated water and is fed to the highly automated filler which feeds the soft drink into the container. In some cases, the syrup is first placed into the containers which are then filled with carbonated water. In either case, the container is immediately crowned or capped and is passed through a warm water rinse before inspection, possible labeling, casing and shipment or storage. Wastes from container filling result from

filler spillage, lost product associated with flavor changing (which requires line flushing) and corresponding clean-up. In a bottling line, there is little or no spillage associated with the filling. In a canning line, there is considerable more spillage during filling due to the speed of the line and the nature of the container.

The model plants utilized in this analysis are representative of those plants which only bottle soft drinks and those which both can and bottle soft drinks.

B. Sizes of Plants

The value of shipments of the soft drink industry in 1972 was $5,486.4 million according to the Census. This gives an average for the 2,687 establishments of $2,041,830. Using the average price of $1.64 per 192 fluid ounce case results in 1,245,000 cases of soft drinks per establishment in 1972.

The criteria for defining size of model plants is average annual production in terms of 192 ounce case equivalents. Four sizes of existing model soft drink plants were developed, small, medium, large and extra-large. The small, medium and most of the large plants were determined to process bottled soft drinks only. The remaining large and all of the extra-large plants were considered to both bottle and can soft drinks. Also developed were two additional models which will be used to represent new source plants; those which are yet to be constructed and will discharge directly. These two models correspond to the large and extra-large existing models. The annual production of the small plant was determined to be 105,000 cases, the medium plant 720,000 cases, the large plant 3,000,000 cases and the extra-large plant 11,000,000 cases. Other relevant information concerning the model plants are depicted below.

Model Plants

	Existing				New Source	
	Small	Medium	Large	X-Large	Large	X-Large
Annual Production (192 oz cases)(000)	105	720	3,000	11,000	3,000	11,000
Gross Sales ($1.70/case)(000)	$178.5	$1,224	$5,100	$18,700	$5,100	$18,700
Average Employees	4	26	98	374	79	289
No. of Corresponding Establishments	596	1,108	706	58	-	-

If the above model plant data are multiplied by the number of represented plants and summed, they provide some indication of how well the model plants, when aggregated, represent the industry. These computations are summarized below:

	Model Plant Data	National Soft Drink Association Data, 1973
Number of Employees	122,072	123,427
Number of Cases Produced (24-8 oz equivalents)	3,617,000,000	3,772,000,000
Gross Sales	$6,272,700,000	$6,223,000,000

The financial profiles for each of the model plants are shown in Table III-1.

C. Investment

The estimated book value and salvage value for each model plant are shown in Table III-2. In addition, current assets, current liabilities and net working capital are shown.

1. Book Value of Investment

The estimates of book value of assets were developed from Internal Revenue Service data obtained from their Corporation Source Book of Statistics of Income. The IRS data, classified by various sizes of total assets for the soft drink industry, enabled the model plants to be related to historical data for similarly sized firms. The actual estimates of book values were obtained by computing from the IRS data, a sales to book value of assets ratio and applying this to the predetermined model plant sales.

2. Salvage Value

The salvage value of soft drink plants will vary widely from plant to plant, depending upon the age of the plant and its condition, the age of the equipment and its condition, and the location of plant. In some instances, the salvage value of old, obsolete plants will be equal to site value plus the scrap value of the equipment. If the buildings are remodeled or refurbished for other uses such as a warehouse, the salvage value of the building may be considerably higher.

There is a market for used machinery and equipment, however, this is limited primarily to modification of present operating lines as virtually all new plants begin with all new equipment.

Since no data are available on actual salvage values for soft drink plants and only a limited market exists for used equipment, it is difficult to estimate the salvage value of a plant closed because of the added cost of effluent controls. For purposes of analysis, the estimated salvage value has been determined based on 30 percent of the book value of the plant's assets. This percentage is partially based on survey results from a survey of the fruit and vegetable canning industries.

Table III-1. Soft drink model plants, financial profiles

	Existing				New Source	
	Small	Medium	Large	Extra Large	Large	Extra Large
Annual Production (24/8 oz. cases)	105,000	720,000	3,000,000	11,000,000	3,000,000	11,000,000
Average Number Employees	4	26	98	374	79	289
Revenue						
Sales ($1.70/Case)	178,500	1,224,000	5,100,000	18,700,000	5,100,000	18,700,000
Other	4,035	30,970	100,980	291,720	100,980	291,720
Total Revenue	182,535	1,254,970	5,200,980	18,991,720	5,200,980	18,991,720
Costs						
Materials	27,900	204,655	854,760	4,023,370	780,147	2,848,758
Packaging	7,675	121,545	902,190	3,319,250	884,167	3,228,592
Plant Labor	10,515	59,365	248,370	791,010	182,034	664,710
Contract Purchases	58,760	345,535	993,480	2,806,870	780,147	2,848,758
Indirect Plant	6,960	47,735	203,490	863,940	208,039	759,669
Other	61,975	388,375	1,582,530	5,862,450	1,560,294	5,697,516
Total Costs	173,785	1,167,210	4,784,820	17,666,890	4,394,828	16,048,003
Cash Earnings	8,750	87,760	416,160	1,324,830	806,152	2,943,717
Less						
Depreciation	5,000	34,970	176,540	801,430	400,000	1,500,000
Interest (1% Sales)	1,785	12,240	51,000	187,000	51,000	187,000
Pre-Tax Income	1,965	40,550	188,620	336,400	355,152	1,256,717
Income Tax	430	12,965	84,040	154,972	163,973	596,724
After-Tax Income	1,535	27,585	104,580	181,428	191,179	659,993
Cash Flow	6,535	62,555	281,120	982,858	591,179	2,159,993

Table III-2. The Soft Drink Industry, estimated investment capital for model plants

	Existing								New Source			
	Small		Medium		Large		Extra-Large		Large		Extra-Large	
	Book	Salv.	Book	Salv.	Book	Salvage	Book	Salvage	Book	Salvage	Book	Salvage
	$1,000											
Total Assets	71.4	21.4	437.1	131.1	1,961.5	588.5	8,904.8	2,671.4	4,000.0	1,200.0	15,000.0	4,500.0
Current Assets	29.2	29.2	225.9	225.9	1,040.2	1,040.2	4,558.0	4,558.0	1,040.2	1,040.2	4,558.0	4,558.0
Current Liabilities	18.2	18.2	141.2	141.2	650.1	650.1	2,848.8	2,848.8	650.1	650.1	2,848.8	2,848.8
Net Working Capital	11.0	11.0	84.7	84.7	390.1	390.1	1,709.2	1,709.2	390.1	390.1	1,709.2	1,709.2
Total Invested Capital	82.4	32.4	521.8	215.8	2,351.6	978.6	10,614.0	4,380.6	4,390.1	1,590.1	16,709.2	6,209.2

3. Operating Capital

Current assets, current liabilities and net working capital are also shown on Table III-2. Current assets were estimated as a percentage of sales which varied according to the size of the operation. For the models in this analysis, current assets for the small plant were estimated to be 16 percent of sales; for the medium plant, 18 percent; for the large plants 20 percent; and for the extra large plants 24 percent. Current liabilities were estimated utilizing a current ratio (current assets divided by current liabilities) of 1.6 which would be financially sound and comparable to firms in the foods industry where there is a relatively high rate of inventory turnover.

D. Model Plant Capacity and Utilization

As soft drink plants vary from one to another, there appears to be no industry rule which can be utilized for the determination of the models' capacities. The models developed were assumed to operate eight hours per day, five days per week. Thus, the opportunity for increasing production is very evident. During the normal day's operation, the model plants were not assumed to be operating at full capacity but, rather, at a range of 70 to 85 percent. These less than full capacity percents were resultant of considerations for clean-up, down-time due to equipment failure and efficiencies resultant from changing from one flavor to another.

The soft drink industry is not characterized by highly seasonal differences in demand and as such, plants can be utilized on a relatively constant basis. According to the National Soft Drink Association, some seasonal variation did occur; however, these variations were not assumed to have significant impacts on the operation of the model plants. For the year 1974, the NSDA has estimated the following sales distribution for the United States:

Quarter	Percent of Total 1974 Sales
1st	21.5
2nd	27.0
3rd	28.4
4th	23.1
	100.0

E. Cost Structure of Model Plants

The cost structures for the model soft drink plants are shown in Table III-1. Major items are discussed below.

1. Raw Materials Costs

Raw materials used in the production of soft drinks include water, purchased formula, and packaging. Of the materials, the formula syrup purchased from the formula owners represents the most significant expense. The bottler has little control over the price paid for the formula and in recent years, the formula price has increased rather substantially. This increase has been resultant of the increased sugar price which constitutes a major input to the syrup (the soft drink industry consumes approximately 20 percent of the domestic sugar production). Those bottlers who use flavoring concentrate instead of purchased syrup have been able to control their material costs by using substitute sweetening agents purchased on the open market at competitive prices.

Packaging also represents a rather significant expense to the soft drink bottler. The amount of this expense is directly related to the packaging mix which the plant produces. Some expenses are involved with the replacement of returnable bottles; however, the majority of the total packaging expense is attributable to the expense for non-returnable bottles and cans. Furthermore, some plants, instead of purchasing a canning line, contract with another firm to can soft drinks. In terms of the model existing plants, the costs were developed as a proportion of the plants sales and these proportions varied according to the model size. Costs related to purchased syrups and related materials ranged from 15.63 percent of soft drink sales for the small plant to 21.51 percent for the extra-large plant. Packaging expenses ranged from 4.30 percent for the small to 17.75 percent for the extra-large plant. Contract purchase expenses ranged from 15.01 percent of soft drink sales for the extra-large plant to 32.92 percent for the small plant. The reason for the small plant paying a greater portion of its sales for contract purchases is resultant of the assumption that due to its small size, the small plant will contract for more services instead of purchasing the equipment.

The costs associated with the new source model plants were developed from the existing model plants' data with considerations for possible efficiencies obtainable in a completely new structure.

2. Operating Costs

Derivation of both direct and indirect plant operating costs was based primarily upon the 1973 Financial Survey of the Soft Drink Industry conducted by the NSDA with other sources, such as the Census, used to supplement the Survey data. Direct plant labor costs were determined to include only those labor costs incurred by employees operating the plant. The costs of the driver-salesmen were included in other costs. Indirect plant costs were determined to include those costs resultant from the operation of the plant such as utilities.

3. Other Costs

This cost classification includes those costs incurred due to the operation of the plant but, yet, not directly considered an operating expense. These costs include expenses for the warehousing, selling and administrative functions with the cost of selling representing the major portion of the three.

4. Depreciation and Interest

Depreciation was derived from IRS data and determined to be, expressed as a percent of book value of assets, 7 percent for the small model plant, 8 percent for the medium plant and 9 percent for the large and extra-large plants, and 10 percent for the new source plants. The percentaged varied, as it was assumed that the smaller plants would be more fully depreciated than the larger plants.

Interest was estimated at one percent of the sales dollar.

5. Total Costs

Total raw material costs for the existing models ranged from 15.3 percent of the sales dollar for the small plant to 21.3 percent for the extra-large plant. These costs include the total costs for the syrup as well as the somewhat lesser expensive water used in the soft drinks. Packaging costs ranged from 4.2 percent for the small plant to 17.5 percent for the extra-large plant and contracted purchases for finished products ranged from 14.8 percent for the extra-large to 32.2 percent for the small plant. Thus, the total materials costs ranged from 51.1 percent of the sales dollar for the small plant to 53.5 percent for the extra-large plant.

Production labor costs for the existing models ranged from 4.2 percent of the sales dollar for the extra-large plant to 5.8 percent for the small plant.

Thus, for the existing model plants, total costs for the small plant were estimated to be 95.2 percent of the sales dollar. For the medium, large, and extra-large plants, total costs were estimated to be 93.0, 92.0, 93.0 percent of the sales dollar, respectively.

For the new source model plants, total costs were estimated to be 84.5 percent for the large model and the extra large model.

F. Annual Profits

After-tax income, return on sales, both pre-tax and after-tax, and return on investments, both pre-tax and after-tax for the various sizes of model plants are shown in Table III-3.

It should be noted that the model plant profiles were based on average 1973 conditions as no later published sources of information were available. It appears that the 1973 period would be a good representative year as the industry experienced a decline in margins in 1974 resultant from a leap in sugar prices and a general inability to keep selling prices in line with cost increases and the development of consumer resistance to substantially higher prices. The projections for 1975 are brighter with lower sugar prices, but a continuation of consumer resistance could continue to depress margins.

Table III-3. The soft drink industry, net income, returns on sales and investments for model plants

Size of Model Plant	After-Tax Income	Return on Sales Pre-Tax	Return on Sales After-Tax	Return on Investment Pre-Tax	Return on Investment After-Tax
	(Dollars)	(Percent)			
Existing					
Small	1,535	1.1	0.9	2.4	1.8
Medium	27,585	3.3	2.3	7.8	5.3
Large	104,580	3.7	2.1	8.0	4.4
Extra-Large	181,428	1.8	1.0	3.2	1.7
New Source					
Large	191,179	6.8	3.7	8.1	4.4
Extra-Large	659,993	6.6	3.5	7.5	3.9

G. Annual Cash Flows

Estimated annual cash flow for the different sizes of plants used in this study are shown in Table III-4. Cash flow as calculated is the sum of after-tax income plus depreciation. It is shown in absolute dollars and as a percent of sales and as a percent of investment.

As a percent of sales, cash flows for the existing models ranged from a low of 3.7 percent to a high of 5.5 percent. The higher cash flows as a percent of sales for the larger (assumed to be newer) model plants are a function of the higher investment costs resulting in considerably higher actual annual depreciation charges.

Cash flows when considered as a percent of investment are much more tightly grouped. The narrower range indicates the lower investment base for the smaller older plants. Another factor narrowing the differences is the difference in income tax as a percent of pre-tax earnings. The small firm with less than $25,000 income would be taxed at an assumed rate of 22 percent whereas the earnings in excess of $25,000 would be taxed at an assumed rate of 48 percent.

The smaller model plants remains in an unfavorable competitive cash flow position in relation to the larger plants.

Table III-4. The soft drink industry, annual cash flows for model plants

Size of Model Plant	Annual Cash Flow	Cash Flow As a Percent of Sales	Cash Flow As a Percent of Investment
	(Dollars)	----------(Percent)----------	
Existing			
Small	6,535	3.7	7.9
Medium	62,555	5.1	12.0
Large	281,120	5.5	12.0
Extra-Large	982,858	5.2	9.3
New Source			
Large	591,179	11.4	13.5
Extra-Large	2,159,993	11.4	12.9

IV. PRICING PATTERNS

A. Price Determination

The price of soft drinks is based primarily on the cost of inputs and the demand for soft drinks by the consuming public. In the past, consumer demand has been the more influential factor affecting prices; however, recent significant increases in materials costs have caused the cost of inputs to gain in influence of prices.

1. Demand for Soft Drinks

Demand is reflective of the quantity of soft drinks the consumers are willing to buy at the current level of prices. Historically, soft drink demand has been steadily increasing, with the average annual increase since 1960 being 6.4 percent. In 1960, the average number of 8 ounce equivalents consumed per capita was 192; by 1973 this has increased to 430 8-ounce units. The per capita consumption of soft drinks for the years 1960 through 1973 are depicted below.

Per Capita Consumption of Soft Drinks [1/]

Year	Total Per Capita Sales	Percent Change from Previous Year
1960	192	--
1961	198	3.0
1962	213	7.6
1963	227	6.6
1964	243	7.0
1965	259	6.6
1966	287	10.8
1967	298	3.8
1968	332	11.4
1969	344	3.6
1970	363	5.5
1971	388	6.9
1972	406	4.6
1973	430	5.9

[1/] Source: National Soft Drink Association

For 1973, approximately 80 percent of the total sales were in packaged form with the remaining 20 percent being in bulk form. This compares to packaged sales in 1960 representing 91 percent of sales with bulk representing only 9 percent. This trend can be assumed to be reflective of consumers acceptance of soft drinks for consumption in restaurants,

theaters and other functions where bulk sales are available. Thus, it may be assumed that consumption of soft drinks has progressed from a "treat" drink to an everyday beverage.

When aggregated, soft drink purchasers consumed approximately 35.4 billion 8-ounce equivalent in 1960. For 1973, this quantity had increased by 155 percent to 90.2 billion.

For 1974, the quantity consumed may have only increased modestly due to customer resistance to higher prices. The higher prices were primarily attributed to higher sugar costs. Consumers, already faced with soaring food bills and a generally inflationary environment, began to cut back on purchases of name-brand soft drinks. This consumer resistance took the form of increased purchases of private-label brands and other competing beverages such as beer, powdered drinks and fruit juices. According to Standard and Poor's, Industry Surveys, the outlook for 1975 is one of uncertainty and, thus, we can conclude the demand for soft drinks will depend on a variety of factors, the most important being price.

There is relatively no foreign demand for bottled soft drinks as it is too expensive to export soft drinks. Instead most foreign requirements are fulfilled by bottling plants located in the foreign country itself. These plants may be foreign or domestically owned and most often represent U.S. brands.

2. Supply of Soft Drink

The basic nature of soft drinks (mixing purchased syrups with treated water) eliminates most restrictions on the supply. Soft drink supply constraints do exist in the form of bottling plant and warehouse capacities as well as the availability of purchased material inputs (i.e. syrup and sugar). However, overall, it is assumed that if demand increases, supply can meet it.

3. Market Structure

Basically, the bottler operates in a highly competitive market in which he is relatively free to set his prices. However, bottlers in general consider a variety of factors in determination of their final product price, including such considerations as the historical demand for a particular flavor, the competitors' sales position and prices, the cost of the purchased inputs and labor and the direction of the present advertising campaign. While being relatively free to set their finished product prices, it should be noted that soft drinks are highly competitive and that the consumers are very price conscious; setting the price one or two cents too high could be disastrous to the individual bottler.

B. Price Trends

Soft drink prices vary throughout the United States by region as well as by metropolitan area. In the 1973 U.S. Department of Labor survey, the price of a 72-ounce six pack of cola-flavored beverage in returnable containers cost 66 cents in Dallas and 93 cents in Honolulu. Average annual 1973 prices paid in 23 different cities as well as the national average prices paid for cola and fruit flavored beverages are shown in Table IV-1.

When viewed in terms of the national average, the consumer price index for cola drinks has increased from 61.0 in 1953 (1967 = 100) to 163.0 in 1974. Since 1970, the consumer price index for cola has increased by 37 percent. Thus, on an annual average, cola prices have increased by approximately 9.0 percent since 1970.

When viewed in terms of the national average, the consumer price index for cola drinks has increased from 61.0 in 1953 (1967 = 100) to 163.0 in 1974. Since 1970, the consumer price index for cola has increased by 37 percent. Thus, on an average, cola prices have increased by 37 percent since 1970.

The price received by the bottler (the wholesale price) has also shown trends of significant increases. The wholesale price index (1967 = 100) has increased from 57.1 in 1953 to 148.6 in 1974. Aside from general inflationary influences, the most significant contributor to the increased wholesale soft drink price has been the increased price of sugar which affects the bottler either directly (purchased sugar) or indirectly (in the form of presweetened purchased syrup). The wholesale indexes for cola drinks, sugar and cola syrup are compared in Table IV-2 for the years 1970 through 1974 as well as on a monthly basis for 1974.

Table IV-1. Soft drink retail prices by city, average 1973, in cents per 72 ounce carton

City	1973 Average Price	
	Cola	Fruit Drink
	(Cents)	
Atlanta	69.4	69.1
Baltimore	103.9	69.6 2/
Boston	97.4 1/	80.4 2/
Buffalo	72.9	82.6
Chicago	99.3	100.7 2/
Cincinnati	77.1	83.7
Cleveland	79.5	79.9
Dallas	66.6	70.2
Detroit	101.8 1/	107.0
Honolulu	93.4	87.2
Houston	65.8	63.1
Kansas City	87.0	63.0 2/
Los Angeles	84.4	82.5
Milwaukee	87.4	69.6 2/
Minn./St. Paul	87.8	81.8
New York	117.8 1/	63.7 2/
Philadelphia	99.8 1/	59.3 2/
Pittsburgh	75.5	79.1
St. Louis	79.0	60.9 2/
San Diego	72.9	73.8
San Francisco	87.8	77.8
Seattle	111.0	109.8 1/
Washington D.C.	112.9	102.2 1/
U.S. Average 3/	86.1	75.5

1/ Non returnables

2/ Cans

3/ U.S. average is the average price for a 72-ounce carton weighted by the population of each city from sample of 56 cities.

Source: U.S. Department of Labor, Bureau of Labor Statistics.

Table IV-2. Wholesale Price Index--The soft drink industry, selected products (1967 = 100)

Year	Cola Drink	Granulated Sugar Cane	Flavoring Syrup
	Average		
1970	121.5	113.3	N.A.
1971	123.7	118.3	109.5
1972	126.3	124.2	115.3
1973	124.4	134.6	116.1
1974	148.6	323.5	170.9
January	123.6	144.8	119.3
February	123.6	163.2	120.7
March	125.5	201.8	123.6
April	130.9	201.8	133.4
May	133.2	250.9	144.0
June	144.8	288.1	155.0
July	156.1	322.7	167.3
August	157.6	341.6	187.1
September	160.3	399.6	188.0
October	173.1	413.0	211.3
November	175.9	555.7	226.6
December	178.8	599.4	275.0

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

V. EFFLUENT CONTROL COSTS

The effluent control system requirements and costs depicted in this chapter were provided by the Effluent Guidelines Division of the Environmental Protection Agency as provided by the technical contractor, Environmental Science Engineering. The recommended and optional treatment alternatives for the model soft drink plants were the same as presented in the Development Document.[1/] However, the associated investment and annual costs have been revised by the technical contractor to reflect the model plants' production characteristics previously described in Chapter III.

A. Pollution Control Requirements

Three effluent control levels for point source categories (direct dischargers) were originally considered:

BPT - Best Practicable Control Technology Currently Available, to be achieved by July, 1977.

BAT - Best Available Control Technology Economically Achievable, to be achieved by July 1, 1983.

NSPS - New Source Performance Standards are recommended to be equal to the BAT control level and to apply to any source for which construction starts after the publication of the proposed regulations.

Raw waste loads for the existing model soft drink plants as well as the new source plants are depicted in Table V-1. From this table it can be seen that variations in flow in gallons per day do exist, however, the concentration expressed in milligrams per liter (mg/l) of wastewater, of biological oxygen demand (BOD) and suspended solids (SS) are constant regardless of plant size. The concentration of fats, oils and grease (FOG) are not present. The recommended effluent limitation guidelines for the model soft drink plants as proposed in the Development Document are shown in Table V-2.

[1/] Development Document for Effluent Limitation Guidelines and New Source Performance Standards, Miscellaneous Foods and Beverages, Point Source Category, Draft Report prepared by Environmental Science and Engineering Inc., for the U.S. Environmental Protection Agency.

Table V-1. Raw waste loads for model soft drink plants

Model	Production Cases/ day	Flow Gallons per day	BOD mg/l	SS mg/l	FOG mg/l
Existing					
Small	400	2,900	1,380	263	N.A.
Medium	2,880	18,000	660	108	N.A.
Large	12,000	76,000	660	108	N.A.
X-large	44,000	280,000	660	108	N.A.
New Source					
Large	12,000	76,000	660	108	N.A.
X-large	44,000	280,000	660	108	N.A.

Table V-2. Recommended Effluent Limitation Guidelines for the Soft Drink Industry

	BPT	BAT	NSPS
	-- kg/cu. m finished product --		
BOD			
Max 30 day ave.	0.231	0.115	0.115
Max Day	0.554	0.276	0.276
SS			
Max 30 day ave.	0.132	0.066	0.066
Max Day	0.369	0.185	0.185

Source: Development Document, Environmental Protection Agency.

B. Discharge Status of the Industry

The common method of effluent discharge in the Soft Drink Industry is to utilize municipal treatment systems. In fact, of the 2,317 soft drink plants operating at the end of 1975 all but 20 utilized municipal systems. Of these 20 plants discharging effluents to navigable waters, according to the EPA, six presently meet the proposed BPT standards and five meet the proposed BAT standards. Of the remaining 9, two have some form of treatment but their treatment systems do not achieve proposed BPT standards.

The remaining 7 direct dischargers have been identified by the EPA as having no treatment and thus discharge their untreated effluent directly to navigable waters.

C. Pollution Control Costs

The cost estimates, in 1972 dollars, and the components of the recommended and optional (if considered desirable) treatment alternatives for the model plants are shown in Table V-5 through Table V-8. From the information provided, total investment and annual costs were inflated so as to be consistent with the costs associated with the models. Investment and annual costs were inflated from 1972 to 1974 dollars by the use of the Engineering News Record Construction Cost Index (1.205 times the provided EPA costs). The resulting treatment costs in 1974 dollars for both the recommended and optional treatment alternatives are summarized in Table V-3.

Investment costs include costs for construction, land, engineering and a contingency fee. Annual operating costs include expenditures for labor, power, chemicals, maintenance and supplies. Total yearly costs include annual operating costs, depreciation and interest. Depreciation was based on a 20 year depreciable life for the pollution controls. Interest was based on a 10 percent rate which was then computed as 10 percent of one half the total pollution control investment costs.

Total investment costs for pollution controls expressed as a percent of book value of the model plants' fixed assets and the total annual costs expressed as a percent of annual sales are depicted in Table V-4.

Table V-3. Effluent control costs for model soft drink plants (1974 dollars)

Model	Treatment Alternative	BPT Investment Costs	BPT Annual Operating Costs	BPT Total Yearly Costs	Incremental BAT Investment Costs	Incremental BAT Annual Operating Costs	Incremental BAT Total Yearly Costs	NSPS Investment Costs	NSPS Annual Operating Costs	NSPS Total Yearly Costs
		$1,000								
Small	Recommended	18	2	4	0	0	0	-	-	-
Medium	Recommended	46	11	15	19	2	4	-	-	-
Large	Recommended	112	11	22	31	4	7	270	46	74
X-Large	Recommended	349	49	84	29	6	8	480	89	137
	Optional	294	69	98	29	6	8	479	120	168

Table V-4. Investment costs and yearly costs expressed as a percent of model plants' investment and sales.

Model	Treatment Alternative	BPT Total Investment as % of Book Value	BPT Total Yearly Costs as % of Annual Sales	BAT Total Investment as % of Book Value	BAT Total Yearly Costs as % of Annual Sales	NSPS Total Investment as % of Book Value	NSPS Total Yearly Costs as % of Annual Sales
		(%)					
Small	Recommended	26.0	2.2	26.0	2.2	-	-
						-	-
Medium	Recommended	10.5	1.2	15.0	1.5	-	-
						-	-
Large	Recommended	5.7	0.4	7.3	0.6	6.8	1.4
						7.2	1.5
Extra Large	Recommended	3.3	0.4	4.2	0.5	3.2	0.7
	Optional	2.7	0.5	3.6	0.6	3.2	0.9

Table V-5. Itemized cost summary for soft drinks--BPT

Alternatives	Small A27-II	Medium A27-III	Large A27-V
Investment Costs:			
(1) List Price	11,843.00*	13,483.00	37,393.00
(2) Installation and Contingencies	1,200.00*	17,291.00	48,132.00
(3) Land	1,800.00*	5,000.00	5,000.00
(4) Freight	1,800.00*	2,500.00	2,500.00
TOTAL	15,403.00*	38,274.00	93,025.00
Yearly Operating Costs:			
(1) Labor	1,500.00	3,122.00	3,122.00
(2) Power	0.00	2,500.00	2,500.00
(3) Maintenance, Chemicals, and Supplies	230.00	3,300.00	3,300.00
TOTAL	1,730.00	8,922.00	8,922.00
Total Yearly Costs:			
(1) Yearly Operating Costs	1,730.00	8,922.00	8,922.00
(2) Yearly Investment Cost Recover (Interest)	710.00	1,531.00	3,721.00
(3) Depreciation	710.00	1,664.00	4,401.00
TOTAL	3,150.00	12,117.00	17,044.00
Treatment Chain Design Efficiency (% BOD Reduction)	100.0%	89.9%	89.9%
Treatment Modules	Septic Tank System	Package Biological Treatment Plant @ 20,000 GPD	Package Biological Treatment Plant @ 75,000 GPD

* Categories for small plant in consecutive order are: (1) Construction, (2) Land, (3) Engineering, and (4) Contingency.

Table V-6. Itemized Cost Summary for Soft Drinks, BPT

Alternative	X-Large - BPT A27-VII	X-Large BPT Optimal A27-IX
Investment Costs:		
1. Construction	225,690.00	195,880.00
2. Land	9,160.00	4,160.00
3. Engineering	22,570.00	19,590.00
4. Contingency	22,570.00	19,590.00
5.* PVC Liner	--	4,650.00
Total	289,990.00	243,870.00
Yearling Operating Costs:		
1. Labor	18,740.00	12,490.00
2. Power	11,580.00	34,210.00
3. Chemicals	4,520.00	4,520.00
4. Maintenance and supplies	6,000.00	5,540.00
5.* PVC Liner	--	320.00
Total	40,840.00	57,080.00
Total Yearly Costs:		
1. Yearly operating cost	40,840.00	57,080.00
2. Yearly investment cost recovery	11,600.00	9,750.00
3. Depreciation	13,540.00	11,990.00
Total	65,980.00	78,820.00
Treatment Chain Design Efficiency (% BOD Reduction)	89.4%	89.9%

Treatment modules:

A1..Control House
B...Pumping Station
C...Equalization Basin
F...Acid Neutralization
H...Nitrgen addition
K...Activated sludge
Q...Sludge thickened
Y...Holding tank
U...Spray irrigation

B...Pumping station
C...Equalization basin
F...Acid neutralization
H...Nitrogen addition
L...Aerated Lagoon

Table V-7. Itemized cost summary for soft drinks--BAT

Alternatives	Small A27-II	Medium A27-IV	Large A27-V
Investment Costs:			
(1) List Price	11,843.00	29,483.00	62,893.00
(2) Installation and Contingencies	1,200.00	17,291.00	48,132.00
(3) Land	1,800.00	5,000.00	5,000.00
(4) Freight	1,800.00	2,500.00	2,500.00
TOTAL	15,403.00	54,274.00	118,525.00
Yearly Operating Costs:			
(1) Labor	1,500.00	3,122.00	3,122.00
(2) Power	0.00	2,500.00	2,500.00
(3) Maintenance, Chemicals, and Supplies	230.00	4,920.00	6,432.00
TOTAL	1,730.00	10,542.00	12,054.00
Total Yearly Costs:			
(1) Yearly Operating Costs	1,730.00	10,542.00	12,054.00
(2) Yearly Investment Cost Recovery (Interest)	710.00	2,171.00	4,741.00
(3) Depreciation	710.00	2,464.00	5,616.00
TOTAL	3,150.00	15,177.00	22,471.00
Treatment Chain Design Efficiency (% BOD Reduction)	100.0%	94.7%	94.7%
Treatment Module	Septic Tank System	Package Biological Treatment Plant @ 28,000 GPD & Filtration	Package Biological Treatment Plant @ 75,000 GPD & Filtration

Table V-8. Itemized Cost Summary for Soft Drinks

Alternatives	X-large BAT A27-VIII	X-large BAT opt. A27-X
Investment costs:		
1. Construction	245,620.00	215,810.00
2. Land	19,160.00	4,160.00
3. Engineering	24,560.00	21,580.00
4. Contingency	24,560.00	21,580.00
5.* PVC Liner	--	4,650.00
Total	313,900.00	267,780.00
Yearly Operating Cost:		
1. Labor	18,740.00	12,490.00
2. Power	15,830.00	38,460.00
3. Chemicals	4,520.00	4,520.00
4. Maintenance and supplies	6,310.00	5,850.00
5.* PVC Liner	--	320.00
Total	45,400.00	61,640.00
Total Yearly Costs:		
1. Yearly operating costs	45,400.00	61,640.00
2. Yearly investment cost recovery	12,560.00	10,710.00
3. Depreciation	14,740.00	13,180.00
Total	72,700.00	85,530.00
Treatment Chain Design Efficiency (% BOD Reduction)	94.7%	94.7%

Treatment Modules:

B1...Control House	B...Pumping Station
B....Pumping Station	C...Equalization basin
C....Equalization basin	F...Acid neutralization
F....Acid neutralization	H...Nitrogen addition
H....Nitrogen addition	L...Aerated lagoon
K....Activated sludge	B...Pumping station
G....Sludge thickener	N...Dual media pressure
Y....Holding tank	Filtrain
L....Spray irrigation	
B....Pumping station	
N....Dual media pressure	

VI. ECONOMIC IMPACT ANALYSIS

The impacts considered in this analysis are as follows:

A. Price effects
B. Financial effects
C. Production effects
D. Other effects

The resulting impacts from the imposition of effluent controls on the Soft Drink Industry for existing soft drink plants are expected to be nominal as only 20 known plants discharge their wastewaters to navigable waters. Furthermore, the overall impacts are expected to be limited because of the 20 known direct dischargers, 11 plants presently meet the proposed BPT standards and 5 of these 11 plants meet proposed BAT standards. Of the plants not meeting either BPT or BAT standards, 2 have some form of treatment already in place and only the remaining 7 plants have no form of treatment systems. Thus, of the 2,317 plants operating at the end of 1975, 99.1 percent utilize municipal treatment systems, 0.5 percent meet either BPT or BAT, 0.1 percent have some form of treatment and 0.3 percent have no treatment whatsoever.

While the overall industry impacts will be small, concern is still warranted for the few existing plants which will be impacted. Concern is also warranted for analysis of those plants which are yet to be constructed and will discharge their effluent to navigable waters (hereafter referred to as New Source). Therefore, this impact analysis will address the potential impact resulting from the imposition of effluent controls on both those existing direct discharging plants and the new source plants. These impacts are analyzed for the model plants described in Chapter III, with the impacts being based on the production and financial characteristics of the models and the effluent control costs as presented in Chapter V.

It should be noted that in Chapter V, two sets of control costs were described for each model; the recommended treatment system and an optional system. For purposes of this impact analysis, only the recommended treatment system will be utilized. This treatment alternative consists of an activated sludge system and according to cost estimates furnished by the EPA, is considerably less expensive than the optional aerated lagoon system.

A. Price Effects

1. Required Price Increase

An implicit indicator of the expected price effects of effluent controls used in this report is the amount of sales price increase necessary to

maintain a soft drink's profitability, after effluent control expenditures, at the same level as the plant without the control expense. The method of computation was described in Part I, Chapter II (Methodology), Section F, under subsection 2 of this report. The ability of soft drink plants to pass on such price increases is evaluated in this section of the report.

The amounts of sale price increases necessary to offset estimated effluent control costs for the model soft drink plants range from 0.6 percent to 2.7 percent and are depicted in Table VI-1. For the existing model soft drink plants, both the required price increases for BPT and BAT are shown. For the new source plants, the required price increases to offset NSPS standards are

2. Expected Price Increase

While Table VI-1 illustrates what the model soft drink plants would require to offset expenditures for controls, it is doubtful those plants which require controls would be able to pass on the additional expense to customers in the form of higher prices. This is due to (1) the discharge status of the Soft Drink Industry and (2) the market characteristics of the industry.

As discussed earlier, of the 2,317 soft drink plants operating in 1975, only 20 (0.9 percent) plants are known to discharge their effluent to navigable waters with the remainder of the industry, 2,297 plants, utilizing municipal treatment systems. Although municipal charges have and are expected to continue to increase, the impacted existing and new source soft drink plants will only be able to pass on price increases equivalent to the level of increase in municipal charges experienced by the remainder of the industry.

However, should municipal charges become higher than private treatment costs, then impacted and new source soft drink plants would have a competitive advantage and have the opportunity to pass on the increased costs of effluent controls assuming the industry as a whole increases prices to offset the increased municipal charges. Although not quantifiable at this time, some industry sources feel that this situation could very easily happen in the near future.

The market characteristics of the Soft Drink Industry may provide some opportunities for impacted and new source plants to pass on effluent control costs but these will be limited to only those plants which by location or production efficiency can maintain or establish a competitive advantage over other plants. In other sords, an impacted or new source plant which can produce and/or deliver its products for lower costs through its competitors, may be able to utilize its greater margin to absorb control costs and still remain competitive.

Table VI-1. The Soft Drink Industry, required price increases necessary to offset effluent control costs.

Model	Cases Produced Annually	Required Price Increase Percent Proposed Control Costs 80%	100%	120%
Existing				
Small	105,000			
BPT		2.1	2.7	3.2
BAT		2.1	2.7	3.2
Medium	720,000			
BPT		1.3	1.6	1.9
BAT		1.5	1.8	2.2
Large	3,000,000			
BPT		0.5	0.6	0.8
BAT		0.6	0.7	0.9
Extra-Large	11,000,000			
BPT		0.5	0.6	0.8
BAT		0.5	0.7	0.8
New Source				
Large	3,000,000	1.4	1.8	2.1
Extra-Large	11,000,000	0.7	0.9	1.1

However, for those impacted plants which cannot achieve a competition advantage, it is probable that such plants will not be able to pass on the required price increases because of the generally high competitive, low profit margin and excess capacity of the industry, and too, for the new source plants, the high costs of new construction. As discussed in earlier chapters of this report, the Soft Drink Industry has experienced relatively low profit margins, is highly competitive and has excess capacity as evidenced by plant closures relative to an increasing output (increasing population and per capita consumption). As shown below in Section B, Financial Effects, high costs of new plant construction are not offset sufficiently by lower operating costs through improved technology which results in new point sources and the existing extra large plant have similar to lower income ratios than the other existing plants and negative net present values of cash flow when discounted at the estimated industry after-tax cost of capital (7.5 percent).

Therefore price increases by impacted plants to offset the costs of effluent controls and the high costs of new construction are not expected to occur. In the following analysis, no price change was assumed to occur as a result of the entire industry increasing prices to offset effluent controls and accordingly the economic viability of the plants are based on financial characteristics of the models without added revenue stemming from aggregated effluent control effects on industry prices.

B. Financial Effects

Based on model plant profiles described previously and costs of pollution control provided by EPA, the following financial indicators were computed under baseline (without pollution controls) and with pollution controls:

1. After tax income
2. After tax return on sales
3. After tax return on invested capital
4. Cash flow and cash flow as a percent of invested capital
5. Net present value

The above were computed according to the discounted cash flow (DCF) and return on investment (ROI) procedures outlined in the methodology.

Furthermore a senitivity analysis was performed using pollution control cost estimates at levels of 80 percent and 120 percent of the costs provided by EPA.

The results of the model plant analysis of the proposed effluent guidelines are summarized in Table VI-2 for the existing model plants and Table VI-3 for the new source plants. These results are discussed below.

1. After-tax Income

As shown in Table VI-2, the imposition of BPT standards on the soft drink models severely reduces the after-tax income to negative levels for existing small and medium model plants. The small model, plant's income is decreased by $4,000 due to BPT controls from the baseline marginal income of $2,000 to -$2,000. The after-tax income for the medium plant decreases by $8,000 from a before controls level of $28,000 to an after-tax controls income of $20,000. The after-tax incomes for the large and extra-large models are reduced, however, not to the point of becoming negative. The large model's income is reduced by 11 percent from $105,000 before controls to $93,000 after controls. The extra-large model's income declines by 24 percent from $181,000 before controls to $138,00 after controls.

BAT standards further depress profits for each of the mode plants except for the small model's profits which stay the same. Thus, for existing plants the imposition of effluent controls seriously affects the profits of the small and medium soft drink plants and depresses, but not to the same magnitude, the profits of the large and extra-large plants.

The imposition of NSPS on new source plants affects after-tax income in that the large model new source's income is reduced by 20 percent and the extra-large new source model by 9 percent.

2. Return on Sales

The after-tax return on sales for the existing and new source model soft drink plants were also shown in Tables VI-1 and 2. Basically the returns reflect the same general pattern as after-tax income. As explained previously, the Soft Drink Industry has experienced relatively low profits in recent years. This is exemplified in that the baseline model's after-tax returns on sales are relatively low. The imposition of BPT standards with the following BAT standards further deteriorate the already marginal returns.

For the small model plant returns on sales decline from 0.8 percent for the baseline case to -1.1 percent for after the BPT standards and 1.1 percent for after the BAT standards are imposed. The medium model indicates a positive return after controls are imposed declining from 2.2 to 1.6 to 1.3 percent for the baseline, BPT and BAT cases respectively. The large and extra-large models' returns remain positive after controls but do decline; the large declining from 2.0 to 1.8 to 1.7 percent and the extra-large declining from 1.0 to 0.7 percent for the baseline, after BPT and after BAT cases respectively.

Table VI-2. Key values of impact analysis for soft drink industry - existing sources

Key Value	Size		Baseline	Percent Proposed Control Costs					
				BPT			BAT		
				80%	100%	120%	80%	100%	120%
	1,000 cases/day								
After Tax Income ($000)	S	105	2	-1	-2	-3	-1	-2	-3
	M	720	28	21	20	17	20	17	13
	L	3,000	105	95	93	91	93	90	87
	X-L	11,000	181	146	138	129	143	133	124
After Tax Return on Sales (%)	S	105	0.8	-0.6	-1.1	-1.5	-0.6	-1.1	-1.5
	M	720	2.2	1.7	1.6	1.4	1.6	1.3	1.1
	L	3,000	2.0	1.8	1.8	1.7	1.8	1.7	1.7
	X-L	11,000	1.0	0.8	0.7	0.7	0.8	0.7	0.7
After Tax Return on Invested Capital (%)	S	105	1.9	-1.3	-2.1	-2.9	-1.3	-2.1	-2.9
	M	720	5.3	3.9	3.6	3.1	3.6	3.0	2.4
	L	3,000	4.4	4.0	3.9	3.8	3.8	3.7	3.6
	X-L	11,000	1.7	1.4	1.3	1.2	1.3	1.2	1.1
Estimated Cash Flow ($000)	S	105	7.0	5	4	3	5	4	3
	M	720	63	58	57	55	57	55	52
	L	3,000	281	276	275	274	275	273	272
	X-L	11,000	983	962	957	951	959	954	948
Cash Flow as % of Invested Capital	S	105	7.9	5.5	4.8	4.0	5.5	4.8	4.0
	M	720	12.0	11.1	10.9	10.5	11.0	10.5	10.0
	L	3,000	12.0	11.8	11.7	11.7	11.7	11.6	11.5
	X-L	11,000	9.3	9.1	9.0	9.0	9.0	9.0	8.9
Net Present Values ($000)	S	105	-6	-30	-36	-42	-30	-36	-42
	M	720	71	6	-10	-26	-3	-22	-41
	L	3,000	145	37	10	-17	21	-11	-42
	X-L	11,000	-1,762	-2,149	-2,167	-2,246	-2,269	-2,342	-2,370

Table VI-3. Key values of impact analysis for soft drink industry: NSPS

Key Value	Size	Baseline	Percent Proposed Control Costs 80%	100%	120%
After Tax Income ($000)	L 3,000	191	161	153	145
	XL 11,000	660	603	589	575
After Tax Return on Sales (%)	L 3,000	3.7	3.1	2.9	2.8
	XL 11,000	3.5	3.2	3.1	3.0
After Tax Return on Invested Capital (%)	L 3,000	4.4	3.6	3.4	3.2
	XL 11,000	3.9	3.6	3.5	3.4
Estimated Cash Flow ($000)	L 3,000	591	572	567	562
	XL 11,000	2,160	2,122	2,113	2,103
Cash Flow as % of Invested Capital	L 3,000	13.5	13.0	12.9	12.8
	XL 11,000	12.9	12.7	12.6	12.6
Net Present Values ($000)	L 3,000	-318	-677	-767	-857
	XL 11,000	-1,995	-2,669	-2,837	-3,006

The NSPS do affect the after-tax returns on sales of the model new source plants but not to the same degree as the effects to the existing models' returns. For the large new source model, return on sales are depressed by 22 percent from 3.7 percent to 2.9 percent after the imposition of NSPS controls. The extra-large new source model's returns are reduced by 11 percent from 3.5 percent to 3.1 percent.

3. Return on Invested Capital

As shown in Tables VI-2 and 3 for the model soft drink plants, pre-control after-tax return on invested capital range from 1.7 to 5.3 percent for the existing models and from 3.9 to 4.4 percent for the new source models. For the existing models, specific returns were 1.9 percent for the small model, 5.3 percent for the medium model, 4.4 percent for the large model and 1.7 percent for the extra-large model. These pre-control returns indicate economies of scale in production which are limited by geographic size of the area served by the plants.

After the imposition of BPT controls on the existing models, return on investment falls to -2.1 percent for the small plant, 3.6 percent for the medium plant, 3.9 percent for the large plants and 1.3 percent for the extra-large plant. BAT controls further decrease these plants' returns to levels where it would be doubtful if they would continue to operate.

For the new source model plants, the imposition of NSPS reduces the returns on invested capital but not to what could be considered less than marginal levels. The new source large plant's returns decline from 4.4 percent to 3.4 percent and the extra-large model's returns from 3.9 percent to 3.5 percent.

4. Cash Flow

Estimated cash flows (after-tax income plus depreciation on invested capital for the model plants) are shown in Tables VI-2 and VI-3 for the existing and new source model plants respectively. In the baseline case cash flows range from 7.9 percent to 12.0 percent for the existing models and 12.9 to 13.5 percent for the new source models. Individually, the cash flows as percentages of invested capital are 7.9 percent for the existing small model, 12 percent for medium and large models and 9.3 percent for the existing extra-large model. For the new source models returns are 12.9 for extra-large model and 13.5 percent for the large model.

When the existing models were impacted by BPT standards, the small model's cash flow as a percentage of invested capital decreased to 4.8 percent, the medium model decreased to 10.9percent and the large and extra-large declined slightly to 11.7 and 9.0 percent respectively. The imposition of BAT controls further depressed the cash flows but not by the same magnitude as the BPT controls.

The resulting impacts on the new source models attributable to NSPS caused a moderate decline in the new source models' cash flows with the large new source declining from 13.5 percent to 12.9 percent and the extra-large new source declining from 12.9 percent to 12.6 percent.

5. Net Present Values

The computed net present values (NPV) for the model soft drink plants indicate in the baseline case, the small, medium and large existing plants achieve positive NPV's and the existing extra-large and the large and extra-large new source plants generate negative NPV's. As discussed in Part I, Chapter II (Methodology), negative net present values would cause most firms to cease operations or to scrap plans for building a new plant. Since for the existing extra-large and both new source models, their NPV's are negative in the baseline case, it could be concluded that very few extra-large plants would be in operation and that few, if any, new source plants would be built. However, it should be noted that negative NPV's indicate that the associated plant would earn less than the estimated 7.5 percent industry cost of capital. Thus, such plants may remain in operation or new plants built provided the firm has been well established in the industry, has expectations to capture a major market share at profitable prices and has an excellent financial performance record (e.g., lower cost of debt capital).

The imposition of BPT controls on the existing model plants results in the small and medium models' NPV's becoming negative, the large model's NPV decreasing by 93 percent and the extra-large model's NPV becoming significantly more negative (from -$1,762,000 -.$2,167,000). The requirements to meet BAT standards result in further declines in the NPV's, with the large model's still remaining positive.

The results of an analysis of the impacted net present values would suggest that it would be probable that the impacted small, medium and extra-large model plants would not continue operations after BPT requirements as they would not be able to incur the associated costs of the controls. If the plants could marginally absorb the BPT control costs, they may choose to do so and continue operations, however, the expected costs of BAT would probably close them prior to the installation of the BAT system. However, it should be noted that the models are considered representative averages of the industry and while the impact analysis may indicate possible plant closures, actual industry plants of similar sizes may have unique operational and/or financial situations which may result in impact characteristics differing from the models.

As stated above, given the characteristics of the new source plants described, it would be doubtful that such new source plants would be constructed. If, however, such plants were built, their net present values would be reduced due to the requirements for effluent controls.

C. Production Effects

Due to the extremely small portion of existing plants in the Soft Drink Industry which would be affected by the imposition of effluent controls, it is doubtful that the current levels of total industry production achieved by the existing plants would reflect any reductions due to the effluent control requirements. As has been pointed out previously 7 direct discharging soft drink plants presently have no controls and 2 plants which do not meet BPT standards have only some controls in place.

Discussions with individuals at these plants by members of the EPA has resulted in the determination that if the proposed standards are promulgated, no plant closures will result. Managements of each of the 9 plants all feel that they can meet the standards and remain viable as they have operational and/or financial characteristics differing from those developed for the models in the impact analysis. Thus, the imposition of effluent controls on the Soft Drink Industry is expected to result in no plant closures.

As would be expected, the imposition of NSPS standards will have little, if any, effect on current production levels. However, the NSPS standards could affect future industry growth as firms could be deterred from entry due to the differential impacts of waste treatment requirements.

However, as described in the above financial description, future growth from new source plants is expected to be restrained by the seemingly high costs of construction not being offset by the lower production costs. In addition, new sources may be further restrained by their limited ability to pass through the additional costs of controls, assuming the rest of the industry does not pass on municipal charge increases. This does not completely rule out the possibilities for new soft drink plants as it is foreseeable that some operations, those which could be classified as optimal producers, could construct and successfully operate a new plant. This has and presently is occuring with a few new plants just recently being constructed, however growth for the industry as a whole is expected to result from additions to or alterations of existing plants which discharge effluent wastes to other than navigable waters.

D. Other Effects

Other types of economic impacts such as employment, community and balance of payment are normally assessed when there are significant plant closures attributable to effluent controls. As previously discussed, it is apparent that the Soft Drink Industry will suffer few effects from the proposed guidelines. Furthermore, the effects of possible closure of the few plants which would be impacted due to control requirements, would be extremely limited when viewed with the number of plants leaving the industry each year for purely economic reasons. Thus, in this report, these related effects were not pursued.

PART VII

SOFT DRINK SYRUPS AND CONCENTRATES

Flavoring Extracts and Syrups

Part VII: SIC 2087 - THE SOFT DRINK SYRUPS AND CONCENTRATES INDUSTRY
Non-Synthetic Flavoring Extracts and Syrup Industry

1. INDUSTRY STRUCTURE

The Soft Drink Syrups and Concentrates Manufactures represent the major portion of SIC 2087, the Flavoring Extracts and Syrup Industry. As this analysis is concerned with the four digit SIC code most references will be made to the Flavoring Extract and Syrup Industry. However, it should be noted that the impact analysis is primarily reflective of Soft Drink and Concentrates Manufacturers.

The Census of Manufactures defines the Flavoring Extract and Syrup Industry as an industry comprised of establishments primarily engaged in manufacturing flavoring extracts, syrups and fruit juices, not elsewhere classified, for soda fountain use or for the manufacture of soft drinks and colors for bakers' and confectioners' use. Flavorings derived from parts of aromatic plants are termed natural flavorings whereas those prepared from synthetic chemicals, such as esters, aldehydes, ketones and other are considered artificial, imitation or synthetic flavors. According to the Environmental Protection Agency, this analysis will be limited to those plants which primarily produce non-synthetic flavors. Those operations producing synthetic flavors are categorized as inorganic operations and are included in a separate report concerning the Inorganic Chemical Industries. This analysis will also be further limited to impact analyses for soft drink beverage base plants as effluent guidelines for the other types of SIC 2087 establishments will be developed in another EPA document. However, as soft drink beverage base establishments are a major portion of SIC 2087 the majority of the general industry discussion will concern itself to the entire SIC 2087 industry.

At the present time, there are no known members of the Non-Synthetic Flavoring Extracts and Syrups Industry which discharge effluent to navigable waters; all are connected to municipal sewage treatment systems. As such the industry will incur very few, if any immediate impacts due to the imposition of effluent controls. The potential does exist however that plants which are yet to be constructed could be impacted if they choose to utilize their own treatment system and thus have to meet the proposed new source performance standards (NSPS). In view of this, this analysis will primarily concentrate on the economic description of the industry characteristics with some discussions pertaining to potential new source impacts.

A. Characteristics of the Industry

The Flavoring Extracts and Syrups Industry is highly competitive as well as being rather complex in its structure. As mentioned previously the overall industry is comprised of those which are considered synthetic manufacturers and those which are considered non-synthetic. Furthermore,

the aggregated industry also contains beverage base manufacturers who produce concentrates and syrups almost exclusively for the major soft drink companies which utilize them in their soft drink products. As a result of the above, information regarding any particular segment of the Flavoring Extracts and Syrups Industry is limited to only aggregated forms from the traditional information sources such as the Census of Manufactures and periodic industrial reports. These sources do have their limitations but efforts to obtain specific industry segment data were not successful. While specific information concerning the Non-Synthetic Flavoring Extracts and Syrups Industry (including beverage base plants) is not readily available, information is available concerning the aggregated industry. Accordingly, these aggregated data will be utilized to describe the characteristics of the industry with explanations, when possible, to denote possible differences associated only with the Non-Synthetic Industry.

1. Number and Size of Firms and Plants

The Census of Manufactures states that in 1972 there were 350 firms in the Flavoring Extracts and Syrups Industry operating some 400 establishments. Thus in 1972, 12.5 percent of all establishments were owned or controlled by firms which operated more than one facility. This percentage has increased in recent years from 5.4 percent in 1963, to 7.0 percent in 1967 to the present 12.5 percent in 1972.

According to Census data, the number of industry plants have decreased during recent years from 534 establishments in 1958, to 431 in 1967, to 400 in 1972. As can be seen in Table I-1, the majority of these existing establishments have been in the smaller size categories.

Also shown in Table I-1 are the employment classes' respective value of shipment and corresponding percentage of total shipment. From this table it is evident that the majority of the industry's shipments are produced in the larger plants with just over 6 percent of all establishments providing nearly 56 percent of the industry's total shipments.

Specific breakouts depicting the number of non-synthetic establishments and beverage base plants are not available from the Census data. However, according to the Development Document[1/], there are 60 non-synthetic plants and 22 beverage base plants. As no other sources of information were available, it will be assumed that the Development Document estimates are correct.

2. Value of Shipments

Value of shipments and other receipts of the Flavoring Extracts and Syrups, N.E.C., Industry in 1972 totaled $1,472.0 million. This included shipments of flavoring extracts and syrups, n.e.c., (primary products) valued at $1,245.2 million, shipments of other products (secondary products) valued at $188.7 million, and miscellaneous receipts (mainly resales) of $38.1 million.

1/ Development Document for Effluent Limitation Guidelines and New Source Performance Standards, Miscellaneous Foods and Beverages, U.S. Environmental Protection Agency, March 1975.

Table I-1. The flavoring, extract and syrup industry, by employment size group, number of establishments, and value of shipments 1963-1972.

Number of Employees	1963 Establishments Number	1963 Establishments Percent of Total	1963 Value of Shipments Million Dollars	1963 Value of Shipments Percent of Total	1967 Establishments Number	1967 Establishments Percent of Total	1967 Value of Shipments Million Dollars	1967 Value of Shipments Percent of Total	1972 Establishments Number	1972 Establishments Percent of Total	1972 Value of Shipments Million Dollars	1972 Value of Shipments Percent of Total
1-4	250	48.1	18.8	2.6	198	45.9	14.2	1.4	160	40.0	29.6	2.0
5-9	97	18.6	23.8	3.3	68	15.8	21.2	2.1	60	15.0	37.1	2.5
10-19	76	14.6	70.0	9.6	55	12.8	42.7	4.2	65	16.2	89.9	6.1
20-49	54	10.4	113.4	15.5	61	14.2	161.8	16.0	70	17.5	311.2	21.2
50-99	24	4.6	219.6	30.1	23	5.3	168.3	16.7	20	5.0	197.4	13.4
100-249	16	3.1	127.6	17.5	22	5.1	334.1	33.1	20	5.0	438.4	29.8
250-499	1	0.2	156.5	21.4	3	0.7	266.9	26.5	3	0.8	368.3	25.0
500-999	2	0.4 }			1	0.2 }			2	0.5}		
1,000+	-				-				-			
Total	520	100.0	729.7	100.0	431	100.0	1,009.1	100.0	400	100.0	1,471.9	100.0

1/ Contains extensive duplication because the products of some establishments are used as materials by other establishments classified in the same industry.

Source: Census of Manufactures.

Estimates of the 1975 value of shipments for the industry are expected to total $1,803 million, 8 percent above the estimated shipments for 1974 and 22.5 percent above the 1972 value of shipments (Table I-2). Historically, the value of shipments increased by an annual average rate of 8.3 percent between the years 1958 and 1975. During this period, the actual rate has fluctuated between minus 2.2 to 18.2 but for most years the range has been relatively near the 17 year average of 8.3 percent.

Shipments of flavoring extracts and syrups, n.e.c., (primary products) in 1972 represented 87 percent (specialization ratio) of the industry's total product shipments (primary and secondary). The industry specialization in 1967 was 94 percent. Secondary products shipped by this industry in 1972 consisted mainly of bottled and canned soft drinks ($20 to $50 million); cane sugar refining ($20 to $50 million); and food preparations, n.e.c., ($43.6 million).

Shipments of flavoring extracts and syrups, n.e.c., (primary products) from establishments classified in industry 2087 in 1972 represented 86 percent (coverage ratio) of these products valued at $1,452.9 million shipped by all industries. In 1967, the coverage ratio was 85 percent. Other industries shipping flavoring extracts and syrups, n.e.c., consisted mainly of industry 2086, Bottled and Canned Soft Drinks, ($20 to $50 million); industry 2043, Cereal Breakfast Foods, ($20 to $50 million); and industry 2099, Food Preparations, N.E.C., ($47.0 million).

3. Level of Integration

The Flavoring Extracts and Syrups Industry can be characterized as containing varying levels of integration with forward integration being the most common. As previously stated, the Flavoring Extracts and Syrup Industry is partially comprised of beverage base plants which produce concentrate and syrups for soft drink manufacturers. These plants are usually owned by national soft drink brands and furnish their products to franchised soft drink bottlers. In this sense, the Flavoring Extract and Syrup Industry can be thought of as forwardly integrated.

4. Number of Products

Flavoring extracts and syrups are produced in a wide variety of forms and concentrations -- extracts, concentrates, powders, emulsions, tablets and essences -- with the strength depending on the intended use of the product. Common flavoring extracts include vanilla, lemon, clove, cinnamon, orange, nutmeg, peppermint, and wintergreen. The industry also produces beverage bases utilized by soft drink bottlers in their production of soft drinks.

5. Level of Diversification

The Census of Manufactures shows the Flavoring Extracts and Syrups Industry with a relatively high specialization ratio of 87 percent. This indicates 87 percent of the sales of establishment classified in SIC 2087 are in the

Table I-2. The flavoring extract, and syrup industry, value of shipments, 1958-1972

Year	Value of Shipments ($ Million)	Percent Change (%)
1958	477.1	
1959	535.2	12.2
1960	*548.3	2.4
1961	*559.3	2.0
1962	*661.3	18.2
1963	729.7	10.3
1964	833.1	14.2
1965	836.5	0.4
1966	974.4	16.5
1967	1,009.1	3.6
1968	1,145.5	13.5
1969	1,173.7	2.5
1970	1,361.3	16.0
1971	1,331.9	-2.2
1972	1,471.9	10.5
1973	1,600.0	8.7
1974	1,669.0	4.3
1975	1,803.0	8.0

* limited reliability (high standard errors)

Source: U.S. Department of Commerce, Census of Manufactures, and Bureau of Domestic Commerce, 1975 Industrial Outlook.

primary SIC code. The remaining 13 percent of the industry's shipments primarily consist of soft drinks and food preparations. It can be assumed, in general, that the industry is not widely diversified.

6. Location of Plants

Flavoring Extract and Syrup plants tend to locate either near a major metropolitan area or else near a source of raw materials, which in many cases is a port. As is depicted in Table I-3, 35 percent of all plants are located in the northeast region of the United States. Most of these plants are located in either New York, New Jersey or Pennsylvania. The next most concentrated area in terms of plants is the north central region. Illinois contains the most plants in this region. The remainder of the plants are distributed in the south or the west regions.

In terms of production, the north central and the south regions, while they have fewer plants than the northeast region, are about equal in having the major portions of the industry's shipments; each with just over 33 percent of all shipments.

B. Employment Characteristics

Total employment in the Flavoring Extracts and Syrups Industry has increased by nearly 10 percent from 9,300 employees in 1958 to 10,200 in 1972 (Talbe I-4). During the 1958 to 1972 period the total number of persons employed in the industry varied considerably from year to year with a total range from 9,100 employees in 1963 to 10,800 in 1970. During the same time period production workers have accounted for 55 to 60 percent of all employees. This relatively low proportion of production workers may be partially explained by the fact that the corporate headquarters for the major soft drink bottlers may fall into this classification and thus their numerous management level individuals would be included in the all employees category.

Overall, the output per production worker has increased significantly with the value of shipments and value added per production worker tripled between 1958 and 1972. Portions of this increase may be attributable to inflation, however the major portion may be attributable to technological advances as well as the more efficient utilization of manpower.

The basic production worker can be described as semi-skilled, with much of the labor being involved with monitoring equipment and cleaning it during the changing of products. The average annual hours worked by production workers has remained relatively constant with the average being 2,067 hours in 1972. Hourly wages nearly doubled since 1958, increasing from $2.14 per hour in 1958 to $3.98 in 1972.

Table I-3. The Flavoring Extracts and Syrup Industry, regional distribution of plants and shipments, 1972.

Region	Value of Shipments ($ Million)	Percent of Total (Percent)	Number of Plants	Percent of Total (Percent)
Northeast	348.7	23.7	140	35.0
New York	168.3	11.4	47	11.8
New Jersey	119.1	8.1	40	10.0
Pennsylvania	19.5	1.3	25	6.3
Other States	41.8	2.9	28	6.9
North Central	489.5	33.3	107	26.8
Illinois	327.3	22.2	45	11.3
Missouri	68.3	4.6	14	3.5
Other States	93.9	6.5	48	12.0
South	487.6	33.1	87	21.7
West	146.2	9.9	66	16.5
California	118.4	8.0	49	12.3
Other States	27.8	1.9	17	4.2
United States	1,472.0	100.0	400	100.0

Source: U.S. Department of Commerce, Bureau of Census, Census of Manufactures.

Table I-4. The flavoring extract and syrup industry, employment statistics 1958-1972

Year	All Employees		Production Workers			Value of shipments per production worker	Man hours per production worker	Wage per production worker man-hour	Value added per production worker man-hour
	Number (000)	Payroll ($ Mil.)	Number (000)	Man-Hours (Mil.)	Wages ($ Mil.)	($000)		($)	($)
1958	9.3	47.5	5.3	10.3	22.0	90.0	1,943	2.14	24.21
1959	9.5	52.2	5.5	11.6	23.4	97.3	2,109	2.02	24.54
1960*	9.5	51.2	5.3	10.8	22.9	103.5	2,038	2.12	28.42
1961*	9.5	53.5	5.4	11.1	23.5	103.6	2,056	2.12	30.18
1962*	9.6	56.4	5.4	11.4	24.6	122.5	2,111	2.16	32.82
1963	9.1	56.6	5.0	10.2	25.1	145.9	2,040	2.46	39.24
1964	9.4	63.5	5.2	11.5	27.8	160.2	2,212	2.42	38.97
1965	9.4	62.8	5.0	10.1	25.7	167.3	2,020	2.54	48.27
1966	10.6	70.8	5.9	11.7	31.3	165.2	1,983	2.68	47.48
1967	9.7	73.0	5.5	11.0	33.0	183.5	2,000	3.00	53.09
1968	9.3	71.5	5.4	10.8	33.3	212.1	2,000	3.08	61.76
1969	10.1	77.3	5.8	12.0	37.9	202.4	2,069	3.16	56.14
1970	10.8	91.1	6.3	12.8	43.3	216.1	2,032	3.38	61.88
1971	9.8	91.4	5.3	11.1	39.7	251.3	2,094	3.58	68.57
1972	10.2	100.9	6.0	12.4	49.4	245.3	2,067	3.98	70.31

* data for these years has limited reliability

Source: Census of Manufactures.

As would be expected the majority of the employees are concentrated in larger establishments (Table (I-5). In 1972, just over 50 percent of the employees were employed by plants with more than 100 employees.

C. Other Considerations

No known plants in the industry discharge waste water other than to a municipal sewage system. For this reason, aggregate effects of water pollution controls are expected to be small.

However, aggregate impacts could be significant if other economic impacts to be expected in the next two to eight years, such as would be imposed by other Federal, State and local regulations are brought to bear upon the industry. The increasing cost of energy of all types and the possible limitations on natural gas consumption are also of concern.

These other economic impacts include but are not necessarily limited to the following:

OSHA;
Air pollution controls;
Solid waste controls;
Energy;
State and local waste water regulations; and,
Municipal system user charges.

Table I-5. The flavoring extract and syrup industry employment - 1972

Employment Size	All Employees	Percent of Total
1-4	300	2.9
5-9	400	3.9
10-19	900	8.8
20-49	2,200	21.6
50-99	1,300	12.7
100-249	2,800	27.5
250-499	} 2,300	} 22.6
500-999		
Total	10,200	100.0

Source: U.S. Department of Commerce, Bureau of the Census, Census of Manufactures.

II. FINANCIAL PROFILE OF THE INDUSTRY

Within the limits of information available, this chapter will present the financial characteristics of the Flavoring Extracts and Syrups Industry. There is little, if any, information concerning the non-synthetic plants and as such, the aggregated industry will be used.

A. Sales

For 1975, the industry's value of shipments were estimated to amount to $1,803 million (Table I-2). This compares to $1,361 million in 1970 and $548 million in 1960. During an average year between 1958 and 1975, the yearly value of shipments would have increased by 8.3 percent over the previous year's shipment. As the Flavoring Industry is closely related to the Soft Drink Industry, it should be noted that sales of soft drinks have increased by over 200 percent since 1954.

The Census value of shipments was based on data obtained from 400 different establishments. Thus the average establishments had shipments worth $3.7 million in 1972. This compares to $2.3 million in 1967 (Table II-1).

While the average plant had sales of $3.7 million in 1972, the actual sales of plants varied considerably. Actual plants ranged from small operations employing less than 5 employees with annual shipment of $185,000 to large operations with more than 250 employees and shipment of $73.6 million.

B. Distribution of Sales Dollars

Very little change has occurred in the industry in terms of the distribution of its sales dollars. In 1967 just over 50 percent of the total industry sales went for miscellaneous operating costs, taxes and profits. In 1972 this had increased to 51.5 percent. Raw materials and labor portions of the sales dollar decreased between 1967 and 1972. These are summarized below:

Distribution of Sales Dollar (Percent)

	1967	1972
Total Sales	100.0	100.0
Raw Materials	42.6	41.6
Payroll	7.2	6.9
Other operating costs, taxes andprofits	50.2	51.5

Table II-1. Flavoring Extracts and Syrup Industry, value of shipments, value added and employees census years 1963, 1967, and 1972.

Item	Units	1963		1967		1972	
		Industry Total	Per Establishment	Industry Total	Per Establishment	Industry Total	Per Establishment
Establishments	No.	520	-	431	-	400	-
Value of Shipments	$ Mil.	729.7	1.40	1,009.1	2.34	1,471.9	3.68
Value Added	$ Mil.	400.2	0.77	584.0	1.35	871.9	2.18
Total Employees	No.	9,100	18	9,700	22	10,200	26

Source: U.S. Department of Commerce, Census of Manufactures.

C. Earnings

The only data available concerning the earnings of the Flavoring Extracts and Syrups Industry which were not aggregated with the Soft Drink Industry were found in Statement Studies, by Robert Morris Associates[1/]. According to this source profits before taxes for the industry were approximately 4.2 percent of sales in 1974. This compares to a similar figure for 1972 of 5.1 percent. In 1974 the industry's ratio of profit before taxes to worth ranged from 9.4 percent to 39.5 percent with an average of 19.5 percent. The ratio of profit before taxes to total assets ranged from 2.7 percent to 21.8 percent with an average of 6.3 percent.

D. Ability to Finance New Investment

The ability of a firm to finance new investments for pollution abatement is a function of several critical financial and economic factors. In general terms, new capital must come from one or more of the following sources: (1) funds borrowed from outside sources; (2) equity capital generated through the sale of common or preferred stock; (3) internally generated funds -- retained earnings and the stream of funds attributed to depreciation of fixed assets.

For each of the three major sources of new investment, the most critical set of factors is the financial condition of the individual firm. For debt financing, the firm's credit rating, earnings record over a period of years, stability of earnings, existing debt-equity ratio and the lenders' confidence in management will be major considerations. New equity funds through the sale of securities will depend upon the firm's future earnings as anticipated by investors, which in turn will reflect past earnings records. The firms' record, compared to others in its own industry and to firms in other similar industries, will be a major determinant of the ease with which new equity capital can be acquired. In the comparisons, the investor will probably look at the trend of earnings for the past five years.

Internally generated funds depend upon the margin of profitability and the cash flow from operations. Also, in publicly held corporations, stockholders must be willing to forego dividends in order to make earnings available for reinvestment.

[1/] Robert Morris Associates, Statement Studies, 1975 Edition.

The condition of the firm's industry and general economic conditions are also major considerations in attracting new capital. The industry will be compared to other similar industries (i.e., other beverage industries) in terms of net profits on sales and on net worth, supply-demand relationships, trends in production and consumption, the state of technology, impact of government regulation, foreign trade and other significant variables. Declining or depressed industries are not good prospects for attracting new capital. At the same time, the overall condition of the domestic and international economy can influence capital markets. A firm is more likely to attract new capital during a boom period than during a recession. On the other hand, the cost of new capital will usually be higher during an expansionary period. Furthermore, the money markets play a determining role in new financing.

Based on the previous discussion in this chapter and Chapter I, it appears that it will not be difficult for the majority of firms to acquire sufficient new capital to finance investment. In most instances, these plants are owned by large conglomerates with adequate abilities to finance new investments.

E. Cost of Capital - After Tax

Return on invested capital is a fundamental notion in U.S. business. It provides both a measure of actual performance of a firm as well as expected performance. In this latter case, it is also called the cost of capital. The cost of capital is defined as the weighted average of the cost of each type of capital employed by the firm, in general terms equities and interest bearing liabilities. There is no methodology that yields the precise cost of capital, but it can be approximated within reasonable bounds.

The cost of capital was determined for purposes of this analysis by estimating performance measures of the industry. The weights of the two respective types of capital for the Flavoring Extract and Syrup Industry were estimated at 32 percent debt and 68 percent equity. The cost of debt was assumed to be 10.0 percent. The cost of equity was determined from the ratio of earnings to net worth and estimated to be 9.5 percent.

To determine the weighted average cost of capital, it is necessary to adjust the before tax costs to after-tax costs (debt capital only in this case). This is accomplished by multiplying the costs by one minus the tax rate (assumed to be 48 percent). These computations are shown below and result in the estimated after-tax cost of capital being 8.1 percent.

Weighted Average After Tax Cost of Capital

Item	Weight	Before Tax Cost	Tax Rate	After Tax Cost	Weighted Cost
Debt	.32	10.0	.48	5.2	1.7
Equity	.68	-	-	9.5	6.4
					8.1

III. MODEL PLANTS

The model plant described in this chapter represents the operational and financial characteristics of a plant which is likely to be built after the promulgation of the guidelines and hence is called a NSPS (New Source Performance Standard) model plant. The model was not constructed to describe existing plants which are direct dischargers.

The operating and financial data contained in this chapter pertain to a plant which is representative of actual plants in the industry and does not reflect information pertaining to specific plants or firms. The data were obtained from industry contacts and published sources.

A. Industry Processes

The Non-Synthetic Flavoring Extracts and Syrups Industry is comprised of a variety of plants which utilize several basic processes to produce numerous products. Some of the more common processes and their resultant products are described below:

Flavoring extracts from essential oils - This process produces standard, terpeneless, and concentrated flavoring extracts from essential oils. Essential oils are liquids which occur naturally in many types of plants or which may be produced by extraction, steam or dry distillation, or, in some cases, destructive distillation.

The preparation of a standard flavoring extract involves a blending process in which specified formulas of the essential oil, alcohol and water are mixed in tanks. In some cases it is desirable to produce a more water soluble flavor, which is accomplished by removing the more insoluble components (terpenes) by either vacuum distillation or solvent extraction. Finally, concentrated extracts are produced in the same manner as standard extracts except the formula is modified to make the final extract more concentrated.

Flavoring extracts from direct solvent extraction of aromatic plant tissues - The most common extract produced by this process in vanilla which is extracted from vanilla beans. The beans are initially chopped and then steeped in an alochol-water solution. The vanilla extract is then drawn off through a filter and adjusted to the desired concentration of water, alcohol and sugar, stored and finally bottled.

Natural Flavoring Concentrates and Powders - These are derived from plant liquid or essential oils. Fruit liquor is usually used in the case of fruit concentrates and powders while essential oils are used for spice concentrates and powders.

In order to produce fruit concentrates or powders, fruits are washed and chopped and the fruit liquor containing water, oil, and fruit particles is expressed from the chopped fruit. To prepare the fruit concentrate the liquor is evaporated under vacuum. If powdered flavor is to be produced, the liquor together with vitamins, sugar, and acid is completely dehydrated. The production of spice concentrates involves the evaporation of essential spice oils. The oils are removed for the production of powder.

Finished Specific Flavors and Cordials - The manufacturing of finished flavors and cordials is a blending process in which natural and/or synthetic flavoring extracts are blended in numerous proportions and combinations with other ingredients such as alcohol, sugar, coloring agents, and water.

Beverage Bases - By far the majority of beverage bases, both concentrates and syrups, are manufactured by major soft drink companies in plants which produce concentrates and/or syrups exclusively.

The flavoring extracts, acids, treated water, colors, and sugar (except in concentrate production) are proportioned from storage tanks into large, stainless steel mixing tanks and blended. The product is then strained through a wire mesh screen and packaged or shipped in bulk by tank cars or trucks.

B. NSPS Model Plant

Based on information provided in the Development Document, the new source model plant (that is, the plant which has yet to be constructed and will be required to meet new source performance standards if it will be a direct discharger) was determined to be a facility which primarily produces beverage bases and which manufactures approximately 80,000 gallons per day. The size of this new source model plant may seem to be rather large but this was determined to be appropriate as it is doubtful if: (1) any new small flavoring extracts or syrups plants would be built; and (2) if a new plant were to be built, it is probable that only a large plant would consider the alternative of treating its own effluent (the small plant would probably locate in a city and discharge to a municipal sewer system).

The basic description information concerning the production and investment characteristics of the model plant are depicted in Table III-1. The

Table III-1. The Soft Drink Syrups and Concentrates Industry, NSPS model, descriptive information.

Production		
Daily Plant Capacity (Gallons)	80,000	
Days per year	230	
Plant Utilization (Percent)	85%	
Annual Production (Gallons)	15,640,000	
Average Employees	204	
Investment ($1,000)	Book	Salvage
Total Assets	$29,403	$5,881
Fixed Assets	18,999	18,999
Current Assets	10,404	10,404
Current Liabilities	4,444	4,444
Net Working Capital	5,960	5,960
Total Invested Capital	24,959	11,841

financial profile of the model is shown in Table III-2. These model plant profiles were developed utilizing the limited data available from the Census of Manufactures, and Robert Morris Associates, Statement Studies.

Table III-2. NSPS model plants for the Soft Drink Syrups and Concentrates Industry, financial profile.

Daily Plant Capacity (Gallons)	80,000	
Plant Utilization	85%	
Days per year	230	
Annual Production (Gallons)	15,640,000	
	($1,000)	(Percent)
Sales ($2.82/gallon)	44,104.8	100.0
Less		
Production Costs	31,799.6	72.1
Other	7,669.6	17.4
Total Costs	39,469.2	89.5
Cash Earnings	4,635.6	10.5
Less:		
Depreciation	2,352.2	5.3
Interest	441.0	1.0
Pre-Tax Income	1,842.4	4.2
Income Tax	877.8	2.0
After-Tax Income	964.6	2.2
Cash Flow	3,316.8	7.5
Returns		
After-Tax Return on Sales		2.2
After-Tax Return on Total Invested Capital		3.9
Cash Flow		
As a Percent of Sales		7.5
As a Percent of Total Invested Capital		13.3

IV. PRICING PATTERNS

The industry impact of increased processing costs associated with imposition of requirements for effluent pollution controls on the Soft Drink Syrups and Concentrates Industry will be directly influenced by the ability of processors to pass pollution control costs forward to the consumer, in the the form of higher prices for finished products, or backward to suppliers, in terms of lower prices for raw materials and purchased services. To the extent that such cost transference opportunities are limited, the costs of effluent controls will have to be absorbed by processors; profits will be reduced and the impact on the industry will be more severe. The reversal of this situation would tend to reduce the severity of the impact on the industry.

This chapter will examine those industry and product characteristics which affect the ability of the Flavoring Extract and Syrup Industry to make the required pricing adjustments.

A. Price Determination

The determination of prices for the industry's product involves the complex interaction of demand, the available supply and the corporate strategy set by the industry leaders (particularly for the beverage base plants).

1. Demand

The demand for flavoring extracts and syrups can be associated with two differing markets. First, there is the production of extracts and syrups for sale to individual consumers for eventual sale in the retail store, and second there is the soft drink bottlers who require syrups and beverage bases to be used in the production of soft drinks. The demand for extracts and syrups differs for these two markets as one deals with consumers' trends and consumption preferences and product recognition (the sale to individuals of extracts and flavorings) and the other deals with the same consumer attitudes but also with the policies as set forth by large national soft drink companies.

Unfortunately, little information is available concerning the demand characteristics associated with the sale of extracts and syrups to individuals. There is however, some information concerning the demand trends for soft drinks which can be directly related to beverage bases and concentrated syrups. This information is described below.

Soft Drink Demand - The demand for soft drinks is reflective of the quantity of soft drinks the consumers are willing to buy at the current level of prices. Historically, soft drink demand has been steadily increasing, with the average annual increase since 1960 being 6.4 percent. In 1960, the average number of 8 ounce equivalents consumed per capita was 192; by 1973 this has increased to 430 8-ounce units. The per capita consumption of soft drinks for the years 1960 through 1973 are depicted below.

Per Capita Consumption of Soft Drinks

Year	Total Per Capita Sales	Percent Change from Previous Year
1960	192	--
1961	198	3.0
1962	213	7.6
1963	227	6.6
1964	243	7.0
1965	259	6.6
1966	287	10.8
1967	298	3.8
1968	332	11.4
1969	344	3.6
1970	363	5.5
1971	388	6.9
1972	406	4.6
1973	430	5.9

When aggregated, soft drink purchasers consumed approximately 35.4 billion 8-ounce equivalent in 1960. For 1973, this quantity had increased by 155 percent to 90.2 billion.

For 1974, the quantity consumed may have only increased modestly due to customer resistance to higher prices. The higher prices were primarily attributed to higher sugar costs, consumers, already faced with soaring food bills and a generally inflationary environment, began to cut back on purchases of name-brand soft drinks. This consumer resistance took the form of increased purchases of private-label brands and other competing beverages such as beer, powdered drinks and fruit juices. According to Standard and Poor's Industry Surveys, the outlook for 1975 is one of uncertainty and, thus, we can conclude the demand for soft drinks will depend on a variety of factors, the most important being price.

2. Supply

The supply of flavoring extracts and syrups is primarily set by the expected quantities demanded by either consumers or soft drink bottlers. In 1972, approximately 50 percent of the materials consumed was sugar, with the remainder being fruit juices, essential oils and various types of plants and beans as well as other supplies and containers. As such it is difficult to identify those inputs which could act as a constraint on the potential supply of flavoring extracts, syrups and beverage bases since at any given time any one commodity could experience a shortage.

3. Market Structure

The products of the Non-Synthetic Flavoring Extract and Syrup Industry are numerous and differentiated with many of the plants producing several products for sale in a wide range of market structures. In some instances a plant may market its product(s) directly to retail stores or it may produce flavoring extracts for use by another manufacturer (i.e., soft drink bottlers, bakers and confectioners). Thus the market structure may be one of nearly pure competition for some products and oligopolistic for other products. Accordingly, the ability of industry members to influence their products' prices vary.

While there is a wide range of market environments in the Flavoring Extracts and Syrups Industry, the greatest portion of the industries' shipments are made in a market which could be characterized as oligopolistic. This is based on Census data which depicts that in 1972, the largest 4 companies accounted for 62 percent of the industry's shipments and the largest 8 companies accounted for 70 percent.

A strict economic definition of an ologopoly is as follows:

> "A market situation where sellers are so few that the supply offered by any one of them materially affects the market price, and, in which, because sellers are so few, each one is able to measure, with a fair degree of accuracy, the effect of his price and production decisions upon similar decisions by his competitors."

In an oligopolistic industry, the pricing decision is subject to a greater uncertainty because of interdependent reaction, i.e., if a price increase does not succeed the firm may experience a substantial loss in sales, profit, and prestige. Therefore, the oligopolistic firm is likely to possess more discretion, and therefore to view the pricing decision in a longer term perspective and is less likely to attempt to equilibrate supply and demand in the short run. When demand rises, more of the burden of market adjustment will fall on rationing and backlogs of orders,

particularly since purchasers have fewer alternative sources of supply. When demand falls, more of the adjustment will be on lower production instead of cutting of price.[1]

According to interview studies, a common principle of long-term pricing appears to be to set price to earn a target rate if return on capital at a standard volume of output.[2] Price is altered if the cost of producing the standard output changes, either because of changes in prices of the main inputs or because of technological progress. According to this practice, for a level of output at or above breakeven point, average direct cost per unit is estimated and a given percentage of direct cost is added to cover both fixed cost per unit and the desired target rate of return. The price based on this formula may be called the normal price. The actual price that a firm seeks to charge in a given location is the normal price adjusted for freight charges, discounts as allowances and the market strategy (i.e., advertising campaigns and "specials", for that area.

The firms that ordinarily set the price as price leaders usually have cost advantages based on location and scale and are usually large in terms of their local market share. Other firms that have less of a cost advantage and produce lower volumes of output will charge an actual price close to that of the actual prices charged by the price leaders. The normal prices determined by the price leaders in a given location are often the price at which they presumably maximize their profits (or minimize their losses).[3]

B. Price Trends

There is very limited data concerning the price trends of the various products of the Non-Synthetic Flavoring Extract Industry. The only relevant data found were the wholesale price index for flavoring syrup and this was available only since 1971. As can be seen in Table IV-1, the price of flavoring syrup remained relatively stable between 1971 and 1973 increasing by only 6 percent. In 1974, however, the flavoring syrup price increased significantly and by December of 1974 had increased by 137 percent over the average price in 1973. As can be seen in the table much of this increase may be attributable to rather significant increases in sugar prices which increased 345 percent during the same period. Finally, it should be noted that as the flavoring syrup price increased, the wholesale price of cola soft drinks also increased; thus the influence of the Flavoring Extract and Syrup Industry can be seen in the Soft Drink Industry.

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[1] Eckstein, Otto and From, Gary, "The Price Equation," The American Economic Review, December, 1968.

[2] Kaplan, A.D.H., Dirlam, J.B., and Lazzilotti, R.R., Pricing is Big Business - A Case Approach, 1958.

[3] Environmental Protection Agency, Economic Analysis of Proposed Effluent Guidelines Cement Industry, August, 1973.

Table IV-1. Wholesale Price Index -- selected products (1967=100)

Year	Flavoring Syrup	Granulated Sugar Cane	Cola Drink
	Average		
1970	N.A.	113.3	121.5
1971	109.5	118.3	123.7
1972	115.3	124.2	126.3
1973	116.1	134.6	124.4
1974	170.9	323.5	148.6
January	119.3	144.8	123.6
February	120.7	163.2	123.6
March	123.6	201.8	125.5
April	133.4	201.8	130.9
May	144.0	250.9	133.2
June	155.0	288.1	144.8
July	167.3	322.7	156.1
August	187.1	341.6	157.6
September	188.0	399.6	160.3
October	211.3	413.0	173.1
November	226.6	555.7	175.9
December	275.0	599.4	178.8

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

V. EFFLUENT CONTROL COSTS

The effluent control system requirements and costs depicted in this chapter were provided by the Effluent Guideline Division of the Environmental Protection Agency as provided by the technical contractor, Environmental Science Engineering. The recommended treatment alternative for the NSPS model soft drink syrup and concentrate was the same as presented in the Development Document 1/. However, the associated investment and annual operating costs were developed by the technical contractor in accordance with the model plant's production characteristics previously described in Chapter III.

A. Pollution Control Requirements

Three effluent control levels for point source categories (direct dischargers) were originally considered:

BPT - Best Practical Control Technology Currently Available, to be achieved by July, 1977

BAT - Best Available Pollution Control Technology Economically Available, to be achieved by July, 1983

NSPS - New Source Performance Standards are recommended to be equal to the BAT control level and to apply to any source for which construction starts after the publication of the proposed regulations.

As was stated in Chapter I of this report, the Non-Synthetic Flavoring Extract Industry presently has no known establishments which do not utilize municipal sewage systems for effluent discharge. Accordingly, only an NSPS model plant was developed and subsequently cost data provided pertained only to the NSPS model.

The flow for the NSPS model plant was determined to be 80,000 gallons per day with a waste load of 2,400 mg/l biological oxygen demand (BOD) and 50 mg/l suspended solids (SS).

The recommended effluent limitation guidelines for NSPS plants are as follows (expressed in kg/cu. m. finished product):

1/ Development Document for Effluent Limitation Guidelines and New Source Performance Standards, Miscellaneous Foods and Beverages, Point Source Category, Draft Report prepared by Environmental Science and Engineering, Inc., for the U.S. Environmental Protection Agency.

NSPS RECOMMENDED GUIDELINES

	Max. 30-day Average	Max. Day
BOD	0.050	0.112
SS	0.015	0.042

B. Discharge Status of the Industry

At the present, all known plants in the Non-Synthetic Flavoring Extract and Syrup Industry discharge their effluents to municipal treatment facilities.

C. Pollution Control Costs

The cost estimate in 1972 dollars and the components of the recommended treatment alternative (activated sludge) for the NSPS model plant are shown in Table V-1. Shown in Table V-2 are the costs for an optional treatment alternative (aerated lagoon) which could be implemented if it was determined desirable. From the information provided, total investment and annual costs were modified so as to be consistent with the model plant characteristics described in Chapter III. These modifications, however, did not change the technical cost basis of the costs provided by the EPA.

Modifications made to the treatment alternatives' costs for the NSPS plant consisted primarily of inflating investment and annual costs from 1972 to 1974 dollars by use of the Engineering News Record Construction Cost Index (1.205 times the EPA provided costs). The resulting treatment costs in 1974 dollars for both the recommended and optional treatment alternatives are summarized below:

	Investment Costs	Annual Operating Costs	Total Yearly Costs
Recommended System	$ 908,823	$ 99,087	$189,969
Optional System	$ 390,649	114,692	153,756

TABLE V-1

ITEMIZED COST SUMMARY FOR BEVERAGE BASE PLANT (NEW SOURCE)
ALTERNATIVE A 28-VII(NSPS)

ITEMIZED COST SUMMARY FOR WASTEWATER TREATMENT CHAIN
DESIGN EFFICIENCY... 97-9[illegible] PERCENT BOD REDUCTION

TREATMENT MODULES:

B1..CONTROL HOUSE
B...PUMPING STATION
C...EQUALIZATION BASIN
K...ACTIVATED SLUDGE
G...SLUDGE THICKENER
R...AEROBIC DIGESTOR
S...VACUUM FILTRATION
Y...HOLDING TANK
N...DUAL MEDIA PRESSURE FILTRAIN

INVESTMENT COSTS:	
1. CONSTRUCTION	334190.00
2. LAND	353180.00
3. ENGINEERING	33020.00
4. CONTINGENCY	33020.00
TOTAL	754210.00

YEARLY OPERATING COSTS:	
1. LABOR	37480.00
2. POWER	33470.00
3. CHEMICALS	0.0
4. MAINTENANCE&SUPPLIES	11280.00
TOTAL	82230.00

TOTAL YEARLY COSTS:	
1. YEARLY OPERATING COST	82230.00
2. YEARLY INVESTMENT COST RECOVERY	30170.00
3. DEPRECIATION	20050.00
TOTAL	132450.00

Source: Effluent Guidelines Division, Environmental Protection Agency

TABLE V-2

ITEMIZED COST SUMMARY FOR BEVERAGE BASE PLANT (NEW SOURCE)
ALTERNATIVE A 28-VI (NSPS-OPTION)

ITEMIZED COST SUMMARY FOR WASTEWATER TREATMENT CHAIN
DESIGN EFFICIENCY... 97.9 PERCENT BOD REDUCTION

TREATMENT MODULES:

B...PUMPING STATION
C...EQUALIZATION BASIN
L...AERATED LAGOON
N...DUAL MEDIA PRESSURE FILTRAIN

INVESTMENT COSTS:

1.	CONSTRUCTION	261450.00
2.	LAND	4160.00
3.	ENGINEERING	26140.00
4.	CONTINGENCY	26140.00
5.	PVC LINER	6300.00
TOTAL		324190.00

YEARLY OPERATING COSTS:

1.	LABOR	12490.00
2.	POWER	75920.00
3.	CHEMICALS	0.0
4.	MAINTENANCE&SUPPLIES	6500.00
5.	PVC LINER	270.00
TOTAL		95180.00

TOTAL YEARLY COSTS:

1.	YEARLY OPERATING COST	95180.00
2.	YEARLY INVESTMENT COST RECOVERY	12970.00
3.	DEPRECIATION	16000.00
TOTAL		124150.00

Source: Effluent Guidelines Division, Environmental Protection Agency

Investment costs depicted above include costs for construction, land, engineering and a contingency fee. Annual operating costs include labor, power, chemicals, maintenance and supplies. Total yearly costs include annual operating costs, depreciation and interest (based on 10 percent of one half the total investment costs). For purposes of the impact analysis, the depreciable life of the pollution control equipment was determined to be 20 years.

Total investment costs for pollution control systems expressed as a percent of the NSPS model plant total investment and total yearly costs expressed as a percent of annual sales are depicted below:

	Total investment for pollution controls as a percent of model investment	Total yearly costs for pollution controls as a percent of annual sales
Recommended NSPS Treatment Alternative	3.1	0.4
Optional NSPS Treatment Alternative	1.3	0.4

VI. ECONOMIC IMPACT ANALYSIS

The impacts considered in this analysis are as follows:

A. Price effects
B. Financial effects
C. Production effects
D. Other effects

The resulting impacts from the imposition of effluent controls on Non-Synthetic Flavoring Extracts and Syrup Industry for existing plants are expected to be negligible as all known plants discharge their effluent to municipal sewage treatment systems. Thus, the impacts described herein will pertain only to those plants which are yet to be constructed who will discharge their effluent directly to navigable waters (hereafter referred to as New Source). These impacts are analyzed for the NSPS model plant described in Chapter III. Impacts are based on the production and financial characteristics of the NSPS model plant and pollution control costs as presented in Chapter V.

It should be noted that in Chapter V two sets of control costs were described, the recommended treatment system and an optional treatment system. For purposes of this impact analysis, only the recommended treatment system will be utilized. This treatment alternative consists of an activated sludge system and according to industry sources, most new source plants which could be built, would be located such that the activated sludge system would have many advantages over the optional aerated lagoon system.

A. Price Effects

1. Required Price Increase

An implicit indicator of the expected price effects of pollution controls used in this report is the amount of sales price increase necessary to maintain a NSPS plant's profitability, after pollution control expenditures, at a level the same as a similar plant without the pollution control expense. The method of computation was discussed in Part I, Chapter II (Methodology), Section F, under subsection 2 of this report. The ability of a new plant to pass on such price increases is evaluated in this section of the report.

The amount of sales price increase necessary to offset NSPS pollution control costs for the model NSPS plant is depicted below. Also shown are sensitivity ranges of required price increases when pollution control costs vary plus or minus 20 percent from the estimated cost.

NSPS Model Plant	Daily Plant Capacity (Gallons)	Required Price Increase (%) -20%	Estimate	+20%
	80,000	0.4	0.5	0.5

2. Expected Price Increases

Although the above illustrated price increases indicate what the NSPS model plant would require to offset expenditures for pollution controls, it is doubtful new plants would be able to pass on the additional expense to customers in the form of higher prices. This is due to (1) the discharge status of the Flavoring Extract Industry and (2) financial effects of building new point source plants relative to the market characteristics of the industry.

As stated above, it is unlikely new source beverage base plants will be able to pass on required price increases due to pollution controls due to, in part, the discharge status of the industry. As pointed out earlier, all known soft drink syrup and concentrate plants discharge processing waters to municipal facilities. Although municipal charges have and are expected to continue to increase, the charges have usually been and are expected to be lower than private treatment costs. In general, new sources will only be able to pass on required price increases due to NSPS levels of control to the extent increased municipal charges are passed on by a majority of financially viable plants in the industry. However, should municipal charges become higher than private costs of treatment, new sources would have a competitive advantage and would have the opportunity to pass on the increased costs of effluent controls assuming industry prices increased to offset the increasing municipal charges. Although not quantifiable at this time, some industry sources feel that, especially in large urban areas, this situation is likely to happen in the near future.

The market characteristics of the industry may provide some capabilities for new plants to pass on pollution control costs but these will be limited to only those plants built in an area where the location or production efficiency of the plant generates a competitive advantage. In other words, an impacted plant which can produce and/or deliver its product at lower costs than its competitor, may be able to utilize its greater margin to absorb the control costs and still remain competitive.

However, for those new source plants which do not achieve a competitive advantage, it is probable that such plants will not be able to pass on required price increases. As discussed in earlier chapters of this report, the Flavoring Extracts Industry has not experienced high rates of return and as shown below in Section B, Financial Effects, the high cost of new plant construction are not offset by lower operating costs through improved technology. This results in new point sources having the same to lower income ratios than existing plants and negative net present values of cash flow when discounted at the estimated industry after-tax cost of capital (8.1 percent).

Therefore, based on the low profit margin and market structure of the Non-Synthetic Flavoring Extracts and Syrup Industry, price increases by new point sources to offset pollution controls, and high costs of construction are not expected to occur. In the following analysis, no price change was assumed to occur due to the entire industry increasing prices to offset effluent controls and, accordingly, the economic viability of the new source plants was based on financial characteristics of the model without added revenue stemming from aggregate pollution control effects on industry prices.

B. Financial Effects

Based on NSPS model plant profiles described previously and costs of pollution controls provided by EPA, the following financial indicators were computed under baseline (without pollution controls) and with pollution controls:

- After tax income
- After tax return on sales
- After tax return on invested capital
- Cash flow and cash flow as a percent of invested capital
- Net present value

The above were computed according to the discounted cash flow (DCF) and return on investment (ROI) procedures outlined in the methodology.

Furthermore a sensitivity analysis was performed using pollution control cost estimates at levels of 80 percent and 120 percent of the costs provided by EPA.

The results of the model plant analysis of the soft drink syrups and concentrate NSPS guidelines are summarized in Table VI-1. After the imposition of effluent controls, after-tax income, after-tax return on sales and after-tax return on invested capital are expected to decline 9 to 10 percent. Variance of the estimated control costs by plus or minus 20 percent results in only nominal changes in the above mentioned percentage reductions. Thus, it appears that NSPS effluent control investments and annual costs do affect the NSPS plants' returns, but only by relatively small amounts.

In terms of the effect of NSPS controls on cash flow return on invested capital, the percentage return declined from 13.3 percent for the baseline case to 13.0 percent (a drop of 2.3 percent) for the after controls case. When costs were varied plus or minus 20 percent, the after control return varied only slightly.

Table VI-1. Key values of impact analysis for soft drink syrups and concentrates: NSPS

Key Value	Baseline	Percent Proposed Control Costs		
		80%	100%	120%
After tax income ($000)	965	892	875	857
After tax return on sales (%)	2.2	2.0	2.0	1.9
After tax return on inv. cap. (%)	3.9	3.5	3.5	3.4
Est. cash flow ($000)	3,317	3,268	3,256	3,243
Cash flow as % of inv. cap.	13.3	13.1	13.0	13.0
Net present values ($000)	-10,781	-11,606	-11,813	-12,019

Net present values for the NSPS model plant are negative both before and after the imposition of controls (Table VI-1). As discussed in Part I, Chapter II (Methodology), large negative net present values would cause most firms to discard plans for building a new plant. Since the estimated net present value is negative before controls are imposed, it is concluded that very few plants, classified as a new source, would be built. However, it should be noted that the negative net present value indicates that the associated plant would earn less than the estimated 8.1 percent industry cost of capital. Thus, a NSPS plant may be built in the future provided the firm has been well established in the industry, has or has expectations to capture a major market share at profitable price levels and has an excellent financial performance record (e.g. a lower cost of capital). Should a NSPS plant be built, it can impact its Net Present Value to decline due to the requirement for pollution controls.

C. Production Effects

Although new source performance standards will not affect current levels of production, future growth in the industry could be seriously affected by the imposed controls. Point source category firms are potentially deterred from entry because of differential impacts of effluent treatment requirements.

However, as indicated in the above financial description, future growth from new sources is expected to be restrained by the high costs of construction not being offset by lower costs of production achieved through improved technology. Also a restraint is the inability of a new source to pass through costs for controls to the consumer. This does not completely rule out the possibilities for new sources. It is foreseeable that some operations, those which could be classified as optional producers, could construct and successfully operate a new plant. However growth for the industry, as a whole, is expected from additions to or alternatives of existing plants that are discharging effluent wastes to municipalities.

D. Other Effects

Other types of economic impact such as employment, community and balance of payments deficit effects are normally assessed when there are plant closures due to pollution controls. However, these other effects are not meaningful nor quantifiable in a report assessing new sources. Although employment is an important consideration to a potential new firm and increases in employment and local business are important to surrounding communities of a potential new plant, these effects are more related to the decision to construct a new plant. Thus, in this report, these related effects were not pursued.

PART VIII

LIMITS OF THE ANALYSIS

PART VIII

LIMITS OF THE ANALYSIS

A. General Accuracy

The data and other information used in this study were drawn from published governmental reports, industry trade associations and from extensive contacts with individual beverage firms. Information on status of effluent discharge, recommended effluent treatment systems and costs were furnished by EPA. Every effort was made to verify the data and other information used. The data and analyses will be reviewed by EPA and by specially-constituted committees of the major related trade associations and comments of both groups will be considered in finalizing the analysis.

Detailed data on size distribution by types of plants are not available. Using industry size distributions from the Census of Manufactures, together with information obtained from numerous trade associations, industry and university contacts, segmentation of size and type of plants were made for each industry.

The Beverage Industries were found to be mostly discharging to municipal treatment facilities. Since the scope of the work in this report is to assess the economic impacts of effluent limitation guidelines and new source performance standards on point source categories (direct dischargers), the majority of this report's effort was concentrated on the economic impacts of new source performance standards (NSPS). However, for industries in which direct dischargers were known to exist, analyses were also made of the economic impacts of BPT and BAT requirements on existing operations.

Financial information concerned with investments, operating costs and returns was not available for individual plants or firms. As a result, the financial aspects of the impact analysis were, of necessity, based on synthesized costs and returns for "representative" types of model plants. These costs and returns were developed from a variety of sources including published research from universities and government agencies, information obtained through trade associations from operating firms in the beverage industries, and published financial performance data.

Published information from the Internal Revenue Service, references such as Standard and Poors, Dun and Bradstreet and other sources of data on financial ratios and financial performance were also used and were checked by industry sources.

Throughout the study, an effort was made to evaluate the data and other information used and to update these materials wherever possible. Checks were made with informed sources in both industry, government and universities to help insure that data and information used were as reliable and as representative as possible. For example, construction costs, working capital

requirements, proportions of capital financed through debt and equity and profitability ratios were checked with the appropriate persons in industry firms who are experienced and knowledgeable in these matters. Efforts were made to use the latest data available.

Specifications of the contract require the Contractor to use effluent control costs provided by EPA. The Effluent Guidelines Division, EPA, together with its technical contractor, provided recommended alternative effluent control systems, investment costs and annual operating costs adapted to the types and sizes of "representative" model plants used in this analysis. The recommended alternatives primarily consisted of aerated lagoons or activated sludge systems. Disposition of final discharge by plant type and the industry was taken from the Development Document Draft and checked to the extent possible by the Contractor.

Given the accuracy of the pollution control costs, it is believed that the analysis represents a usefully accurate evaluation of the economic impact of the proposed effluent limitation guidelines and new source performance standards, point source categories on the six Beverage Industries.

B. Range of Error

Different data series and different sections of the analysis will have different possible ranges of error.

Errors in Data - Estimated data error ranges as an average for the industry are as follows:

		Error Range
(1)	Information regarding the organization and structure of the industry, number, location and size of plants, and other information descriptive of industry segments	± 10
(2)	Price information for products and raw materials	± 15
(3)	Cost information for plant investments and operating costs	± 15
(4)	Financial information concerning the beverage industries	± 10
(5)	Recommended alternative effluent treatment costs for new sources 1/	± 20

1/ Error ranges for effluent treatment costs are the Contractor's estimate. EPA did not provide error ranges.

C. Critical Assumptions

In an economic impact analysis of most any industry, it is inevitable that simplifying assumptions must be made to bring the problem into a framework of analysis consistent with the constraints of time, budget and data availability. The major critical assumptions used in this analysis are as follows:

1. Types and sizes of the model plants are representative of plants actually existing in the industry and of plants expected to be built in the future.

2. It is assumed the financial data are representative of costs and returns of existing plants or new plants to be constructed after promulgation of proposed guidelines. As stated earlier, the model plant financial data are on a constant 1974 dollar basis and can be adjusted at future times to reflect the future economic activity.

3. Levels of profitability reflected in model plant profiles (based primarily on the average of the period from 1970 to 1975 so as to include years of high and low profits) will be the same for new sources in the future.

4. It was assumed that the economic impacts of effluent controls on those products not included in the detailed analysis of "representative" plants could be evaluated in general terms through associating them with those "representative" model plants for which detailed analyses were made. This association was based primarily on the fact that models were developed for a single product plant which represented a majority of industry production. In most cases, there were actual plants producing products in similar combinations to the model plants which was the primary objective where possible.

5. Effluent control costs and control status estimates were supplied by the Effluent Guidelines Division, EPA. It is assumed that these data are realistic in terms of:

   (a) Applicability of effluent treatment systems recommended.
   (b) Investment and annual operating costs for systems
   (c) Percentage of total number of plants which are direct dischargers for each industry segment and for the industry in general reported in the Development Document Draft.

D. Remaining Questions

1. A major question, not addressed by this study, is concerned with the economic impact of effluent guidelines on those beverage plants discharging through municipal waste treatment systems, in total or in part. Nearly all plants in these industries are discharging to municipal systems. Municipal sewage charges and other costs related to such sewage services are reported to be rising rapidly. The economic impacts of these increasing sewage charges on beverage plants have not been determined. Such determination is needed to complete the evaluation of proposed effluent controls on the beverage related industries.

2. The use of the model plant approach necessarily raises questions as to the "representativeness" of the model plants used and in particular, the process of generalizing "by association" from the specific model plants analyzed to plants processing other beverages or combinations of beverages. However, the Wine, Malt, Beverage, Soft Drink and Distilled Spirits Industries are felt to be adequately represented. In the Malt and Flavoring Extracts industries, the lack of information from the industries, together with limitations on time and budget for this study, made a more detailed analyses of industry segments impracticable.

3. Another fundamental question which remains unanswered stems from the fact that this analysis was concerned only with the impacts of proposed effluent guidelines. It is recognized that there are other regulatory EPA programs in air and noise control, pesticide regulatory programs, OSHA, FDA, energy controls, consumer protection and various State controls, either existing or emerging which will influence the operations and profitability of plants studied. The analysis does not consider the full impact of this aggregate of regulations, particularly as they may affect the future of the beverage related industries. Although it is impossible to quantify the aggregate impacts of all these regulatory programs, it is evident that the combination of programs imposes additional burdens on management in keeping up with regulations, filing reports, replying to surveys and other similar administrative requirements, constitutes a significant degression from the major function of these firms -- producing beverages for human consumption.