

The Economic Contribution of the California Air Pollution Control Industry

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Abstract

The purpose of this study is to profile the California Air Pollution Control (APC) Industry. Little economic research has been performed on this industry, and few tools exist to estimate the impact air quality policy has had on this industry. After developing an industry definition, a database of companies was constructed, surveys were performed and results were modeled into a comprehensive set of industry statistics. In 2001, the California APC Industry generated \$6.2 billion in revenues representing 0.5% of the economy, and employing 32,000 Californians.

The APC industry can be divided into two subsets: a ‘Core APC Industry’ directly addressing air quality issues; and a ‘Clean Air Products Industry’ making less-emitting products, vehicles or energy sources. The APC industry has grown from \$450 million in 1970 to \$6.2 billion in 2001, a compounded annual growth rate of 9%. Growth is expected to continue, although at a more modest rate, and ample opportunities exist for California APC businesses around the world.

ARB programs are responsible for a considerable portion of revenues derived by APC companies. California is reasonably well positioned in the ‘Core APC Industry,’ but a potentially much larger opportunity exists of becoming leaders in the emerging ‘Clean Air Products Industry.’ Future policies can play a greater role in preserving air quality but also in stimulating the evolution of the APC industry.

Executive Summary

Background

The purpose of this study is to provide an economic profile of the California Air Pollution Control (APC) Industry. As the California Air Resources Board (ARB) has developed, introduced and maintained air quality standards and regulation over the years, there have been numerous occasions where the regulated community has objected to the institution of such policies on the grounds of a negative economic impact on their businesses and the California economy. ARB and members of the APC and the broader environmental industry have intuitively understood that if, for instance, \$2 million is spent on complying with an air regulation, a considerable portion of that \$2 million must show up in the economy as positive revenues earned by companies in the business of solving air quality problems. Little economic research has been performed to define, assess and quantify the economic contribution of this APC industry, and few tools exist to estimate the positive economic impact of air quality policy on this important component of the state economy. Therefore the results of this study are expected to provide information for a more balanced assessment of overall economic impacts resulting from air quality regulation and ARB programs.

Methods

To assess the APC industry in California the first step was to develop a consensus of the definition and structure of the APC industry. The definition process was completed with maximum input from ARB, other regulators, APC industry participants, trade associations and industry analysts. Proceeding from this definition, a database of APC companies was constructed from a variety of sources, surveys of APC firms of all types were performed and the results were compiled, analyzed and modeled into a comprehensive set of new industry statistics on the APC industry in California.

Results

The California APC Industry generated \$6.2 billion in revenues in 2001, employing 32,000 Californians. The \$6.2 billion in revenues represents approximately 0.5% or 1/200th of the California economy. The APC industry is a component of the larger environmental industry that represented \$27.5 billion in revenues in California in 2001, employing 178,000 Californians.

The APC industry can be divided into two major subsets: a 'Core APC Industry' which represents companies directly addressing air quality issues; and a less-defined 'Clean Air Products Industry' which represents companies making 'cleaner' or substantially less-emitting products or alternatives like

renewable energy or low-emission vehicles, industrial equipment or consumer goods. The ‘Core APC Industry’ accounted for 36% of revenues and 47% of employment and the ‘Clean Air Products Industry’ accounted for 64% of revenues and 53% of employment in 2001.

The APC industry has grown 14 times its size from \$450 million in 1970 to \$6.2 billion in 2001, a compounded annual growth rate of 9% and well ahead of the economic growth rate of the overall state economy during the same period. A total of 29,000 jobs have been added to the APC industry since 1970, or almost 1,000 jobs per year on average. Exports have grown to more than \$220 million in just the ‘Core APC Industry’ or 10% of the revenue total in 2001. Executives in the APC industry expect continued growth to 2010, although at somewhat more modest rates than in the past, and ample opportunities for California APC businesses to leverage the expertise gained in their own state market into markets in other states and around the world.

Conclusions

This study demonstrates that the APC industry is an important contributor to the state’s economy. While it is difficult to directly relate exact dollar figures to specific ARB program initiatives, it is clear that ARB programs are responsible for a considerable portion of the revenues derived by APC companies in the state. And while accurate statistics are not available on overall expenditures by the regulated community on air pollution control, it is clear that a significant portion of any of these expenditures remains in the state to result in no great loss in state economic activity or output.

California is reasonably well positioned in the ‘Core APC Industry’ with equipment and service companies that are competitive in solving air quality problems for industry and government—and efforts should be made by companies to promote this expertise. A common theme discussed by both government and private companies during this study, however, is the state of California being business leaders in the global ‘Clean Air Products Industry.’ Leaders imagine with the first and succeeding generations of clean energy, clean consumer products, clean industrial process, low- and zero-emission vehicles and even being pioneers in the ‘hydrogen economy.’

Policies and programs by the ARB have contributed to the creation of a significant APC industry in California. Perhaps future policies can play an even greater role in not only preserving the state’s air quality but also stimulating the growth and competitiveness of an air pollution control and clean air products industry.

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1. Introduction

1.1. Study Mission & Methodology

The original Request for Proposal (RFP) for this study provided the following statement: “The objective of this study is to develop a historical profile of the air pollution control (APC) industry in California... and the industry’s impact on the state’s economic growth from 1970 to the present.”

The authors of the RFP acknowledged a noticeable “lack of consensus” on APC industry definition and size. They emphasized the importance in the project of structuring a sensible and consistent definition of the APC industry, as well as obtaining consensus of members of government and industry in “a comprehensive definition of the APC industry.”

While the vast majority of the research performed for this study was done by San Diego-based Environmental Business International Inc., considerable direction and input was received by staff members of the study’s sponsor, the California Air Resources Board (ARB). In addition, input and guidance were provided by an official advisory board consisting of APC executives, industry experts and other regulators as well as numerous conversations with industry participants during the course of the study. The project advisory board was selected and convened by EBI and ARB with suggestions from industry associations, companies and other regulatory agencies. A particular emphasis of this input and interaction during the first phase of the study was on the structure and definition of the APC industry. Definitions were compiled from a number of sources and summarized and presented to ARB staff and the advisory board. Emails were exchanged on the ‘living document’ of the proposed definition of the industry and a special meeting was held in Sacramento in May 2002 to discuss and finalize the industry structure to be used in this final report.

Once a reasonable consensus was reached on APC industry definition and structure, the basic research for this study proceeded in the following way:

- Secondary research of existing literature, reports, websites, economic data sources and other materials for an assessment of the existing published public record on the APC industry, in addition to background and perspective on APC industry definition, sales, history, market drivers, regulations, programs, top companies, etc.
- Collection and compilation of databases, published directories, association memberships, certified company lists, advertisements, telephone directories and other sources of APC company names and contacts to build into one inclusive database of APC companies in the United States and California.

This database exceeded 1,000 names and contacts and was the working file for the directory of companies appearing later in this report.

- Primary research of a quantitative nature whereby sales data was collected directly from companies over a series of years and questions relating to growth, market drivers, customers, equipment or service type were posed and catalogued. (Copies of the surveys used by EBI to collect business data from APC companies are listed in the appendix of this report.)
- Solicitations for the national and a California-based firm survey were sent by mail to the top 200 firms in EBI's database ranked by APC revenues, by fax to a selected list of the top 200 firms (including prior respondents to similar surveys conducted by EBI to complete annual research for publication in Environmental Business Journal), and by email to the entire list of contacts in EBI's email database numbering in the thousands that had direct operations or some involvement in the APC business. A special survey website page was created and the email solicitation included a link to the instruction page and the survey forms. Overall EBI received responses from more than 130 companies to the APC equipment manufacturers survey.
- In addition, EBI surveyed companies in other segments of the environmental industry to determine the proportion of their revenues derived from air quality work. These segments included consulting & engineering firms, instrument manufacturers and environmental testing laboratories. (These surveys are included in the appendix.) EBI also surveyed companies by telephone in two sub-segments of the clean energy segment: wind power and solar energy; in addition to relying on market information provided by their respective trade associations.
- The modeling of the resulting survey data in each APC industry segment was then performed, principally to obtain an estimate of total market size. The models were derived taking into account an accumulated knowledge of the 'universe' of companies (including the top 20-100 companies in each sub-segment of the APC industry that account for anywhere from less than half to more than 90% of each subsegment). Responses were aggregated in each size subcategory and product, service, customer and other breakdowns were applied to estimate results for the 'unsurveyed populace' in each size category of each segment. These estimates of the 'unsurveyed' were then added to the aggregated actual responses to represent totals in each size category. Size category totals were then summed to create a total market size and 'universe' of companies total in each subsegment.
- In general, accepted methods of statistical analysis were applied to the data collection and modeling although it should be mentioned that respondents were 'self-selected' rather than randomly selected. In other words surveys were sent out to as many companies as could be identified, rather than identifying 300 companies and randomly selecting 50 or those companies for instance as the population upon which to model the total segment. This latter method is more applicable to populations displaying more uniformity like human beings for example, rather than companies that

vary from thousands of employees and hundreds of millions in revenues to as small as two employees in a tiny office.

- Finally a great deal of primary research of a qualitative nature was conducted throughout the study to assure maximum input and perspective from the industry, regulators and the regulated community. The qualitative research proceeded where selected companies, experts, regulators, generators and others were interviewed by telephone, in person or responded to emailed questions to assess opinion on industry structure and size, market drivers, specific government programs and other issues pertinent to the study.

While research in each of these categories persisted throughout the course of the study, upon completion of the majority of this work, quantitative conclusions were drawn in each of the APC industry sub-sectors based on the best available knowledge obtained from the research. Conclusions were then summarized and consolidated into a single industry model to obtain the aggregated APC industry statistics published in this report. (It is worth noting that most sub-segments involved different data sources, survey instruments, set of companies and market drivers so that the methodology varied for each sub-segment. Any notable differences in data sources and methodology are explained in sections of the industry profile chapter.)

For each of the statistical areas below the following basic methods were used:

- **Revenues** were determined from surveys of companies in each segment, interviews with companies and experts and using a model of the ‘universe’ or total companies in that segment. In universe tables constructed for each segment of the industry, a comprehensive effort is made to obtain revenues from the top firms in that segment and statistical sampling of smaller companies is done to characterize the segment into various size categories. Total market size is reconciled with any spending data on that segment from industry or government sources, as well as total market estimates by analysts or companies in the industry.
- **Number of companies** were determined from building the ‘universe’ or model of total companies in each segment. Lists and databases were compiled, companies were classified and estimates of ‘uncaptured’ companies were made to complete the universe.
- **Employment** totals were estimated based on survey results of companies in each segment. Companies that responded to surveys with both revenue and employment figures display a fairly uniform ratio of revenues per employee in each segment. These ratios are analyzed and averaged to result in an average ratio for that year which is then applied to the revenue figure, resulting in a total employment figure for that segment.

- **Capital expenditures** were estimated based on average capital expenditures as a function of revenues for the appropriate match of companies to that segment using US DOC industrial statistics collected and compiled by the DOC Bureau of Economic Analysis or the Census Bureau.
- **Profits** were estimated based on survey results of companies in each segment. Companies that responded to surveys with revenues and profits resulted in an average aggregate margin for that segment for that year. (In some cases companies reported just profit margins and these were weighted and averaged with the rest.) The average margin is then applied to the total revenue figure to obtain the total profits in that segment.
- **Exports** were also estimated based on survey results of companies in each segment. Companies that responded to surveys with revenues and exports resulted in an average aggregate percentage of sales from exports for that segment for that year. (In some cases companies reported just export percentage and these were converted to dollars of exports and aggregated with the rest.) These results yielded an average export percentage for certain size categories in each segment for each year. The average export percentage for each size category is then applied to the revenue total for that size category to obtain the total exports in that segment for that year.

Subsequent to completing the comprehensive industry statistical model, APC industry statistics were compared to broader state and national economic statistics obtained primarily from government sources. Comparisons of APC industry performance to economic statistics were made in order to result in most of the tables presented in section 4 of this report on the APC industry's impact on the California economy.

During the entire course of this project (database construction, data collection, statistical analysis, writing and completion of this final report), research continued in the form of ongoing dialogue with ARB staff and the advisory board. In addition a number of APC industry executives and survey respondents who expressed interest in the ongoing research of the study were contacted for input. Finally, members of the advisory board, ARB staff and selected others were given the opportunity to review and comment on this report, and adjustments were made in response to this input.

1.2. Definition and Segmentation of the Air Pollution Control Industry

The following definition is a result of a compilation of Air Pollution Control industry definitions used by a number of sources. Input on earlier versions of this framework was obtained from government agencies, private companies, research analysts, industry associations and other interested parties in the

process of evolving a ‘living definition’ of the APC industry in California. Subsequent discussions and meetings decided on the framework that follows. The structure is intended to be ‘inclusive’ so that no meaningful contributor to the economic output of the APC industry is neglected, but segmented so that different tiers of the industry may be separated and analyzed for specific purposes.

Basic Framework: As exhibited below, the APC industry is divided into three major subsegments:

- Equipment Manufacturers (labeled A in the detailed list below),
- Service Providers (labeled B), and
- ‘Non-Traditional’ or Less-Polluting Sources (labeled C).

The first two sections (A and B) are viewed as the ‘Core APC industry’ in that their revenues are directly attributable to air quality concerns. For the purposes of this study, research emphasis will be placed on the quantification and private company contributions of these segments.

Less-polluting or ‘Non-Traditional’ sources are analyzed in a more subjective and less quantitative manner. This segment is also referred to as the Clean Air Products industry in this study. One could argue their contribution to air quality in the future is no less than the ‘core’ segments analyzed in more detail. However, the less-polluting products, vehicles, energy sources, industrial equipment, etc. that make up this category are only a loosely-defined subset of much larger industries (i.e. zero emission vehicles as part of the automobile industry or renewable energy as part of the energy business).

It can also be observed that this latter category of the Clean Air Products industry does not really represent air pollution control in a literal sense. In some instances we refer to the entire industry as the Air Quality Industry which includes both the Core APC Industry and the Clean Air Products Industry.

Below is the comprehensive, inclusive list of industry segments agreed upon by EBI, ARB, the project advisory board and others.

A. Equipment Manufacturers

(1) Stationary Source Equipment Manufacturers

- a. Flue gas desulfurization (various SO_x control & wet and dry scrubbers)
- b. Electrostatic precipitators
- c. Fabric filters/ baghouse equipment and Non-fabric filters (HEPA, diesel/particulate filters-metal & ceramic)
- d. Oxidation systems (including catalytic oxidizer, thermal oxidizers, after burners, flares)

- e. Carbon adsorption
- f. NO_x control systems (mostly selective no-catalytic reduction (SNCRs) and no-catalytic reduction (NCRs); low NO_x boilers are included in C below)
- g. Delivery systems (pipes, valves, nozzles and ducts)
- h. Materials & supplies (e.g. soda ash, ammonia for desulfurization systems, replacement parts and retrofits)
- i. Vapor recovery
- j. Dust control systems
- k. Other equipment
- l. Emission control for backup power supply/distributed generation
- m. Odor control (for sewage plants, landfills and certain industries)
- n. Indoor air filters (not including HVAC systems)

(2) Mobile Source Emission Control Systems Manufacturers

- a. Gasoline engines: catalytic converters, catalysts, supplies and automobile diagnostic systems specifically for emission controls
- b. Diesel emission control systems
- c. Others

(3) Environmental Instrument & Information Systems

Manufacturers of detectors, in-stack monitors, ambient monitors, diagnostic systems, analyzers, continuous emissions monitoring, laboratory bench-top analytical equipment and software systems.

B. Service Providers

(1) Consulting & Engineering

- a. Front-end (analysis, testing, permitting, source monitoring services & modeling, preparing specifications, process engineering for pollution control & prevention, and project planning)
- b. Engineering design (implementation, design and project management of the air pollution control solution and integration of APC components)
- c. Construction engineering (engineering for construction of units to house major APC systems)
- d. Institution Building & Enforcement Activities (including training & education)
- e. ISO 14000 and other industry environmental management systems.

(2) Analytical and Vehicle Testing Services

- a. Commercial testing labs

- b. Vehicle smog testing stations

(3) Research & Development for A, B & C

- a. Corporations, universities and government labs

(4) Emission Trading

- a. Brokerages and other financial services firms with dedicated emissions trading practices

C. Non-Traditional Sources

(1) Consumer Goods

(See an inclusive list of ‘low-emission’ products below)

(2) Industrial Machinery

- a. Low NOx boilers
- b. Low emission burners and generators
- c. Low-polluting equipment of all types (industrial, commercial, residential; e.g. energy efficient appliances, electric motors, lighting, etc.)

(3) Non-Polluting/Less Polluting Vehicles

- a. Hybrid cars
- b. Hydrogen (fuel cell) cars
- c. Electric cars
- d. Compressed natural gas (CNG) vehicles
- e. Super-efficient cars
- f. Buses, trucks and other forms of transportation
- g. Supplies and parts (not including fuel)

(4) Alternative Energy Sources (Systems Manufacturing and Power Generation)

- a. Solar photovoltaic systems
- b. Solar thermal systems
- c. Geothermal systems
- d. Wind power systems
- e. Biomass
- f. Fuel cells
- g. Supplies and parts for a-f

h. Power sales from all renewable sources in a-f

(5) Alternative Fuels

- a. Ethanol
- b. Hydrogen
- c. Low-sulfur coal & oil
- d. Compressed natural gas
- e. Liquified petroleum gas
- f. Reformulated conventional fuels (Identified but not quantified due to the fact that virtually all automotive fuel is 'reformulated' to some extent in California.)

(6) Paints & Coatings

Architectural (see list below)

Automobile

Aerosol (see list below)

Industrial

(7) Green Buildings

'Low-Emissions' supplies and building materials

C. Detail of Non-polluting/Less Polluting Consumer Goods*

Consumer Products

Adhesives
 Air Fresheners
 Automotive Brake Cleaners
 Automotive Rubbing or Polishing Compounds
 Automotive Wash/Polish/Sealant/Glaze
 Automotive Windshield Washer Fluids
 Bathroom and Tile Cleaners
 Bug and Tar Remover
 Carburetor or Fuel-injection Air Intake Cleaners
 Carpet and Upholstery Cleaner
 Charcoal Lighter Material
 Dusting Aids
 Engine Degreasers (all forms)
 Fabric Protectants
 Floor Polishes/Waxes
 Floor Wax Stripper
 Furniture Maintenance Products
 General Purpose Cleaners
 General Purpose Degreasers
 Glass Cleaners
 Hair Mousses
 Hair Shine
 Hair Styling Gels
 Hairsprays
 Heavy-duty Hand Cleaners or Soap
 Insect Repellents
 Insecticides
 Laundry Prewash
 Laundry Starch Products
 Metal Polish/Cleanser
 Multi-purpose Lubricant
 Nail Polish Removers
 Non-selective Terrestrial Herbicide
 Oven Cleaners
 Paint Remover or Stripper
 Penetrant
 Personal Fragrance Products
 Rubber and Vinyl Protectant
 Sealants and Caulking Compounds
 Shaving Creams
 Silicone-based Multi-purpose Lubricant
 Spot Remover
 Tire Sealants and Inflators
 Undercoating
 Wasp and Hornet Insecticide

Aerosol Coating Products

General Coatings

Clear Coatings
 Flat Paint Products
 Fluorescent Coatings
 Metallic Coatings
 Nonflat Paint Products
 Primers

Specialty Coatings

Art Fixatives or Sealants
 Auto Body Primers
 Automotive Bumper and Trim Products
 Aviation or Marine Primers
 Aviation Propeller Coatings
 Corrosion Resistant Brass, Bronze, or Copper Coatings
 Exact Match Finishes
 Floral Sprays
 Glass Coatings
 Ground Traffic/Marking Coatings
 High Temperature Coatings
 Hobby/Model/Craft Coatings
 Marine Spar Varnishes
 Photograph Coatings
 Pleasure Craft Finish Primers, Surfacer or Undercoaters
 Pleasure Craft Topcoats
 Shellac Sealers
 Slip-Resistant Coatings
 Spatter/Multicolor Coatings
 Vinyl/Fabric/Leather/Polycarbonate Coatings
 Webbing/Veil Coatings
 Weld-Through Primers
 Wood Stains
 Wood Touch-Up, Repair or Restoration Coatings

Antiperspirants & Deodorants

Antiperspirants
 Deodorants

* While this list is intended to include as many products as Possible, many categories may have been overlooked.

**Derived from a list compiled by ARB

C. Detail of Less Polluting Coatings

Architectural Coatings

Flat Coatings
Nonflat Coatings
Antenna Coatings
Antifouling Coatings
Bituminous Roof Coatings
Bond Breakers
Clear Wood Coatings
Concrete Curing Compounds
Dry Fog Coatings
Faux Finishing Coatings
Fire-Resistive Coatings
Fire-Retardant Coatings
Floor Coatings
Flow Coatings
Form-Release Compounds
Graphic Arts Coatings (Sign Paints)
High Temperature Coatings
Industrial Maintenance Coatings
Low Solids Coatings
Magnesite Cement Coatings
Mastic Texture Coatings
Metallic Pigmented Coatings
Multi-Color Coatings
Pre-Treatment Wash Primers
Primers, Sealers, and Undercoaters
Quick-Dry Enamels
Quick-Dry Primers, Sealers, & Undercoaters
Recycled Coatings
Roof Coatings
Rust Preventative Coatings
Shellacs
Specialty Primers, Sealers and Undercoaters
Stains
Swimming Pool Coatings
Swimming Pool Repair and Maintenance Coatings
Temperature-Indicator Safety Coatings
Traffic Marking Coatings
Waterproofing Sealers -Wood
Waterproofing Sealers - Concrete
Wood Preservatives

2. Market Drivers: A Review of Government Programs and Regulations

The objective of this section is to portray significant market drivers that have had an impact on the development of the APC industry in California from 1970 to 2002. While cataloging every piece of federal, state, district or local legislation, regulation, standard and rule would be far too exhaustive, a core set of laws, regulations and programs that have the greatest influence in driving sales in the APC industry are presented in this section. In the following review, we attempt to summarize these laws and characterize their role in the history of the APC industry in California.

While it is tempting to make specific direct correlations between regulations and sales increases, each business transaction involving air quality equipment and/or services results from multiple factors—and not all of them regulatory. However, one can make some broad assessments based on sales figures and comments of industry participants to draw some conclusions, and these are presented in section 2.3 below.

As a final introductory statement to this section, when looking at future regulations, standards or requirements, it is also tempting to make a general rule for each rule's potential effect on the APC industry. The analysis performed for this report clearly indicates that the vast majority of clean air rules and regulations result in economic activity in the APC industry. It is also clear that almost every rule or program elicits a unique response by local regulators, the regulated community and their APC service providers and equipment vendors. While it is impossible to determine a specific ratio or factor to predict economic activity resulting from APC regulations, the collected analysis demonstrates that the vast majority of APC expenditures by the regulated community result in revenues for the APC industry.

Given the overall purpose of analyzing what have been the most influential factors impacting sales of APC equipment and services, we first wish to establish what the APC industry itself considers the most important market drivers, and then to proceed with an examination of specific laws and programs. This section presents material on market drivers in the following subsections:

- The results of a survey performed to determine what APC companies believe are the most influential market drivers in the APC industry;
- A review of the major federal air quality legislation and comments on the impact each had on the APC industry in general;

- A comprehensive timeline of federal, state and local laws and programs that have driven sales in California's APC industry;
- Profiles of the significant 'eras of evolution' in major segments of the APC industry from 1970-2002, connecting the major drivers to each segment;
- Loose estimates on the direct economic impact of some specific regulations on APC industry sales; and last
- An assortment of comments made to project researchers by district officers and APC executives to demonstrate the diverse nature of the APC market and industry.

2.1. Survey of APC Industry Market Drivers

There are numerous market drivers that have helped to form the air pollution control (APC) industry in California. These drivers are mainly federal, state & local regulations but also include some non-regulatory factors that impact APC sales such as public concerns, funding mechanisms or general economic conditions. Interviews with APC companies revealed a number of factors that are summarized in the list of market drivers below.

California APC Industry Market Drivers	
■	Clean Air Act Title I - Ambient Air Quality
■	Clean Air Act Title III - Air Toxics
■	Clean Air Act Title IV - Acid Rain
■	Clean Air Act Title V - Operating Permits
■	Clean Air Act: Other Provisions
■	MACT Standards for Industry*
■	Risk Management Plans
■	State Air Quality Standards
■	Local/Regional Standards in California Air Districts (including mobile standards)
■	Special Programs (e.g. ReClaim, etc)
■	Emission Trading Programs (SO ₂ and other credits)
■	Level of Enforcement Activity
■	Economic Conditions in Customers' Industry
■	Public Pressure/Corporate Environmentalism
■	TRI Listings*
■	Tax Credits, Grants and other Financial Incentives
■	Research and Development (R&D) Expenditures and Programs
■	Others

* MACT is maximum achievable control technology; TRI is the EPA's Toxic Release Inventory

This list formed the basis of a quantitative survey of California APC companies conducted in order to determine which market drivers the companies believed were the most influential in impacting sales. In the survey conducted in written form, over the internet and on the telephone, APC companies were asked to rate market drivers in response to the following question: "Please rate each of the following in terms of their impact on driving sales of your company's APC equipment. (Scale: 1=No impact, 2=Small impact, 3=Moderate impact, 4=Strong impact, 5=Very strong impact)"

Two phases of this survey were performed. The first phase was a national survey of APC equipment firms conducted in early to mid 2002 as described in the methodology section of this report. In the first survey only a subset of the longer list of drivers were used. (This list appears in the table of ratings below in the order that it appeared in the survey and the entire survey is reproduced in the appendix of this report). In the second phase only companies with known presence in California were contacted to respond to exactly the same question on market drivers with the addition of a few more of the market drivers on the list specific to California to be rated by respondents.

First we examine the results from national survey of APC market drivers, listed in the order they appeared on the survey form:

Exhibit 2-1 Ratings of APC Market Drivers

APC Market Drivers in 2002	2002 All APC Firms	2002 with Calif offices*	Difference in CA companies
Clean Air Act Title I - Ambient Air Quality	3.2	3.4	0.3
Clean Air Act Title III - Air Toxics	3.0	3.1	0.0
Clean Air Act Title IV - Acid Rain	2.4	2.1	-0.3
Clean Air Act Title V - Operating Permits	3.3	3.7	0.4
MACT Standards for Industry	3.3	3.1	-0.2
Risk Management Plans	2.1	2.5	0.4
State/Local Air Quality Standards	3.7	4.0	0.3
Level of Enforcement Activity	3.9	3.9	0.0
Economic Conditions in Customers' Industry	3.7	3.8	0.1
Public Pressure/Corporate Environmentalism	2.7	2.9	0.2
TRI Listings	2.2	2.1	0.0

Note: Respondents rated market drivers on their "impact on driving sales of your company's APC equipment."
(Scale: 1=No impact,, 2=Small Impact, 3=Moderate impact, 4=Strong Impact, 5=Very Strong Impact)"
*Subset of responding companies from national survey with headquarters or office in California.

Source: EBJ 2002 national survey of APC equipment companies.

The results from national survey of APC market drivers indicate that there are only three areas that could be characterized as having a consistently strong impact on sales: Level of Enforcement Activity, State/Local Air Quality Standards and Economic Conditions in Customers' Industry.

Interestingly each of these areas are rated as having a higher impact in California (by only a slight amount of 0.03 in Level of Enforcement Activity, however) than other states. Also notable is that State/Local Air Quality Standards leaps to the highest ranked market driver by California companies. Both these observations are consistent with the premise put forth by a number of APC companies that California's air quality program is more advanced and results in greater economic activity for APC firms in the state when compared to the rest of the nation.

Another observation from these survey results is that three areas are rated by companies with a California presence as having less impact on sales than national averages and these are: Clean Air Act Title IV - Acid Rain, MACT Standards for Industry, and TRI Listings. Presumably these federal-standard and public-information drivers are more influential by comparison in states with less stringent local & state air quality requirements than California. Also it is likely that different concentrations of industries (and thus sources of air pollution) in different states account for lesser rating in California. The acid rain provision is an obvious example where sulphurous coal is rarely combusted in the state but it a significant issue in the eastern United States.

The second phase of surveys focused on California companies and we examine the results below:

Exhibit 2-2 Ratings of APC Market Drivers in California

Rank of California APC Market Drivers in 2002	Rated on a scale of 1 to 5
Level of Enforcement Activity	3.9
Local/Regional Standards in California Air Districts	3.8
State Air Quality Standards	3.6
Economic Conditions in Customers' Industry	3.6
Clean Air Act Title I - Ambient Air Quality	3.3
Clean Air Act Title V - Operating Permits	3.3
Special Programs (e.g., ReClaim, etc)	3.2
MACT Standards for Industry	3.1
Emission Trading Programs (SO ₂ and other credits)	3.0
Clean Air Act Title III - Air Toxics	2.9
Tax Credits, Grants and other Financial Incentives	2.7
Clean Air Act: Other Provisions	2.4
Risk Management Plans	2.2
Public Pressure/Corporate Environmentalism	2.2
R&D Expenditures and Programs	2.1
TRI Listings	2.0
Clean Air Act Title IV - Acid Rain	1.8

Note: Respondents rated market drivers on their "impact on driving sales of your company's APC equipment."
 (Scale: 1=No impact, 2=Small Impact, 3=Moderate impact, 4=Strong Impact, 5=Very Strong Impact)"

Source: EBJ 2002 survey of California APC equipment and service companies.

Notable results from the surveys focused in California (in this chart ranked by average response) reveal first that the market drivers can roughly be separated into three groups: strong impact or over 3.5 average rating; moderate impact or around 3 rating; and small impact or around 2 rating. These survey responses clearly establish that, in the opinion of APC companies, enforcement (almost all carried out at the state and local level), local & state standards and programs, and the economy are the major issues which affect APC sales.

No doubt federal standards are influential and indeed fall in the 'moderate' category, but enforcement (generally viewed as somewhat variable by the environmental industry community) is much more

important as a market driver. Also worth noting is the measurably higher rating given Local/Regional Standards in California Air Districts (the districts) over State Air Quality Standards (the state). This may be accounted for by the APC industry's perception of a larger enforcement role played by the districts in many of the areas that drive APC sales. Overall, however, the ratings of state and local market drivers are fairly similar.

2.2. Specific Regulations

The main purpose of this section of this report is to catalog APC regulations and identify the key drivers that stimulated the development of the APC industry in California. However, we will also attempt to draw links between major pieces of legislation and/or regulatory programs and year-to-year revenue generation by APC equipment and service companies in the state of California.

Initially we will briefly summarize major federal, air-quality legislation and its resulting effect as APC industry market drivers. Second we will present a more detailed chronological timeline of pertinent federal, state and local market drivers followed by detailed discussion of the most influential laws or programs on the development of the California APC industry.

2.2.1. Major Federal Statutes

- 1955 Air Pollution Control Act
- 1963 Clean Air Act
- 1965 Motor Vehicle Air Pollution Control Act
- 1966 Clean Air Act Amendments
- 1967 Air Quality Act
- 1969 National Environmental Policy Act
- 1970 Environmental Protection Agency established
- 1970 Clean Air Act Extension
- 1976 Toxic Substances Control Act
- 1977 Clean Air Act Amendments
- 1990 Clean Air Act Amendments

Summary of Major Federal Legislation and Effects on the APC Industry

- **1955 Air Pollution Control Act**

Authorized the Surgeon General to coordinate efforts by federal, state, local, and private agencies to research air pollution. Congress authorized annual appropriations of \$5 million for five years to the Department of Health, Education, and Welfare (HEW) to study and disseminate information.

Effect on APC Industry: First significant piece of federal legislation sends important message to generators. Most spending occurs in government agencies, but some private research entities presumably perform contracts.

• 1963 Clean Air Act

Allowed federal and state governments to take legal action to address air pollution problems that threatened health. Directed the Secretary of HEW to research causes of air pollution and to produce a separate study on attempts by the auto industry to reduce pollution. States have primary role as Congress approved a matching grants program to states for establishing air pollution control programs.

Effect on APC Industry: Minimal. APC industry still virtually non-existent with some specialists doing studies and some manufacturers making combustion filters.

• 1965 Motor Vehicle Air Pollution Control Act

Amended 1963's Clean Air Act by adding the Motor Vehicle Air Pollution Control Act, charging the Secretary of HEW with setting emission standards for carbon monoxide, hydrocarbons, and other pollutants.

Effect on APC Industry: First statute on vehicular emissions elicits mostly response from auto manufacturers, but some specialty emissions controls suppliers (including catalysts) emerge in the next 5-10 years as regulations take effect.

• 1966 Clean Air Act Amendments

A new program of grants to state, interstate, and local air pollution control agencies to cover the ongoing costs of operation.

Effect on APC Industry: Momentum to budding regional authorities leads to development of some specialty control equipment manufacturing and specialty air quality scientific and consulting & engineering companies.

• 1967 Air Quality Act

Strengthened the government's air pollution control powers. Authorized \$428 million spread across three years for federal pollution control, including \$125 million for research into the pollutants released by fuel combustion. Established air quality control regions, and permitted HEW to set air quality standards in regions lacking agencies.

Effect on APC Industry: First major spending program builds up regulatory infrastructure, laying the foundation for the market to take off in the 70s. Some standalone APC equipment firms, and environmental-science consulting firms exist at this point. Instrument manufacturers developing monitoring and lab devices for air testing.

- **1969 National Environmental Policy Act**, and
- **1970 Environmental Protection Agency** established

Declared government-wide policies of acting to protect the environment and considering environmental factors in all decision-making and created the Council on Environmental Quality (CEQ). In 1970, a reorganization established the Environmental Protection Agency (EPA), an independent agency that would assume control over all federal environmental efforts.

- **1970 Clean Air Act Extension**

Provided for \$1.1 billion over three years to study and abate air pollution—particularly automobile emissions. EPA to establish primary and secondary air quality standards. Each state remained responsible for its air quality and for developing a plan to meet the new standards. Required automobile manufacturers to reduce emissions by 90 percent between model year 1970 and model year 1975. Authorized EPA to grant states funds to cover two-thirds of costs for vehicle inspection and emission testing programs. The administrator could seek injunctions to stop polluters endangering public health, private individuals could sue polluters or government agencies for failure to carry out the act, and the Attorney General could sue to force makers of technology used to limit emissions to share their advances. Penalties for knowingly violating the act reached \$25,000 per day for the first offense.

Effect on APC Industry: Launch of a new era in entire environmental industry, with air leading the way in the 70s. Continues momentum from spending effects started in 1966 and 1967. Initiatives underway and escalate in regulatory agency and APC company development. Stimulates major investments in APC equipment for major sources in the decade of the 1970s, particularly fixed-facility combustion, thus creating strong demand for stationary source APC equipment. Also creates strong and sustained demand for service providers like consulting & engineering firms to assess regulations, emissions and technical solutions, as well as design control systems and specify equipment purchases.

- **1976 Toxic Substances Control Act**

Required EPA approval for all new industrial and commercial chemicals. EPA could issue subpoenas or inspect chemical manufacturers' facilities, and could restrict or ban chemicals that threaten public health. EPA must maintain a list of all chemicals manufactured in the United States. Private individuals could file suit against either the EPA or a chemical producer if either failed to comply with the act.

Effect on APC Industry: Minimal at this point but established groundwork for air toxics programs in the 90s.

• **1977 Clean Air Act Amendments**

New penalties on industrial plants ensured that violation of the act, if detected, would be more expensive than compliance. Congress extended by five years deadlines for cities to clean up urban smog. Congress extends the deadline for compliance with the new automobile emissions standards for the second time in the 70s. Most cars now required to meet emissions target by model year 1980, although several exemptions (trucks, buses, and motorcycles) were granted.

Effect on APC Industry: Continued delays keep sales relatively low in mobile source equipment, although growing rapidly. Industry ratchets up spending on air emissions making the industrial market of equal interest for APC equipment companies as that of power utilities.

• **1990 Clean Air Act Amendments**

Four main titles addressed smog, motor vehicle emissions, toxic air pollutants, and acid rain. Deadlines placed for attaining compliance with new standards on cities classified according to a five-level scheme. The definition of a "major source" revised to allow states to regulate businesses releasing even small levels of VOCs. For cars, reductions in hydrocarbons and nitrogen oxide required for model year 1995. Gas stations in the nine smoggiest cities could sell only reformulated gasoline beginning in 1995, and emissions control equipment had to last ten years or 100,000 miles by model year 1999. For acid rain, Congress coupled stronger limitations with a system of emissions "allowances," providing arguably the first major test of market-based pollution control policy.

Effect on APC Industry: Though immediate response was mostly disappointing for APC firms as delays in some regulations were widespread, the 1990 CAAA laid the foundation for many programs still driving revenues well into the 21st century. (See more detail in the table on the following page.)

Source: Legislative descriptions adapted from The Brookings Institution, "Government's 50 Greatest Endeavors"; Effects on APC Industry derived predominantly from interviews with APC executives.

Exhibit 2-3 Summary of 1990 CAAA Business Impacts

Title/Provisions	Summary of APC Revenue Impacts
Title I Non attainment Ozone (1993-2010) Carbon Monoxide (1995 & 2000) Particulate matter (1994 & 2000)	<ul style="list-style-type: none"> ■ Manufacture, design, development and construction of technological controls and process and product modifications ■ Production and supply of clean/oxygenated fuels
Title II Mobile Sources Reformulated Gasoline (1995) Oxygenated Fuels (1992) Fleet Program (1998-2001) California Pilot Prog. (Models 1996/99) Tier I Tailpipe Std. (1994-1998)	<ul style="list-style-type: none"> ■ Manufacturers and parts & materials suppliers for motor vehicle emission control devices ■ Development, production and supply of reformulated gasoline and oxygenated fuels ■ Design/production of clean/alternative fueled vehicles ■ Vehicle testing services (SmogCheck)
Title III Air Toxics Major Sources (1992-2003) Area Sources (1992-2003) Accidental Releases (1993)	<ul style="list-style-type: none"> ■ Manufacture, production, design, and construction of APC equipment and process modifications ■ Development of accidental release plans for C&E firms
Title IV Acid Rain Sulfur Dioxide Provisions (1995 & 2000) Nitrogen Oxide Provisions (1992-2003) Emissions Monitoring (1993 & 1995)	<ul style="list-style-type: none"> ■ Supply, manufacture, design, and construction of SO₂ and NO_x control equipment ■ Supply, manufacture, design, and installation of CEMs ■ Supply and transport of low sulfur coal, natural gas, and lime/limestone
Title V Operating Permits Initially, 35,000 "major" sources require operating permits Ultimately, tens of thousands of small, previously unregulated facilities subject to Title V provisions	<ul style="list-style-type: none"> ■ Businesses directly associated with air quality compliance—environmental consulting & engineering (C&E), legal consulting and software and information systems providers—benefited most, peaking from 1995 - 1997, with compliance deadlines.
Title VI Stratospheric Ozone Production Phase-Out (2000 & 2030) Recovery and Recycling (1992 & 1994) Motor Vehicle Air Conditioners (1992) Product Labeling and Select Bans (1992)	<ul style="list-style-type: none"> ■ Chlorofluorocarbon substitute development and production ■ Manufacture, design and construction of chlorofluorocarbon recovery and recycling equipment ■ Supply, manufacture, design, and installation of leak detection equipment ■ Development of non-chlorofluorocarbon containing product substitutes

Source: Environmental Business International Inc. (San Diego, Calif.), some deadlines and program components have changed over time

2.2.2. Local, State and Federal Market Drivers**Timeline of Major Federal & California Legislation and Initiatives That Have Impacted California APC Companies**

- 1938** • Sulfur Dioxide and Dust Fall Air Sampling stations are set up in the U.S. under the Federal Works Progress Administration.
- 1943** • First recognized and recorded episodes of 'smog' occur in Los Angeles.
- 1945** • The City of Los Angeles begins its air pollution control program, establishing the Bureau of Smoke Control in its health department.
- 1947** • Air Pollution Control Act signed into law in California, authorizing the creation of an Air Pollution Control District in every county of the state. The Los Angeles County APCD is established as the first of its kind.
- 1950** • California Rule 50A passed, limiting smoke emissions.
- 1953** • Los Angeles County starts "Smoke School Program" for black smoke, beginning the standardization of "Visible Emission Programs" nationwide.
- 1955** • Federal Air Pollution Control Act of 1955 is enacted, providing for research and technical assistance and authorizing the Secretary of Health, Education and Welfare to

- work towards a better understanding of the causes and effects of air pollution.
- The Bay Area APCD is established. Bureau of Air Sanitation is formed within the State Department of Public Health.
- 1959** • California enacts legislation requiring the state Department of Public Health to establish air quality standards and necessary controls for motor vehicle emissions.
- 1960** • The Motor Vehicle Pollution Control Board is established. Primary function is to test and certify devices for installation on cars for sale in California.
- Federal Motor Vehicle Act of 1960 is enacted. Requires federal research to address pollution from motor vehicles.
- 1961** • The first automotive emissions control technology in the nation, Positive Crankcase Ventilation (PCV), is mandated by the California Motor Vehicle State Bureau of Air Sanitation to control hydrocarbon crankcase emissions. PCV Requirement goes into effect on domestic passenger vehicles for sale in California in 1963.
- 1963** • First Federal Clean Air Act of 1963 enacted. Empowers the Secretary of the federal Health, Education, and Welfare to define air quality criteria based on scientific studies. Provides grants to state and local air pollution control agencies.
- 1965** • Federal Clean Air Act of 1963 is amended by the Motor Vehicle Air Pollution Control Act of 1965. Direct regulation of air pollution by the federal government is provided for, and the Department of Health, Education, and Welfare is directed to establish auto emission standards.
- 1966** • The first ever auto tailpipe emission standards for hydrocarbons and carbon monoxide are adopted by the California Motor Vehicle Pollution Control Board. California Highway Patrol begins random roadside inspections of vehicle smog control devices.
- 1967** • Federal Air Quality Act of 1967 is enacted. Establishes framework for defining air quality control regions and setting timetables for states to establish their own air quality standards. Allows the State of California a waiver to set and enforce its own emissions standards for new vehicles
- Mulford-Carrell Air Resources Act creates the Air Resources Board by merging the California Motor Vehicle Pollution Control Board and the Bureau of Air Sanitation.
- 1969** • First state Ambient Air Quality Standards are promulgated by California for total suspended particulates, photochemical oxidants, sulfur dioxide, nitrogen dioxide, and carbon monoxide.
- 1970** • National Environmental Protection Act (NEPA) signed. U.S. Environmental Protection Agency (U.S. EPA) created. The first Earth Day is held April 22.
- Federal Clean Air Act Amendments of 1970 enacted, serving as the principal source of statutory authority for controlling air pollution. Establishes basic U.S. program for controlling air pollution. Allows states to establish their own stricter standards (California soon does this).
- ARB requires auto manufacturers to meet standards for hydrocarbon and nitrogen oxide emissions.
- 1971** • Federal EPA promulgates National Ambient Air Quality Standards for particulates, photochemical oxidants (including ozone), hydrocarbons, carbon monoxide, nitrogen dioxide and sulfur dioxide.
- ARB adopts the first automobile nitrogen oxide standards in the nation.
- 1973** • OPEC Oil Embargo results in rising fuel cost, the use of smaller, more fuel efficient automobiles, more cost conservative use of fuel by industry, and corresponding lower air emissions.
- Department of Commerce performs first in an annual series of data collection of Pollution Abatement Capital Expenditures by industry, by state and by media. Air is a specific media item, allowing economic analysis of industrial spending on air pollution. Program continues until 1994.
- 1975** • First Two-Way Catalytic Converters come into use as part of ARB's Motor Vehicle Emission Control Program.

- 1976**
 - The Toxic Substance Control Act is established by Congress in response to an increasing awareness of toxic substances used by industry.
 - The regional South Coast Air Quality Management District is formed. It includes portions of Los Angeles, Orange, Riverside, and San Bernardino counties. ARB limits lead in gasoline.
 - First tax credit for renewable energy issued for solar energy. From 1978 to 1985, both California and the federal government offered tax credits for alternative energy equipment. The state provided up to a 55% tax credit on solar, wind, geothermal and biomass for residential applications. State commercial/industrial tax credits were 10-15%. Feds offered a 40% credit on residential and a 10-15% credit on commercial/industrial. Credits have subsequently been reduced, eliminated but in some cases were revived.
- 1977**
 - Federal Clean Air Act Amendments of 1977 enacted, providing more time for areas with more serious air quality problems to comply with standards. Requires review of all National Ambient Air Quality Standards by 1980.
- 1978**
 - The Public Utility Regulatory Policy Act (PURPA) passed by Congress, requiring utilities to buy power from independent companies that could produce power for less than what it would have cost for the utility to generate the power, called the "avoided cost." PURPA is credited as the most effective single measure in promoting renewable energy resulting in over 12,000 megawatts of non-hydro renewable generation capacity.
- 1980**
 - Compliance testing performed by ARB on autos in use to determine whether they continue to comply with emission standards as they age. This is a strong incentive for manufacturers to develop more durable emission control equipment to avoid the risk of recall.
- 1983**
 - California's air toxics program began with the adoption of the Toxic Air Contaminant Identification and Control Act (AB 1807). The act set up a process to identify a substance as a toxic air contaminant and, develop control measures. In 1992 the Act was amended to integrate rules from the federal CAA.
- 1984**
 - California Smog Check Program goes into effect to identify vehicles in need of maintenance and to assure the effectiveness of their emissions control systems on a biennial basis.
- 1987**
 - Indoor Air Quality Act first introduced into Congress. EPA establishes Indoor Air Division of the Office of Air and Radiation in 1988 and Congress approves Indoor Radon Abatement Act.
- 1988**
 - California Clean Air Act is signed into law. Sets forth the framework for how air quality will be managed in California for the next 20 years.
- 1990**
 - The Clean Air Act Amendments are signed into law, requiring a number of new programs aimed at curbing urban ozone, rural acid rain, stratospheric ozone, toxic air pollutant emissions and vehicle emissions, and establishes a new, uniform national permit system. Also providing more time to comply with standards but requiring that cities implement specific air pollution control measures.
 - ARB approves standards for Cleaner Burning Fuels and Low and Zero Emission Vehicles.
- 1991**
 - Cal/EPA formed by consolidating state environmental agencies under one secretary. American Lung Association (ALA) sues U.S. EPA to force review of ozone air quality standard. By law, the standards were to be reviewed every five years, but were not reviewed since 1979. In 1992 the court rules in favor of the ALA. In 1992 ALA sues EPA to force review of the sulfur dioxide standard, and court rules in favor of the ALA in 1993.
- 1992**
 - Phase I California Cleaner Burning Gasoline comes to market, resulting in a 6% emissions reduction and elimination of the use of lead in gasoline. ARB also requires addition of oxygenates to gas to cut CO emissions by 10%.

- 1993** • SCAQMD adopts Regional Clean Air Incentives Market (RECLAIM) program for NOx and SOx. ARB enacts new standards for cleaner diesel fuel and California Diesel Fuel comes to market.
- 1994** • U.S. Court orders U.S. EPA to develop Federal Implementation Plan (FIP) for numerous non-attainment areas in California. California submits a more cost effective State Implementation Plan to U.S. EPA.
- Smog Check II signed into law to meet the requirements of the 1990 CAAA. The program targets vehicles that pollute 2-25 times more than the average vehicle and requires repairs and re-testing of vehicles.
- 1996** • California Phase II Cleaner Burning Gasoline comes to market.
- California's State Implementation Plan for ozone approved by U.S. EPA.
- 1997** • EPA strengthens the standard for particulate matter air pollution.
- 1998** • ARB identifies diesel particulate emissions as a Toxic Air Contaminant. ARB amends off-road engine regulations for lawn mowers, weed trimmers, and other small engine power tools. ARB adopts Low-Emission Vehicle (LEV II) standards for most mini vans, pickup trucks and sport utility vehicles to reduce emissions to passenger car levels by 2007. Marine engine regulations are also adopted.
- 1999** • EPA's issues Tier II rules on SUVs and other light-duty vehicles modeled after ARB's LEV II.
- ARB adopts consumer products rules to cut smog-forming emissions and volatile organic compounds from an estimated 2,500 common household products ranging from nail polish remover to glass cleaners. ARB adopts a regulation that reduces emissions from portable gas cans. ARB approves a new set of gasoline rules that will ban the additive MTBE while preserving all the air-quality benefits obtained from the state's cleaner-burning gasoline program.
- The California Fuel Cell Partnership, a public-private venture to demonstrate fuel cell vehicles in California, formally begins.
- 2000** • ARB approves a comprehensive plan to reduce particulate emissions from diesel powered equipment. ARB amends the state's agricultural burning guidelines to reduce effect of controlled burns. The ARB adopts regulations to further reduce air pollution from transit buses operating in California.
- 2001** • Zero emission vehicle (ZEV) mandate upheld, with modified requirements. Automakers are required to produce between 4,450 and 15,450 zero emission cars starting in 2003. ARB adopts new rules that limit public exposure to asbestos-laden dust from construction and quarry sites.
- New standards pass for new large diesel engines. The new standards take effect with the 2007 model year and affect engines that power big-rig trucks, trash trucks, delivery vans, and other large vehicles.

Source: Adapted from the California Air Resources Board, The Brookings Institution, American Lung Association and numerous other sources

2.3. Estimates of the Economic Impact of Specific Regulations

While it is impossible to assign most APC sales directly to one specific program or regulation, two things are clear. First, virtually every law or program has resulted in some sales by APC companies. Second, certain laws and programs have had substantially more significant impact on APC sales volumes and general economic activity than others.

The following laws and programs were selected for estimation of revenue impact:

- Federal Clean Air Act Amendments of 1970
- Federal Clean Air Act Amendments of 1977
- California Smog Check Program I of 1984
- California Clean Air Act of 1988
- Federal Clean Air Act Amendments of 1990
- California's State Implementation Plan of 1994
- California Smog Check II of 1994
- ARB Low-Emission Vehicle (LEV II) standards of 1998

For each area, some basic assumptions and time periods were selected to estimate the amount of incremental revenues that were derived principally from each as a market driver. These figures are not claimed to be exact in any way, but they are intended to provide an approximate figure of what new or additional revenue resulted for the California APC industry from each major piece of legislation or program.

Percentages used in these broad estimates below were derived from assessing the approximate change from the 'base' of sales in the years prior to the regulation under examination, as well as perspective compiled from responses from a number of interviews with APC companies and regulators. For example, if research indicates that a new regulation had a major impact on sales for the next five years from polling vendors, we would ascribe 50% of sales in that segment for the next five years to that regulation or program—or if the total of sales over that five year period totaled \$600 million we estimate that \$300 million resulted from the new regulation. Alternatively if a completely new program is introduced we have ascribed 100% of additional sales in that segment to the new program.

While it may be more appropriate to list these impacts in ranges of revenues, this exercise is intended more to indicate orders of magnitude rather than exact figures so the mathematical result of applying the listed percentages to the time ranges specified is used. When citing these figures it is suggested to round them to the nearest hundreds of millions of dollars in revenue impact.

Federal Clean Air Act Amendments of 1970: 50% of California stationary source equipment, 20% of mobile equipment, 33% of instruments and 50% of consulting & engineering revenues were attributable to the CAAA of 1970 from the years 1970-1979. **This results in a figure of \$940 million in additional revenues or 31% of the California 'Core' APC business in that decade, so it is not unreasonable to say that the 1970 CAAA generated \$1 billion in sales for APC companies in California in the following decade.**

Federal Clean Air Act Amendments of 1977: 50% of California stationary source equipment, 10% of mobile equipment, 50% of instruments and 50% of consulting & engineering revenues were attributable to the CAAA of 1977 from the years 1978-1982. **This results in a figure of \$950 million or 32% of the California APC business in that five-year period.**

California Smog Check Program I of 1984: 100% of California vehicle smog testing stations & repair revenues above the amount generated in 1984 prior to the program from the years 1985-1994. **This results in a figure of \$1.65 billion or 12% of the California APC business in that ten-year period.**

California Clean Air Act of 1988: 10% of California total ‘core’ APC industry from 1989-1998. **This results in a figure of \$1.66 billion or 10% of the California APC business in that ten-year period.**

Federal Clean Air Act Amendments of 1990: 10% of the California APC Industry revenues (excluding vehicle smog testing) from 1991-1995 and 15% from 1996-2000. **This results in a figure of \$1.73 billion or 10% of the California APC business in that ten-year period.**

California's State Implementation Plan of 1994: 10% of California total ‘core’ APC industry from 1995-2002. **This results in a figure of \$1.64 billion or 10% of the California APC business in that eight-year period.**

California Smog Check II of 1994: 100% of California vehicle smog testing stations & repair revenues above the amount generated in 1994 prior to the program from the years 1995-2002. **This results in a figure of \$2.43 billion or 15% of the California APC business in that eight-year period.**

ARB Low-Emission Vehicle (LEV II) standards of 1998: 20% of mobile equipment, from the years 1999-2002. **This results in a figure of \$550 million or 6% of the California APC business in that four-year period.**

2.4. Selected Observations from District Officers on Specific Market Drivers

Interviews with regional district air quality officers around the state of California revealed a considerable variety in local air quality and APC industry market conditions. While painting an accurate picture in every corner of the state is outside the scope of this study, we thought it instructive to present some selected responses from these district officers.

Following are some comments we received directly from district officers during the course of our research. Some are edited for clarity.

Mobile Source Division Manager, Sacramento Air District:

The major drivers that have improved air quality in the mobile arena in our district include:

- State Measures
- Smog Check Program (California's program is decentralized and privatized so this stimulates private sector jobs)
- Tougher emission standards for new vehicles (this has a longer time horizon for improving air quality since it relies on the turnover of older, higher emitting vehicles being replaced with new, lower emitting vehicles. I don't know whether this has any net economic effect. I guess you could argue that the development of the lower emission technologies like electronic engine controls and catalysts provide jobs somewhere.)
- Local Programs
- Sacramento Heavy-duty NOx Program: We have a major program to reduce NOx emissions from heavy-duty on-road and off-road vehicles and equipment funded by several different sources. Over the past five years we've moved over \$50 million in grants to public and private fleet operators in our region to:
 - Buy new, low-emission vehicles (transit, refuse, public works)
 - Modernize (grants for new or newer trucks for owner-operators who normally operate 15+ year old trucks)
 - Repower older vehicles (put new or newer engines into older trucks and buses)
 - Retrofit (use technologies like emulsified fuels or exhaust retrofit devices to reduce emissions from existing vehicles)

All these programs create sales and service work for local vendors as well as equipment and vehicle manufacturers.

San Luis Obispo County Air Pollution Control District

- For VOCs. The greatest impact was from ARB's ATCM for benzene emission controls on vehicle refueling, which resulted in Phase II Vapor Recovery at service stations.
- Also for VOCs, the next highest impact was from District Rule 427 for controls on marine tanker loading, which resulted in approximately 1 ton per day of VOC reductions from various internal combustion engines that were controlled in lieu of vessel controls.

- For NO_x, the only significant reductions were from District Rule 429 for controls on the Duke Morro Bay Power Plant. The District's 2001 Clean Air Plan estimated emission reductions of 11 tons per day in 2003.
- For particulate matter (PM), recognition of the toxicity of diesel engine exhaust has led to significant but unquantifiable reductions in diesel exhaust particulate matter under District Rule 219, Toxics New Source Review (NSR).

The following summarizes equipment sales in our district:

Measure	Year	Equipment
Phase II Vapor Recovery	1989 - present	dispensers, nozzles, hoses, vacuum assist systems
Marine Tanker loading	1997	3-way non-selective catalyst for natural gas fired engines
Power Plant combustion	1996	Low- NO _x burners
Toxic NSR impact on DPM	2001	nonroad engines certified to emit low levels of DPM

Kern County

In Eastern Kern County it was particulate matter emission limits (visibles & emission rates) that resulted in the greatest demand for APC equipment. This demand continues, but peaked between 1975 and 1990.

Mojave Desert Air Quality Management District

New Source Review and its Best Available Control Technology (BACT) requirements are the most effective tool we have. NSR generates business for consultants, testing firms and control technology manufacturers and providers. In recent years, we have seen several selective catalytic reduction installations, non-selective catalytic reduction installations, and oxidation catalysts. Baghouses and related appurtenances are also required by NSR/BACT.

2.5. Selected Observations from APC Companies on Specific Market Drivers

The following quotes were obtained during our research throughout the course of the study. A general characterization of the firm providing the comments is provided. It merits noting that some of the comments provided pertain to national and regional markets, and not always just specifically to California markets. It is apparent that most APC firms of significant size—both equipment and service providers—are national and even international in scope. A number of the interviewees indicated that California has advanced air quality regulations in comparison to other states to some degree, but almost all did not agree with the statement that they ‘honed their competitiveness’ in California before transferring it to other regions.

National Large Engineering/Construction Firm

“We see a lot of SCR projects for coal plants to reduce NOx emissions in the middle of the country. What’s driving that is the regulatory marketplace... requirements for lower emissions from these plants. We’re also beginning to see a new round of flue gas desulphurization (FGD) projects driven by either federal regulations or agreements between utilities with coal plants and individual states. States have been taking an increasing role in driving the market. The state of North Carolina recently reached agreement with all the utilities in North Carolina to put FGD systems on all their coal plants over the next 10 to 12 years. Those are very big capital projects.”

Mid-Sized VOC Equipment Company

“Revenue growth in VOCs from 2000 to 2003 has been somewhat limited. The principal driver for the VOC/HAP market has been EPA’s maximum achievable control technology (MACT) standards for HAP, or ‘air toxics,’ emissions, and many facilities in those industries that are already regulated have made their equipment purchases by now... The Clinton Administration was not aggressive in issuing new MACT standards for those industries that the Clean Air Act pegged for HAP controls, and the Bush Administration has shown little sign either of stepping up the pace of new MACT regulations or of aggressively enforcing existing standards.”

Mid-Sized VOC Equipment Company

“The primary driver for VOC-control equipment is the MACT regulatory program under Title III of the Clean Air Act (CAA) Amendments of 1990. Unlike some people in the air pollution control industry, we have not seen any significant slowdown in the issuance of new MACT regulations... The regulations are being promulgated at the normal pace—nothing extraordinary there... The Bush Administration does not really give us concern. The regulations are being issued pretty much according to the schedule under the CAA Amendments... What has been slowing the pace of sales is a drop-off in capital expenditures across the industrial sectors that we serves... As a result, 2002 was a flat year following two years of record revenue levels in 2000 and 2001.”

Mid-Sized VOC Equipment Company

“The NSR program has an impact on our business... The primary impact of any NSR revision will be on power plants, but it will also affect petrochemical plants, because they emit a lot of air toxics, and they will all slow down what they will do until the issues are cleared up... Any NSR rollback will certainly go to the courts, and will take a long time to play out. That will hurt sales, and hurt our industry.”

Large Diversified APC Equipment Company

“Despite a number of drivers, such as New Source Review (NSR) enforcement, NO_x control initiatives, and EPA’s regional haze rule, the schedules for issuing expected new standards are far from certain, and the levels of emissions that are likely to be allowed, as well as the extent to which existing and new standards will be enforced, remain unclear.... We believe the air-pollution control market offers reliable opportunities over the next eight to ten years, but for now, many regulated parties are finding themselves unable to plan.”

Mid-Sized NO_x Equipment Company

“New Source Review (NSR), multipollutant control legislation, and electric utility deregulation all play a role... but when it comes to controlling emissions of nitrogen oxides (NO_x) from electric power plants and other industrial facilities, EPA’s NO_x “SIP Call” is the driving force above all others... Since the U.S. Supreme Court allowed the SIP Call to go forward in March 2000, the orders for NO_x control equipment started rolling in...For us, there was nothing like the SIP call... Some states have already issued NO_x allowances to their emitters.”

Large Diversified APC Equipment Company

“Power plant construction cycles play a big role in our business. We outfit quite a few new gas-fired power plants with NO_x controls... [however] we expect a slowdown in new plant construction. Retrofits will account for a majority of the business going forward, particularly for SO₂ controls. Some NO_x retrofits are not yet finished, but there is a huge need for SO₂ retrofits...The retrofit market is driven primarily by EPA’s enforcement of the New Source Review (NSR) standards, which require power plants, refineries, and other large emissions sources to obtain revised permits and install the necessary emissions-control equipment whenever they undertake plant modifications that are likely to increase emissions. EPA’s NSR enforcement initiative has prompted many targeted utility and petrochemical companies to reach settlements with EPA and develop schedules for installing new NO_x and SO₂ controls on their facilities [ahead of enforcement actions]. Other parties that have not yet settled with EPA are nonetheless taking steps to correct their emission problems.”

Large Diversified APC Equipment Company

“The pulp & paper MACT rule was the major driver for our systems business... although the full impact of the MACT rule is still unclear.”

Large Air Instrumentation Company

“We now have access to customers in cement production, petrochemical refining, and pulp and paper. For facilities in these industries, the key regulatory drivers are the same ones driving the air-pollution control market in the power sector.... EPA’s NO_x SIP Call is prompting several industries to find out what their emissions are and to take steps to reduce those emissions... Currently, we’re looking at the U.S. market, although the testing guys are starting to see a global pull. There is a global CEM market, but it’s not growing at the rate that the U.S. market is growing.”

Mid-Sized Company with an Emissions Control System for Haz Waste Incinerators

MACT standards for hazardous waste incinerators are our biggest driver...EPA’s limits are very strict... About 170 hazardous waste incinerators need to upgrade their air-pollution control equipment to meet the MACT standards... There is also a lot of public scrutiny of our haz waste projects.”

Mid-Sized Consulting & Engineering Firm

“We have had ongoing opportunities in providing compliance assistance related to the maximum achievable control technology (MACT) standards... In spite of the economy, there’s no slack there... The Miscellaneous Organic NESHAP (MON) rule, which established MACT standards for HAP emissions from a broader range of industries has caused a nice increase too... The scheduling for the rule is part of an EPA settlement with the Sierra Club in which some deadlines for the MACT hammer—a CAA provision requiring the states to take regulatory action on HAP emissions from various industries if EPA fails to do so—were extended... If EPA fails to meet its commitment in the settlement, then the hammer will fall... Either way, the MON rule will help us. It takes a few man-years to comply, and facilities don’t have the labor.”

Mid-Sized Consulting & Engineering Firm

“Our work in air quality consulting has experienced the impact of economic downturn... Capital-project permitting is no longer taking up the lion’s share of the practice, as it was when merchant power plant permitting was dominating the market. That’s slowed down quite a bit, although we are seeing some continued development of coal-fired facilities and merchant plants that are able to get financing. There’s just fewer of them... Fortunately the development side of the business has been replaced by the regulatory side, such as Title V permit renewals... The larger industries, like refineries, have thousands of applicable requirements, and that’s driving the need for a lot of different types of varied consulting and environmental management activities.”

Small Specialist Consulting & Engineering Firm

“An area that has provided good business for us lately is data collection for compliance determinations under the benzene NESHAP.... Also there were developments with regard to the combustion MACT standards, which affected some of the older industrial and institutional boilers, and particularly the older coal-fired, oil-fired or waste boilers... Those standards are going to be finalized sometime between now and the early part of 2004. An interesting element is the option for those facilities to gain some relief of the control requirements through what I call a health-risk assessment ‘off-ramp.’ For example, if the facilities can demonstrate that their emissions don’t exceed chronic or acute health-risk standards, they can get some relief... Another consulting opportunity has been the work associated with assessing residual risk standards. Under the Clean Air Act, eight years after EPA issues HAP emissions standards for any industrial category, the agency must establish residual risk standards for those source categories. It has been more than eight years since EPA issued the Hazardous Organic NESHAP (or HON rule) covering a broad range of source categories in the synthetic organic chemical manufacturing industry... Like the MACT ‘off-ramp’ there is opportunity to conduct risk assessments for facilities with the aim of obtaining some regulatory relief if the residual risks are shown to be insignificant.”

Mid-Sized Consulting & Engineering Firm

“Prevention of Serious Deterioration (PSD) permitting for new facilities has been a fairly robust business... The work for so many PSD permits has come as a pleasant surprise... our company has been involved in about 100 permits over the past two years, mostly at electricity generating facilities... That’s a lot of plants, although not all of them will be built.... Electric utility deregulation had been a particular spur for PSD permitting, but there’s an obvious slowdown in the states’ interest in restructuring their electric utilities.... Most of states are trying to figure out what went wrong in California. I don’t yet see a point when the deregulation movement will pick up again.”

Small Consulting & Engineering Firm

“We see continuing opportunities to address the air-quality issues of independent power producers and industrial cogenerators. There is a whole host of people trying to build cogeneration facilities. At a huge refinery, which generates a lot of steam or waste heat, it makes sense to build a cogeneration facility, sell the power back to the grid, and use the steam back in the process.”

Mid-Sized Consulting & Engineering Firm

“The economic slowdown also has an upside—the lower cost of money—that can keep some projects moving forward... With money rates as low as they are, many companies are saying, if we are going to invest, this is the time to do it... So they will continue to fund the permitting projects, if not the construction. We see that activity in the power, refining, pulp and paper, and chemical industries. Most

industries are not doing that well, except for power, but they are going ahead with spending because money is cheap.”

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3. Profiles of the Air Pollution Control Industry from 1970 to 2002

This section presents a summary of the statistical model of the California APC Industry resulting from all of the quantitative and qualitative research performed for this study. First data tables and charts are presented on the entire California APC Industry as outlined in the earlier definition and segmentation section. These data tables include all pertinent statistics such as revenues, number of companies, employment, capital expenditures, profits and exports. Second is a review of historical trends, a recent assessment of trends and some forecasts of growth in each major segment.

3.1. California's APC Industry in 2001

Overall the California APC Industry generated \$6.2 billion in revenues in 2001, employing 34,000 Californians. The \$6.2 billion in revenues represents approximately 0.5% or 1/200 of the California economy. (The gross state product was \$1.36 trillion in 2001.)

The primary division in the APC industry as outlined in the previous section is between the 'Core APC Industry' which represents companies directly addressing air quality issues and the 'Clean Air Products Industry' which represents companies making 'cleaner' or substantially less-emitting products or less-emitting alternatives like renewable energy or energy efficient devices. The 'Core APC Industry' accounts for 36% of revenues and just under half (47%) of employment and the 'Clean Air Products Industry' accounts for 64% of revenues and the just over half (53%) of total employment.

Exhibit 3-1 The Total California APC Industry in 2001: Two Major Categories

	Revenue (\$mil)	% of Revenue	Employment
Core APC Industry*	2,234	36%	15,075
Clean Air Products Industry**	3,943	64%	17,113
Total Air Quality Industry	6,177	100%	32,188

Source: Environmental Business International Inc. (San Diego, Calif.)

* Core APC Industry is equipment and services directly related to air pollution control (A and B below).

** The Clean Air Products Industry is 'cleaner' or less-emitting products or energy sources (C below)

Looking at the total industry in more detail provides the following picture.

Exhibit 3-2 The Total California APC Industry in 2001: In Detail

	Revenue (\$mil)	Employment
A. Equipment Manufacturers		
Stationary Source Equipment Manufacturers	407	2,748
Mobile Source Emission Control Systems Manufacturers	670	2,603
Air Quality Instrument & Information Systems	157	1,246
B. Service Providers		
Consulting & Engineering Services (including monitoring)	164	1,695
Commercial testing labs	6	73
Vehicle smog testing stations & repair *	773	6,250
Research & Development	55	450
Emissions Trading	1	10
Core APC Industry Total (A+B)	2,234	15,075
C. Non-Traditional or 'Clean Air Products' Industry		
'Clean' Consumer Goods	42	163
'Clean' Industrial Machinery	309	1,630
Non-Polluting/Less Polluting Vehicles	203	390
Alternative Energy Sources **	3,249	14,503
'Clean' Alternative Fuels	67	151
'Clean' Paints & Coatings	73	277
Clean Air Products Industry (C)	3,943	17,113
Total Air Quality Industry	6,177	32,188

* counts all smog check revenues and repairs

** counts all power sales and equipment sales

The term 'clean' in respect to goods and industrial products is not clearly defined and has been qualified based on subjective measures. In the use of the term clean, specifications vary in each product category from as little as 0.5% of the total of industrial machinery to as much as 10% of boilers

Source: Environmental Business International Inc. (San Diego, Calif.)

3.2. California's 'Core' APC Industry in 2001

Provided with a focus on determining the measurable economic impact of air quality regulatory programs on the APC industry in California from 1970-2002, understandable emphasis was placed on the 'Core' APC industry. The following tables present the basic statistics on this 'core' industry for the year 2001, with some general observations or explanations of the data below.

Exhibit 3-3 California 'Core' APC Industry in 2001 (\$mil)

	2001 Industry Size (\$mil.)	2001 Core Industry Percentage
Stationary Source Equipment Manufacturers	407	18%
Mobile Source Systems Manufacturers & Suppliers	670	30%
Vehicle Smog Testing Stations & Repair	773	35%
Rest of 'Core' APC Industry	384	17%
Total 'Core' APC Industry	2,234	100%

Source: Environmental Business International Inc. (San Diego, Calif.)

- Almost two-thirds or 65% of the core industry is mobile equipment or smog testing.

Exhibit 3-4 California 'Core' APC Industry in 2001: Revenues, Numbers of Companies and Employment

Core APC Industry	Revenue (\$mil)	Companies	Employment
A. Equipment Manufacturers			
Stationary Source Equipment Manufacturers	407	200	2,748
Mobile Source Emission Control Systems Manufacturers	670	100	2,603
Air Quality Instrument & Information Systems *	157	80	1,246
B. Service Providers			
Consulting & Engineering Services (including monitoring)	164	500	1,695
Commercial testing labs	6	70	73
Vehicle smog testing stations & repair *	773	3,900	6,250
Research & Development	55	20	450
Emissions Trading	1	10	10
Core APC Industry	2,234	4,880	15,075

Source: Environmental Business International Inc. (San Diego, Calif.)

- While almost 5,000 businesses are listed, eliminating smog-testing services reduces this number to about 1,000, and eliminating consulting & engineering firms reduces the total to about 500 companies with businesses dedicated mostly to air pollution control.
- The APC industry represents about 6,600 manufacturing jobs in California, more than 6,000 automotive testing & repair jobs and another 2,200 service jobs.

Exhibit 3-5 Service & Equipment Firms

California APC Revenues	Total Cos.	Total Revs	% of Ind.	Avg. Revs
>\$50 Million	2	136	6%	68
\$20 Million–\$50 Million	6	207	10%	34.5
\$10 Million–\$20 Million	17	239	11%	14.1
\$5 Million–\$10 Million	63	435	20%	6.9
\$1 Million–\$5 Million	159	315	15%	2.0
<\$1 Million	4,535	840	39%	0.19
Total	4,782	2,171	100%	2.2

Including Commercial testing labs, Vehicle smog testing stations & repair, Research & Development, and Emissions Trading firms

Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-6 Service & Equipment Firms Excluding Smog Testing Stations

Aggregate	Total Cos.	Total Revs	% of Ind.	Avg. Revs
>\$50 Million	2	136	10%	68
\$20 Million–\$50 Million	6	207	15%	34.5
\$10 Million–\$20 Million	17	239	17%	14.1
\$5 Million–\$10 Million	58	404	29%	7.0
\$1 Million–\$5 Million	115	267	19%	2.3
<\$1 Million	684	145	10%	0.21
Total	882	1,398	100%	1.6

Excluding Commercial testing labs, Vehicle smog testing stations & repair, Research & Development, and Emissions Trading firms

Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-7 California 'Core' APC Industry in 2001: Revenues, Capital Expenditures and Profits

	Revenue (\$mil)	Capital Expenditures (\$mil)	Estimated Profits (\$mil)
Core APC Industry			
A. Equipment Manufacturers			
Stationary Source Equipment Manufacturers	407	18.3	40.7
Mobile Source Emission Control Systems Manufacturers	670	30.2	80.4
Air Quality Instrument & Information Systems	157	5.5	22.0
B. Service Providers			
Consulting & Engineering Services (including monitoring)	164	2.9	16.4
Commercial testing labs	6	0.3	0.5
Vehicle smog testing stations & repair	773	23.2	61.9
Research & Development	55	2.2	1.1
Emissions Trading	1	0.02	0.1
Core APC Industry	2,234	83	223.0

Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-8 California 'Core' APC Industry in 2001: Revenues and Exports

	Revenue (\$mil)	Exports (\$mil)	Exports Percentage
Core APC Industry			
A. Equipment Manufacturers			
Stationary Source Equipment Manufacturers	407	122.0	30%
Mobile Source Emission Control Systems Manufacturers	670	46.9	7%
Air Quality Instrument & Information Systems	157	36.1	23%
B. Service Providers			
Consulting & Engineering Services (including monitoring)	164	20.8	13%
Commercial testing labs	6	negligible	
Vehicle smog testing stations & repair	773	negligible	
Research & Development	55	negligible	
Emissions Trading	1	negligible	
Core APC Industry	2,234	225.8	10%

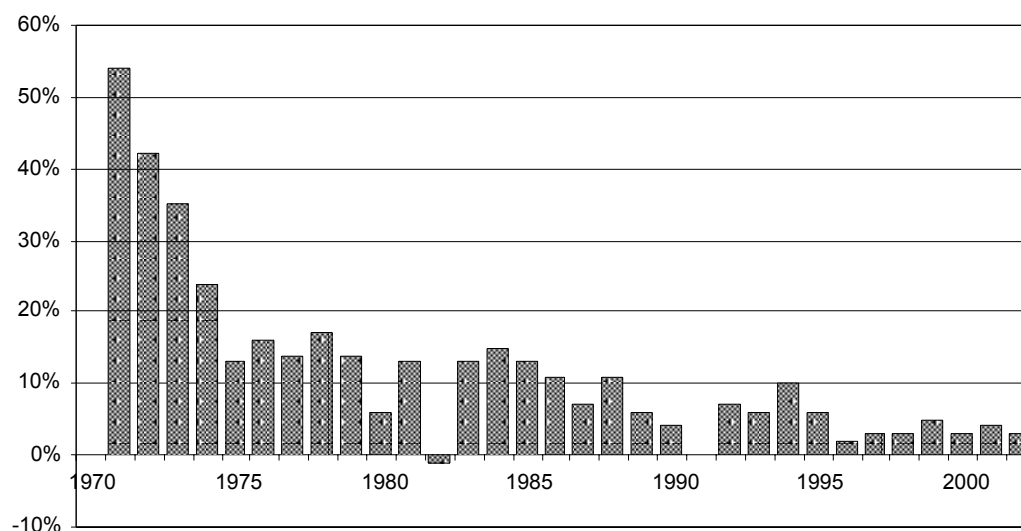
Source: Environmental Business International Inc. (San Diego, Calif.)

- Equipment companies export the vast majority of the 10% of the APC industry revenues that result from outside the state.

3.2.1. Historical Growth of Revenues and Jobs from 1970-2000

As the table below depicts, after early gains in the nascent APC industry in California, annual growth rates in the core APC industry were fairly consistent from the mid 70s to 1990, and even somewhat consistent throughout the 90s. As the data and discussion below will indicate, however, while growth rates were seemingly somewhat uniform across the core APC industry, each segment went through some noticeable fluctuations.

Exhibit 3-9 Annual Growth Rate of California 'Core' APC Industry, 1970 - 2002



Source: Environmental Business International Inc. (San Diego, Calif.)

The Economic Contribution of the California Air Pollution Control Industry

Presenting the growth by segment, by decade shows some interesting variations.

- As one would expect in a relatively small and developing industry, growth rates from decade to decade have fallen dramatically. However, the amount of added revenues each decade has remained high.
- The ‘negative growth’ or decline in revenues is notable in the 90s in three core segments; Stationary Source Equipment Manufacturers; Consulting & Engineering Services; and Commercial Testing Labs as a larger portion of the work in these segments was performed in the previous two decades to ‘catch up’ for years of relative neglect in air quality prior to 1970.
- Mobile source emission control systems manufacturers and vehicle smog testing stations & repair were by far the most significant contributors to revenue growth in the 90s as these mobile programs gained momentum.

Exhibit 3-10 California APC Industry, 1970, 1980, 1990 and 2000 (\$mil)

California APC Revenues (\$mil)	1970	1980	1990	2000
Stationary Source Equipment Manufacturers	25	300	406	397
Mobile Source Emission Control Systems Manufacturers	34	201	511	703
Air Quality Instrument & Information Systems	7	24	100	154
Consulting & Engineering Services (including monitoring)	4	23	151	139
Commercial testing labs	0	2	7	6
Vehicle smog testing stations & repair	4	14	192	703
Research & Development	2	23	32	53
Total Revenues (\$mil)	76	587	1,399	2,154

Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-11 California APC Industry 10-Year Growth, 1970s, 1980s and 1990s

	Growth in the 70s	Growth in the 80s	Growth in the 90s
Stationary Source Equipment Manufacturers	1119%	35%	-2%
Mobile Source Emission Control Systems Manufacturers	489%	155%	37%
Air Quality Instrument & Information Systems	265%	315%	54%
Consulting & Engineering Services (including monitoring)	424%	547%	-8%
Commercial testing labs	300%	308%	-16%
Vehicle smog testing stations & repair	254%	1272%	266%
Research & Development	1254%	42%	63%
Total Revenues (\$mil)	674%	138%	54%

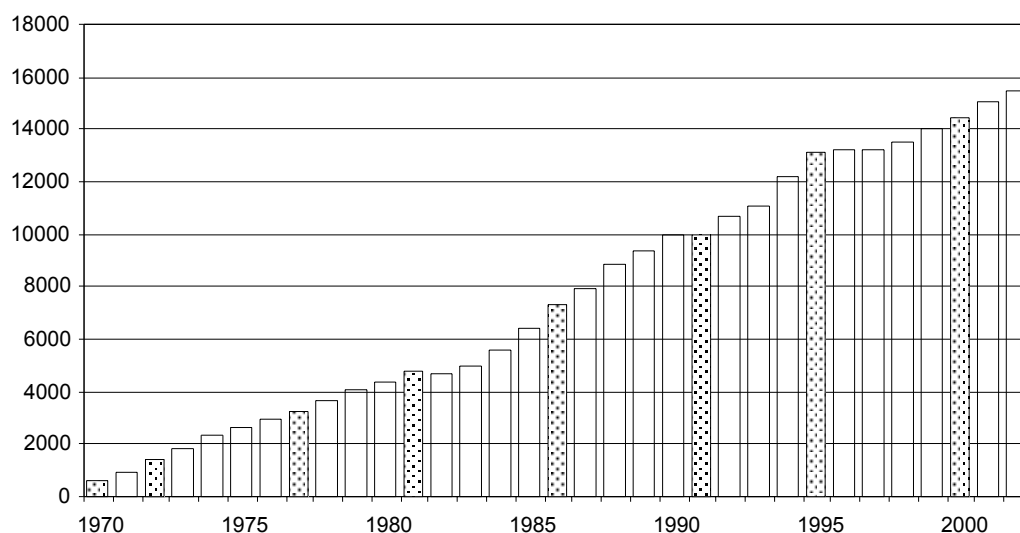
Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-12 California Core APC Jobs, 1970, 1980, 1990 and 2000 (\$mil)

California Core APC Jobs	1970	1980	1990	2000
Stationary Source Equipment Manufacturers	220	2,432	2,982	2,699
Mobile Source Emission Control Systems Manufacturers	180	961	2,216	2,756
Air Quality Instrument & Information Systems	73	240	900	1,239
Consulting & Engineering Services (including monitoring)	64	303	1,772	1,468
Commercial testing labs	6	23	85	70
Vehicle smog testing stations & repair	44	140	1,734	5,739
Research & Development	19	229	293	433
Emissions Trading	0	0	0	6
Total Employment	606	4,327	9,983	14,408

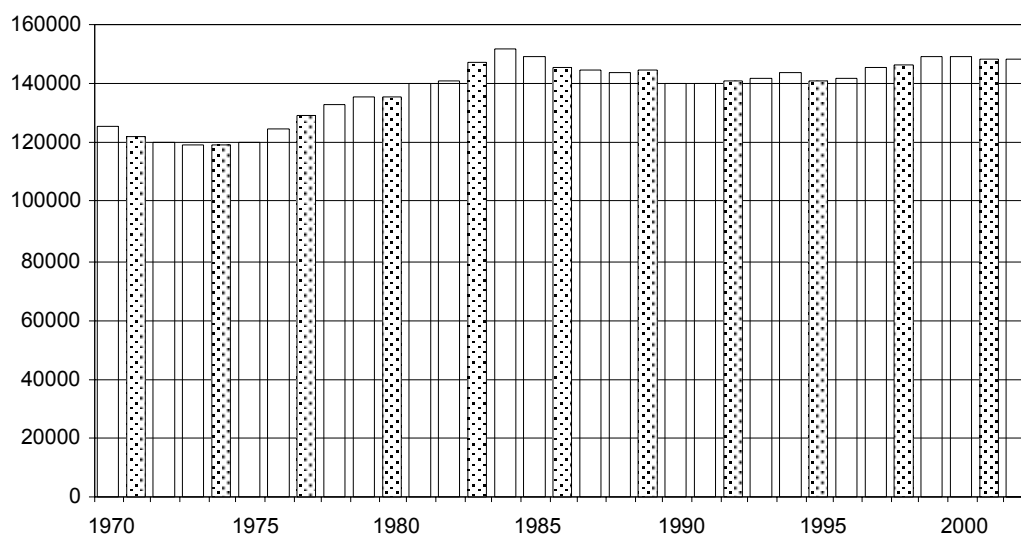
	Jobs Added in the 70s	Jobs Added in the 80s	Jobs Added in the 90s
Stationary Source Equipment Manufacturers	2,212	550	(283)
Mobile Source Emission Control Systems Manufacturers	781	1,255	540
Air Quality Instrument & Information Systems	167	661	338
Consulting & Engineering Services (including monitoring)	239	1,468	(304)
Commercial testing labs	17	62	(15)
Vehicle smog testing stations & repair	96	1,595	4,005
Research & Development	210	65	139
Emissions Trading	0	0	6
Total Added Jobs	3,722	5,655	4,426

Source: Environmental Business International Inc. (San Diego, Calif.). Figures in brackets indicate negative numbers.

Exhibit 3-13 Total Employment in the California 'Core' APC Industry, 1970 - 2002


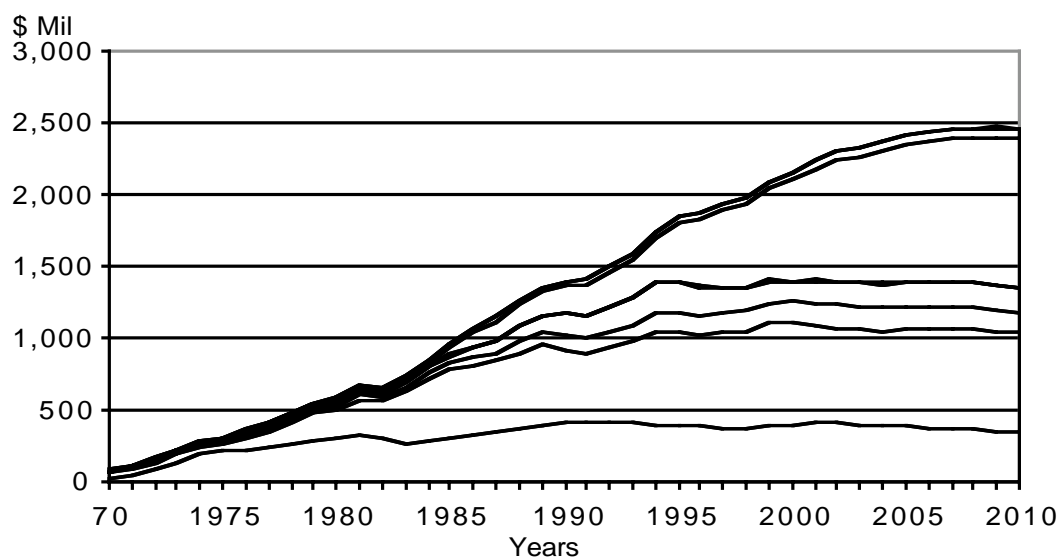
Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-14 Productivity or \$Revenues/Employee in the California 'Core' APC Industry, 1970 - 2002



Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-15 Historical and Projected Growth in the California 'Core' APC Industry



Source: Environmental Business International Inc. (San Diego, Calif.). Seven segments from bottom to top: Stationary Source Equipment Manufacturers, Mobile Source Emission Control Systems Manufacturers, Air Quality Instrument & Information Systems, Consulting & Engineering, Commercial testing, Vehicle smog testing stations & repair, Research & Development. Sales in current dollars, units in \$ million.

3.2.2. Air Pollution Control Equipment Segments

The market for equipment and systems for stationary sources includes flue gas desulfurization (FGD) systems, electrostatic precipitators (ESP), fabric filter systems, absorbers, oxidation systems, catalytic systems, NO_x control systems, and other equipment including parts and supplies. Total U.S. sales in stationary source APC equipment were \$3.8-billion in 2002. Sales by California companies were \$410 million or 11% of the U.S. industry. Most of stationary source APC equipment is associated with fixed-facility combustion. Historically a large portion of air quality markets evolved along the lines of combustion or energy with control efforts focused on utilities, waste incineration plants and then moving on to metals production and pulp & paper mills and other facilities generating their own power or using combustion systems. Other equipment includes air filters used for small stacks, oxidation systems, volatile organic compound (VOC) controls, hazardous air pollutant (HAP) controls, odor controls and air handling equipment used on landfills and remediation projects.

Controls for mobile sources of air pollution (mostly catalytic controls for vehicles and the supplies associated with this) are inextricably linked with the automotive manufacturing industry. Mobile emissions have not generally been viewed as a stand-alone business sector, but more part of the automotive supply business although top companies like Corning, Johnson Matthey, Allied Signal, and Engelhard do think of themselves as environmental companies as well as automotive supply companies. Total U.S. sales in mobile APC equipment were \$15.2-billion in 2002. Sales by California companies were \$662 million or 4.4% of the U.S. industry.

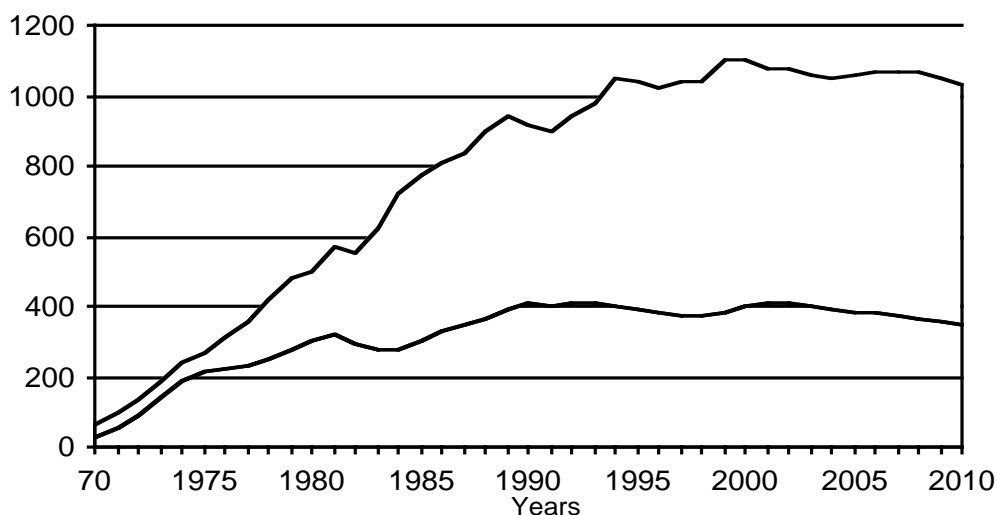
Exhibit 3-16 California 'Core' APC Industry in 2001 (\$mil): Control Equipment Only

	2001 Market Size (\$mil.)	2001 Eqpmt Percentage
Stationary Source Equipment Manufacturers	407	38%
Mobile Source Emission Control Systems Manufacturers & Suppliers	670	62%
Total 'Core' APC Equipment	1,077	100%

Source: Environmental Business International Inc. (San Diego, Calif.)

**Exhibit 3-17 Historical and Projected Growth in the California APC Segment: Stationary
Source Equipment and Mobile**

STATIONARY: SHADED • MOBILE: WHITE



Source: Environmental Business International Inc. (San Diego, Calif.) Sales in current dollars, units in \$ million.

Looking at a 40-year history of air quality equipment sales in California, it is apparent that, after stationary sources accounted for the majority of equipment sales in the 1970s, mobile sources or vehicles became the larger revenue generator in the early 1980s. The mobile business has grown faster than the automotive manufacturing industry, but its growth cycles have become more linked to the overall automobile manufacturing industry as emissions controls have become more standard. In spite of the inclusion of a number of non-automotive emissions in the late 90s like boats, small generators and gardening equipment and the focus on diesel throughout the decade of 2000-2010, however, analysts ultimately see mobile APC systems and supplies markets starting to decline slightly with the introduction of more significant amounts of low- and zero-emission vehicles towards the end of the decade.

In stationary sources, markets gradually grew with regulatory programs with periodic bursts of sales growth in specific industries or equipment segments. However, in the long term forecasters see some decline as some emission issues are ‘designed out’ of new industrial machinery and power generation equipment in some cases, and cleaner technology replaces traditional sources of air pollution in industry, power generation and other areas. This decline, however will be somewhat modest as despite the best of intentions, the more likely scenario is that the vast majority of power generation and vehicular power will be generated by traditional sources in the forecast time window of 2004-2010. Therefore, the ‘most likely’ forecast projects that the business of manufacturing emissions control

equipment, stationary and mobile, will remain a vibrant portion of the state economy representing more than \$1.1 billion in sales and over 7,300 jobs in 2000—and conservatively projected, will be \$1.03 billion in sales and over 6,000 jobs in 2010.

3.3. Stationary Source Equipment Manufacturers

3.3.1. APC Equipment Market Industry Structure

Although the APC equipment market is led by a group of large equipment manufacturers, the industry is actually made up of numerous small companies. The \$3.8 billion U.S. market is populated by an estimated 550 firms. The top 7 firms listed in the second exhibit below of total US firms represent 25% of the market. Companies under \$100 million in APC revenues represent approximately 75% of the total market. There are about 450 firms that had less than \$10 million in annual APC revenues in the U.S. These firms tend to be technology or market specific manufacturers or specialty suppliers. In California there are an estimated 200 stationary source APC equipment firms. Some of these are national—or indeed international—firms, and the majority of these 200 companies have offices or headquarters outside of California in addition to their presence in California.

Exhibit 3-18 Stationary Source Equipment Manufacturers (Sales of California-based Operations)

California APC Revenues	Total Cos.	Total Revs	% of Ind.	Avg. Revs
\$20 Million–\$50 Million	1	22.0	5.4%	22
\$10 Million–\$20 Million	5	63.0	15.5%	12.6
\$5 Million–\$10 Million	28	190.4	46.8%	6.8
\$1 Million–\$5 Million	44	101.2	24.9%	2.3
<\$1 Million	122	30.1	7.4%	0.25
Total	200	406.7	100%	2.0

Exhibit 3-19 U.S. Stationary Source APC Equipment Industry, 2001

Company Size	Number of Companies	Total 2001 APC Revenue	Percent of Industry Rev	Average Revenue
>\$100 Million	7	975	25%	139.3
\$50 Million–\$100 Million	8	549	14%	68.7
\$20 Million–\$50 Million	26	801	21%	30.8
\$10 Million–\$20 Million	48	611	16%	12.7
<\$10 Million	405	914	24%	2.3
Total	494	3,850	100%	7.8

Source: Environmental Business International Inc. (EBI), based on survey and data analysis of over 100 companies. Sales are for calendar year 2001 and units are in \$mil. Includes only revenues from stationary source air pollution control equipment sales and directly related services.

The following is EBI's list of top APC revenue earning equipment manufacturers in the nation. The list is compiled from surveys and data analysis of more than 200 APC equipment firms. Note that not all the

firms on the list are US companies. This is because many foreign firms have a considerable presence in the US APC market.

3.3.2. Top APC Equipment Companies in the United States

Exhibit 3-20 The Top APC Equipment Companies in the U.S. Market, 2001

Company	U.S. HQ Location
>\$100 Million	
Donaldson Company Inc.	Minneapolis, MN
BHA Group Inc.	Kansas City, MO
MFRI	Niles, IL
Alstom Power	Knoxville, TN
Clarcor	Lancaster, PA
Babcock Borsig Power Inc.	Worcester, MA
Monsanto EnviroChem	Chesterfield, MO
\$50 Million–\$100 Million	
Ceco Filters Inc	Conshohocken, PA
Environmental Elements Corp.	Baltimore, MD
Babcock & Wilcox Co.	Barberton, OH
Wheelabrator Air Pollution Control	Pittsburgh, PA
Koch Industries/John Zink, Todd Combustion	Louisville, KY
FLS miljo Inc.	Houston, TX
\$20 Million–\$50 Million	
Ducon Technologies Inc.	Farmingdale, NY
MEGTEC Systems	DePere, WI
Marsulex Environmental Tech Llc	Lebanon, PA
Hamon Research-Cottrell	Somerville, NJ
McGill Air Clean Corporation	Groveport, OH
Mitsubishi Heavy Industries America Inc.	Newport Beach, CA
Met-Pro Corp.	Harleysville, PA
Durr Industries, Inc.	Wikom, MI
Crown Andersen Inc.	Peachtree City, GA
Flex-Kleen Corp.	Somerville, NJ
Lydall Inc	Manchester, CT
Belco Technologies Corp.	Parsippany, NJ
Coen Company Inc.	Burlingame, CA

Source: EBI Inc, based on survey and data analysis of over 200 companies. Sales are for calendar year 2001 and units are in \$mil. Includes only revenues from stationary source air pollution control equipment sales and directly related services. Although EBI and Environmental Business Journal has made every reasonable effort to be accurate, revenue figures are not the result of internal or external audits and therefore are not guaranteed to be accurate. Errors and omissions are unintentional.

3.3.3. Historical Development of Stationary Source APC Markets

The historical development of this segment was discussed briefly in the market driver section, but the main points merit repeating here. The Clean Air Act Amendments of 1970 and subsequent programs set off high growth in control equipment sales in the 70s, particularly in petroleum refineries in California. Equipment market gets another boost by 1977 Clean Air Act Amendments which drives sales again in the refinery sector (SIC 29) but also in fabricated metals (SIC 34) and transportation equipment (SIC 37) industries. From 1979-1981 these three industries accounted for 60% of the state's industrial (non-

utility) capital expenditures on air pollution control, according to U.S. Department of Commerce (DOC) Pollution Abatement Capital Expenditures (PACE) survey.

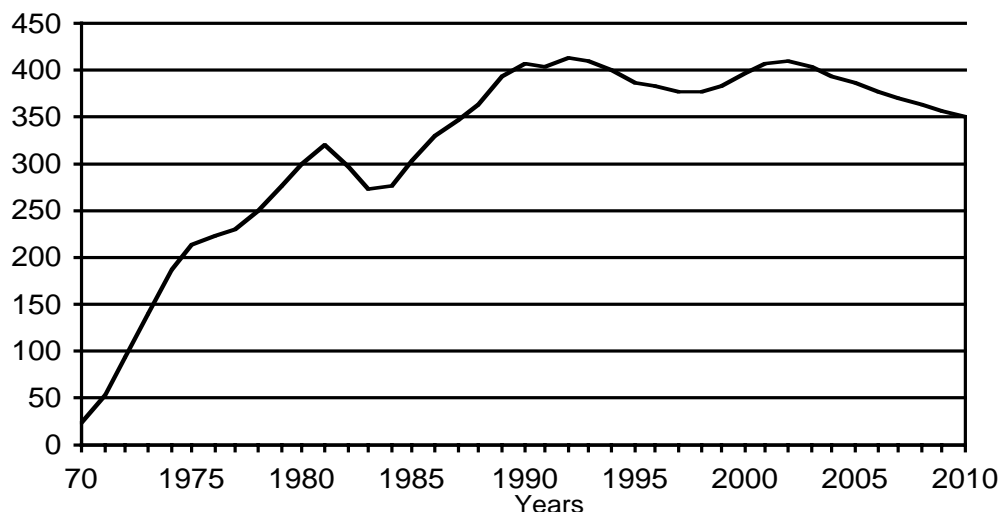
From 1981 to 1983, sales decline in stationary source APC equipment due principally to three factors, according to APC executives: 1) Certain deadlines being met by many major sources by 1980; 2) Transition to the Reagan Administration resulting in a 'regulatory de-emphasis,' uncertainty at EPA and lack of new programs; and 3) Some overall economic slowdown. Growth slowly returned in the late 80s as EPA programs regained momentum and backlogged equipment sales were realized.

The Clean Air Act Amendments of 1990 offered hope for equipment manufacturers of an avalanche of sales, but they were generally disappointed in the short-term as delays were made to a number of programs, economic slowdown occurred in 1991-92 and the transition to the Clinton administration caused regulatory and enforcement uncertainty. However over the course of a decade or more, the foundation laid by the amendments of 1990 had a serious impact on APC industry sales. (See detail on the Clean Air Act Amendments of 1990 above)

In the late 1990s manufacturers report very significant growth in VOC control and NOx control equipment, mostly as a result of requirements to address ozone, much of which was addressed in the State Implementation Plan (SIP). High-growth in these categories is balanced by decline in more traditional controls like flue gas desulphurization and electrostatic precipitators, resulting in only modest growth for the overall stationary source APC equipment category up to 2002.

The chart below showing annual sales totals from 1970-2010 exhibits these eras.

Exhibit 3-21 Historical and Projected Growth in the California Stationary Source APC Equipment Segment

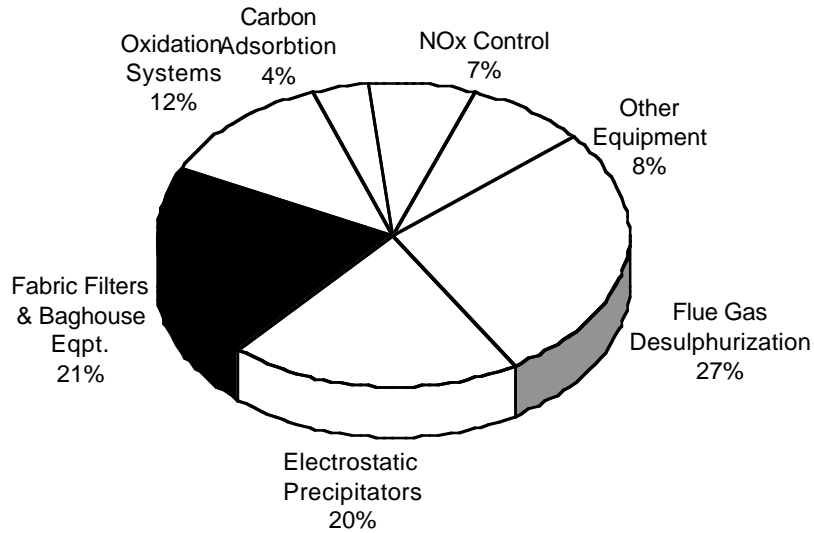


Source: Environmental Business International Inc. (San Diego, Calif.) Sales in current dollars, units in \$ million.

3.3.4. The National Picture in Stationary Source APC Equipment APC Equipment Market by Equipment Type

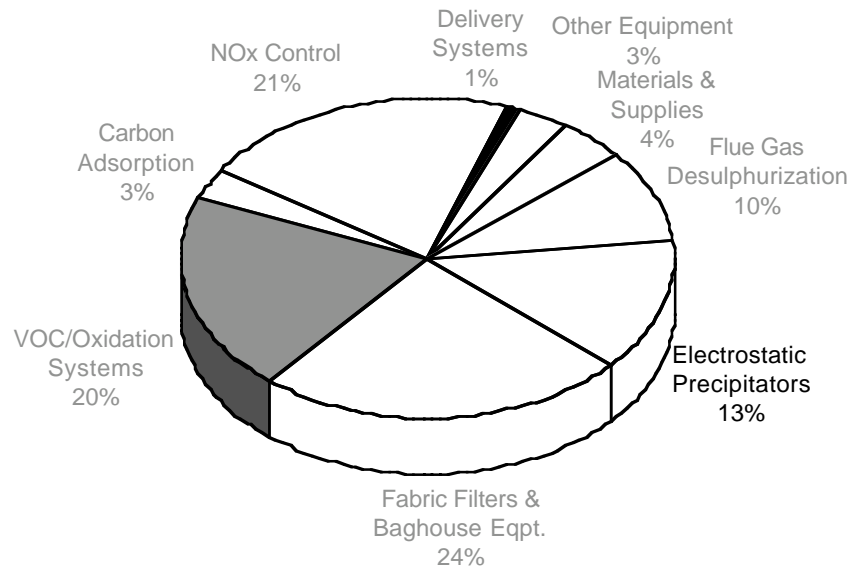
The U.S. APC market was once dominated by flue gas desulfurization (FGD), electrostatic precipitation (ESP), and fabric filters and baghouse systems. The market representation of these categories is not expected to increase as capital expenditures on APC equipment has already peaked for power utilities with the exception of NO_x markets. Oxidation systems, NO_x control, and carbon adsorption represented just over 15% of APC equipment revenues in 1992 but grew to 23% of the market in 1994 and their revenue share has ballooned to over 40% by 2001 driven mostly by NO_x and VOCs. These equipment markets for treating VOC emissions, air toxics, NO_x, etc. were driven by CAA regulations and enforcement efforts as well as by the expanding scope of regulated industries. Another regulatory driver outside of California was the Ozone Transport Attainment Group (OTAG), a coalition of 37 states focusing on VOCs and NO_x as leading contributors to ground-level ozone. The following exhibits portray the changing shares of equipment types from 1994 to 2001.

Exhibit 3-22 U.S. APC Equipment Market by Equipment Type, 1994
(TOTAL MARKET = \$3.7 BILLION)



Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-23 U.S. APC Equipment Market by Equipment Type, 2001
(TOTAL MARKET = \$3.7 BILLION)



Source: Environmental Business International Inc. (San Diego, Calif.)

U.S. APC Equipment Market by Pollutant

The breakdown of APC equipment revenues by the type of pollutant shows that in 1994 particulates represented the largest volume (30%) followed closely by SOx (26%) and the growing segments of VOCs (16%) and air toxics or hazardous air pollutants (HAPs) at 14%. However, market shifts led to large gains in NOx and VOCs and decline in SOx equipment.

Exhibit 3-24 U.S. APC Equipment Market by Pollutant, 1994

(TOTAL MARKET = \$3.7 BILLION)

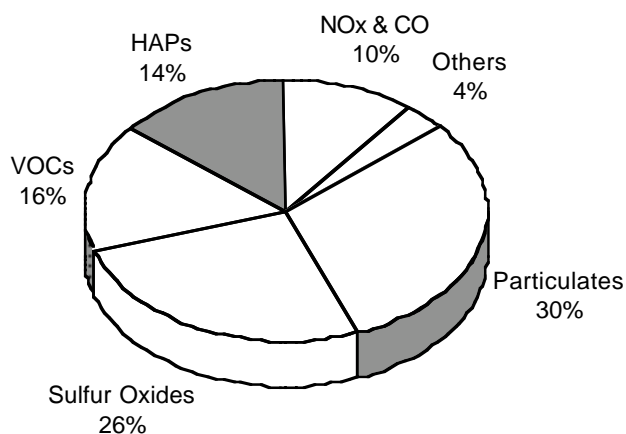
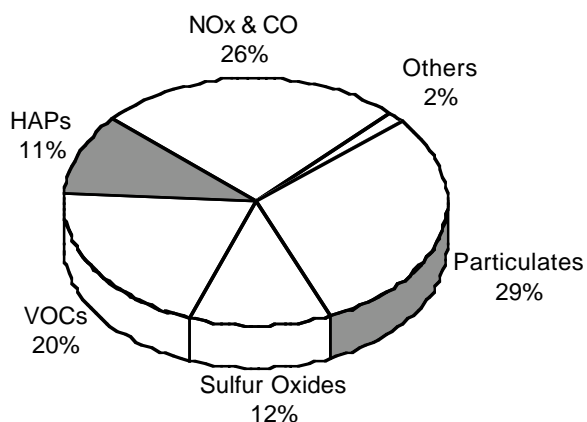


Exhibit 3-25 U.S. APC Equipment Market by Pollutant, 2001

(TOTAL MARKET = \$3.7 BILLION)

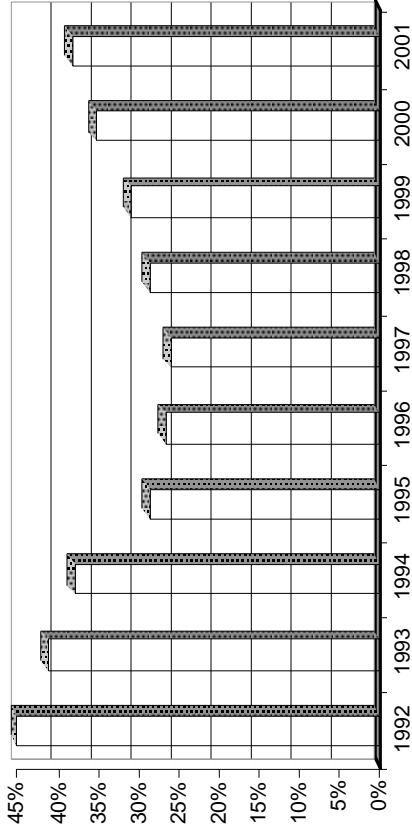


Source: Environmental Business International Inc. (San Diego, Calif.)

APC Equipment Market by Customer Type

Breaking down the APC equipment market by industry buyer shows the historical focus on fixed facility, large-scale combustion as best characterized by utilities, which represented 45% of the market in 1992, but declined to 26% in 1997. Utilities moved back up with the growth in the NOx market from 1998-2002, however. Although the utility market is still the largest contributor to APC revenues in 2002, it is not expected to experience another growth spurt as high as before and its share of equipment revenues will be approximately 30-40% from 2002-2006. After-market sales and some growth in NOx equipment will contribute a significant portion of sales, balancing still declining FGD sales. It is possible that New Source Review programs or other regulatory and/or enforcement efforts aimed at the larger, older predominantly coal-fired plants could result in a major growth spurt. This is deemed unlikely, however, unless there is a substantial policy or administration change in Washington and, even if there was a change, much of the resulting activity would not involve California sources.

Exhibit 3-26 Share of U.S. APC Equipment Market by Power Utilities, 1992-2001



Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-27 U.S. APC Equipment Market by Customer Type, 1994

(TOTAL MARKET = \$3.7 BILLION)

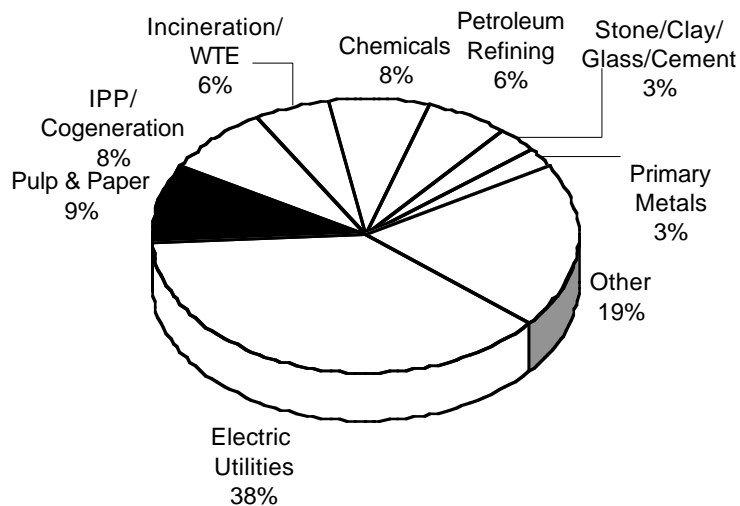
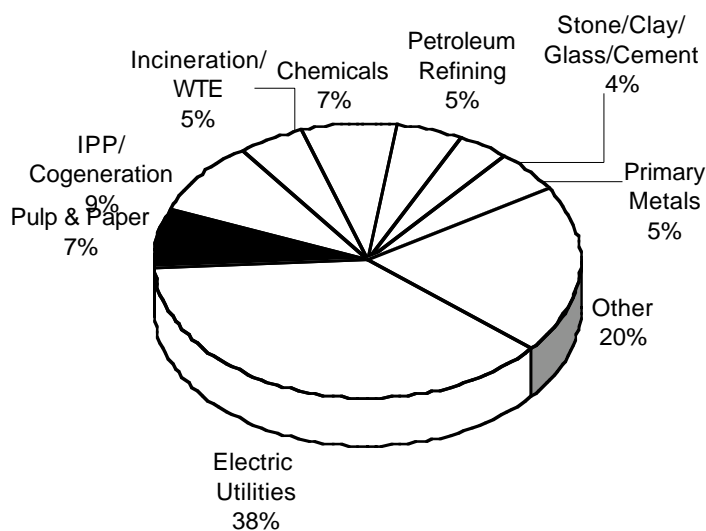


Exhibit 3-28 U.S. APC Equipment Market by Customer Type, 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

3.3.5. Current Trends in Stationary Source Equipment

With numerous fingers pointed at coal-fired electric power plants, re-identifying them still as the leading U.S. sources of nitrogen oxides (NO_x), sulfur dioxide (SO₂), and mercury pollution—to say

nothing of emitting substantial volumes of carbon dioxide—the impetus to regulate these facilities more stringently has been overwhelming once again since 2001 and 2002. The regulatory initiatives are coming from multiple directions, and despite the regulated community’s customary efforts to resist, some of the initiatives are now certain to stick.

In addition, at least until the economic downturn, new power generation projects were moving forward at rapid pace. No surprise, then, that many providers of air-quality equipment and services have identified the electric power industry as their primary target market by a considerable margin. The NO_x-control equipment market in particular remains poised for growth until almost 2004 as states in the Midwest and Southeast scramble to revise their State Implementation Plans (SIPs) with new, tighter NO_x emission standards.

Meanwhile, several other questions about the electric power industry as a prime air-pollution control market remain: Will the New Source Review (NSR) program continue to be enforced at its current level? Will the Bush Administration proposals for NSR reform scale back some need for emissions-control retrofits? Will ‘multi-pollutant’ control legislation—now commanding bipartisan support, but years away in terms of specific regulatory programs—include a carbon dioxide standard? Will climate change concerns and electric utility deregulation prompt a move away from electricity generation based on fossil fuels towards other, more efficient sources? Will the perception of a crisis in electricity-generating capacity and transmission grids (and events like the California power crisis and the 2003 eastern blackout) trump environmental concerns?

“The challenges that air-pollution control companies face today are not unlike the ones that have existed for many years—a lot of competition, customers buying on the basis of lowest cost, customers who desire the product in most cases only because they are required to install it, so they are buying just enough, just in time,” says Jeff Smith, executive director of the **Institute of Clean Air Companies** (ICAC; Washington, DC), the major trade association representing APC companies. “Perhaps the most important challenge, however, is the uncertainty that pervades our market as to the nature of future clean air rules and their enforceability.”

The most certain regulatory driver since 2001 has been EPA’s “NO_x SIP Call,” the regulation designed to address regional NO_x transport. The NO_x SIP Call requires 22 states east of the Mississippi River, along with the District of Columbia, to revise their SIPs with new NO_x standards. These standards focus largely on NO_x emissions from coal-fired power plants, which have until May 2004 to comply.

With the May 2004 deadline in place, NO_x equipment orders have been rolling in. “The NO_x control business dwarfs everything else in the air pollution sector, and it’s all driven by the SIP Call,” said one market analyst. “Some systems are installed already, and some are in the process of being installed.” The market for NO_x control equipment is expected to grow from \$2.2 billion in 2001 to \$3.3 billion in 2002, said the analyst.

Another spur to the installation of air-pollution control systems at electric power plants, as well as other affected industrial facilities, had been EPA’s aggressive enforcement of the NSR program under an initiative launched during the last years of the Clinton Administration. The Clean Air Act’s NSR provisions require existing facilities to obtain the necessary air permits and install pollution-control equipment whenever they undertake substantial modifications or upgrades that could increase emissions. Many of the utilities targeted for enforcement action vigorously challenged EPA’s interpretation of “modifications,” and complained that EPA’s actions were chilling efforts to conduct necessary maintenance and meet growing electricity demand. However, multimillion-dollar early settlements with companies such as Cinergy and Virginia Power undermined the utilities’ objections. Since the Bush Administration, however the NSR program has been plagued with uncertainty and many APC installations have been postponed. Outcry from many quarters, however, has blunted the Administration’s efforts to ease NSR requirements substantially.

Particulate matter, especially that resulting from diesel fuels, is becoming a more prominent target in mobile and stationary source applications. California ARB’s diesel retrofit initiative under the Diesel Risk Reduction Program, for example, includes sources like back-up power generators and other small-scale stationary sources, in addition to vehicles, and will spur a significant quantity of filter sales and other measures for controlling or preventing emissions.

A potential longer-term driver for the air-pollution control market in the electric utility sector beyond the NSR program is “multipollutant” control. Clearly impressed by all of the data identifying U.S. electric utilities as the world’s leading polluters, Congress is building some bipartisan momentum towards enacting legislation to reduce emissions of NO_x, SO₂, and mercury, as well as particulate matter, from coal-fired electric power plants. The biggest bone of contention is whether carbon dioxide (CO₂) emissions—power plants contribute about 33% of U.S. CO₂ emissions—will be regulated as part of the final legislation.

Based on the bipartisan signals from Congress, multipollutant control is virtually certain to include a cap-and-trade program, which the air-pollution control community sees as a plus in any regulatory

initiative. “With the advent of emissions trading, it is now possible for members of our industry to show customers that, in fact, there is a contribution to the bottom line for installing pollution controls,” says Smith. “To participate successfully in clean-air technology markets today, our members have had to master not only their technology but also clean-air emissions trading policy.”

Even further out than multipollutant control legislation is the impact of climate change policy, which presents a host of variables. Included among the uncertainties is the extent to which the United States will wean itself from fossil-fuel sources and generate a substantially greater percentage of its electricity from renewable resources. Yet despite the unqualified optimism of energy gurus like Amory Lovins, the radical change of consciousness required to effect this transition is certainly years away at the least. “It’s hard to envision that Congress will pass CO₂ reduction requirements that will seriously compromise our need to burn coal in this country, because coal is an important element of our ability to generate electricity, and will be for some time,” says Jeff Smith of the Institute of Clean Air Companies. “Coal will be there as part of the mix, and it can be burned cleanly. And sufficiency of energy supply trumps environmental concerns every time,” he adds, acknowledging that panic about sufficient electricity-generating capacity has abated somewhat.

Whatever happens with climate change, generating capacity security, and electric utility restructuring, electric power plants are the center of the action and debate is for much of the U.S. air-pollution control industry in 2002-2003 and the next few years.

3.4. Mobile Source Emission Control Systems Manufacturers

Controls for mobile sources of air pollution (mostly catalytic controls for automobiles) amount to a \$13.4 billion business that has traditionally been linked with the automotive manufacturing industry. Mobile emissions have not generally been viewed as a market opportunity for ‘environmental’ companies even though companies such as Corning, Johnson Matthey, Allied Signal, and Engelhard think of themselves as environmental companies as well as automotive supply companies.

The mobile sources industry universe is broken down into size categories the following way:

Exhibit 3-29 Mobile Source Emission Control Systems Manufacturers (Sales of California-based Operations)

California APC Revenues	Total Cos.	Total Revs	% of Ind.	Avg. Revs
>\$50 Million	2	136.0	20.3%	68
\$20 Million–\$50 Million	5	185.0	27.6%	37
\$10 Million–\$20 Million	10	144.0	21.5%	14.4
\$5 Million–\$10 Million	18	129.6	19.3%	7.2
\$1 Million–\$5 Million	22	57.2	8.5%	2.6
<\$1 Million	45	18.6	2.8%	0.41
Total	100	670.4	100.0%	6.7

Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-30 Top Mobile Source Emission Control Systems Manufacturers in the U.S.

Company	2000 Mobile APC Revenue
>\$500 Million	
The Top Six Companies: Honeywell (Allied Signal), Engelhard, Johnson Matthey, Siemens, Degussa and Corning	
Sum of Top 6	4,100
Others	11,300
Total	15,400

Source: Environmental Business International Inc. (San Diego, Calif.)

3.4.1. Historical Development of Mobile APC Markets

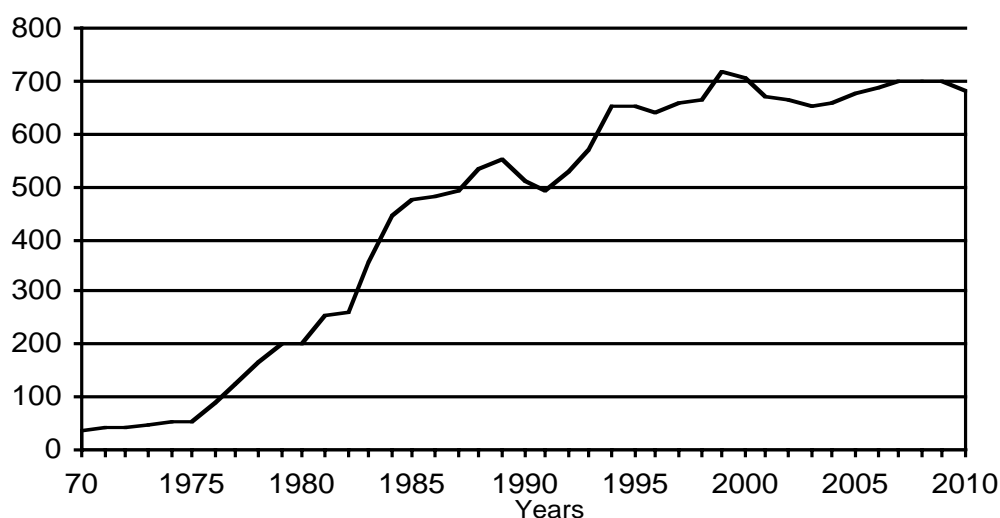
The historical development of this segment was summarized in the market driver section, but the main points merit repeating here. Although the first recorded use of automotive emissions control technology was in 1961 and the first tail-pipe emissions standards appeared in 1966 and 1970, significant revenue generation in the business of manufacturing and supply of Mobile Source Emission Control Systems didn't occur until the 1970s. The year 1975 marked the introduction of the first two-way catalytic converter and the industry has not looked back since. Growth remained particularly strong from 1975 to 1990—averaging roughly 16% per year—as both the automotive industry and the demand for emissions controls grew steadily. During this time 'California standards,' as they became to be known, gradually spread across the nation.

Beyond the standards for new cars sold in California set by ARB, particular drivers during this rapid growth period included the introduction of compliance testing by ARB in 1980 and the subsequent launch of the California Smog Check Program in 1984. A key factor in growth of mobile systems is the somewhat cyclical nature of the automotive industry and its dependence on the health of the overall economy. While in most cases sales of emissions control devices and supplies outpaced car sales in this era, year-to-year sales fluctuated along with the economy.

An additional factor of concern to California was that as the emissions control industry grew and matured, some innovations made in the state were reproduced by larger companies outside the state. This leads to what is still believed to be a net ‘importing’ of California cars from other states. In total about 95% of the U.S. Mobile Source Emission Control Systems industry is estimated to be outside California, although 10-15% of vehicles in the United States are purchased in California. For California’s economy it seems a shame that the state is ‘under-represented’ in mobile emissions systems and supply, but that state can hardly expect to wield too much influence on the entire U.S. automotive industry.

By the 1990s, the growth in sales of emission control systems and supplies were tied fairly closely to the manufacturing output of the automotive industry. Significant developments were more on the clean fuel side with 1992’s Phase I California Cleaner Burning Gasoline and 1996’s California Phase II Cleaner Burning Gasoline examples of changes. However, by the late 90s, with diesel identified as a toxic air contaminant, ARB further broadened its scope first to small engines like marine engines and mowers and later to buses, trucks and big rigs. The federal government followed suit in one of the Clinton Administration’s final actions with EPA’s 1999 Tier II rules setting new standards for engine emissions of diesel particulate matter, oxides of nitrogen and hydrocarbons to phase in until 2010, and many suppliers are forecasting annual double-digit growth rates for the decade.

Exhibit 3-31 Historical and Projected Growth in the California Mobile Source APC Equipment Segment



Source: Environmental Business International Inc. (San Diego, Calif.) Sales in current dollars, units in \$ million.

3.4.2. Current Trends in Mobile Emission Control Equipment

A series of recent regulatory initiatives, led mostly by new diesel emission programs of the California Air Resource Board and federal standards issued as one of the Clinton Administration's final actions, have apparently jump-started unprecedented levels of technology development among makers of mobile-source emissions controls. Manufacturers are preparing for robust markets for particulate filters, oxidation catalysts, selective catalytic reduction (SCR) systems, and lean NO_x traps (LNTs), or NO_x absorbers as new standards for engine emissions of diesel particulate matter, oxides of nitrogen, hydrocarbons, phase in during 2000-2010.

Both light-duty vehicles, such pickup trucks, minivans, and sport utility vehicles (SUVs), and on-road heavy-duty diesel vehicles, including buses and large trucks, face compliance with new regulations as early as 2004—or in 2002 due to consent decree. EPA's 1999 Tier II rules will require the SUVs and other light-duty vehicles, for the first time ever, to meet the same emission standards as passenger cars beginning with the 2004 model year. The Tier II rules are modeled after the Air Resource Board's second round of Low-Emission Vehicle standards (LEV II). The Tier II and LEV II standards will tighten in successive years so that, by 2010, a GM Suburban will be as clean as a Toyota Tercel, emission-control companies say.

The Tier II and LEV II programs “are going to create new market opportunities for emission control manufacturers in the areas of exhaust emission controls as part of a ‘systems-approach’ that includes advanced engine designs, fuel delivery systems, and electronics,” according to Bruce Bertelsen, executive director of the **Manufacturers of Emission Controls Association** (MECA; Washington, D.C.). “Unlike the heavy-duty side, exhaust emission controls have been used for years, but what you will see is enhanced emission controls, which will create additional market opportunities.” Starting with the 2007 model year, the heavy-duty engines will be required to reduce emissions by 90 to 95% over the current standards. The emission standards for the diesel engines are thus the true technology drivers, taking aim at a pollution source—diesel combustion—that is fast gaining attention as a major human health threat.

Dual-track regulation, requiring changes in fuels and engines, has prompted “a concerted effort among the oil companies, the automobile companies, and the emission control companies,” said one APC manufacturer. “The work is comparable to the cooperation on the shift to unleaded gasoline in the 1970s—maybe on a higher level.” Meanwhile, EPA has launched a “voluntary retrofit” program for diesel engines that is already fueling sales of emissions control units. EPA says that, under its Voluntary

Diesel Retrofit Program, it has received commitments to place new controls on more than 70,000 trucks, buses, and construction vehicles nationwide.

ARB, too, is moving forward with a diesel retrofit initiative under its wide-ranging Diesel Risk Reduction Program, which has a goal of reducing diesel particulate emissions and the associated health risk by 75% in 2010 and 85% by 2020. The program has mandatory, voluntary, and incentive-based elements. Europe has also taken steps to address diesel pollution from heavy-duty engines with phased-in standards comparable to those in the United States—possibly creating more export opportunities for U.S. firms. The Euro IV standards establish new limits on emissions of NO_x, particulates, hydrocarbons, and carbon monoxide by 2005, while the Euro V standards tighten the NO_x limits further. “These standards are less stringent than EPA’s 2007 standards for heavy-duty vehicles, so there is some question as to whether filters will be needed on all vehicles to meet the standards,” according to MECA’s Bertelsen. However, countries in the European Union “have made it clear that they want filters on heavy-duty vehicles,” he adds. “Filters are extraordinarily effective in controlling particulate matter, especially ultra-fine particles.”

The off-road market represents up to half of the diesel emissions inventory in the United States, but EPA has started the process of issuing emission standards for off-road vehicles, such agricultural tractors, forklifts, and construction cranes in US EPA’s Tier IV program. Industry players speculate that this class of vehicles could face controls as stringent as those for on-road heavy-duty diesel vehicles, although, in all likelihood, no earlier than 2009. All in all, “the actions taken by EPA and CARB, as well as Europe’s actions, have really triggered a technology renaissance,” Bertelsen remarks. “The pace at which technologies have been improved and optimized is extraordinary, and that’s a function of the standards being in place,” he explains. “I’ve never seen anything like it. It’s an exciting time. Everyone’s extraordinarily busy right now.” According to MECA, the motor-vehicle emissions control industry is expected to spend more than \$2 billion during the current decade to develop the advanced technologies needed to meet the new heavy-duty engine and light-duty vehicle standards.

3.5. Environmental Instrumentation

Instrument manufacturers have benefited steadily from growth in air quality concerns. Continuous emissions monitoring (CEM) contributed a great deal to this growth, representing more than \$300 million market at its peak in 1994 until regulatory driver diminished causing decline until some new CEM requirements surfaced after 2000. Laboratory instruments, ambient monitors and other sampling and testing systems, in addition to CEMs, account for an \$800-million air quality instrumentation

The Economic Contribution of the California Air Pollution Control Industry

market in the U.S. in 2001. This is about 30% of the total environmental instrument business. In California the air instrument was \$157 million in sales in 2001, or about 19% of the U.S. industry.

Exhibit 3-32 Environmental Instrument & Information Systems in 2001 (Sales of California-based Operations)

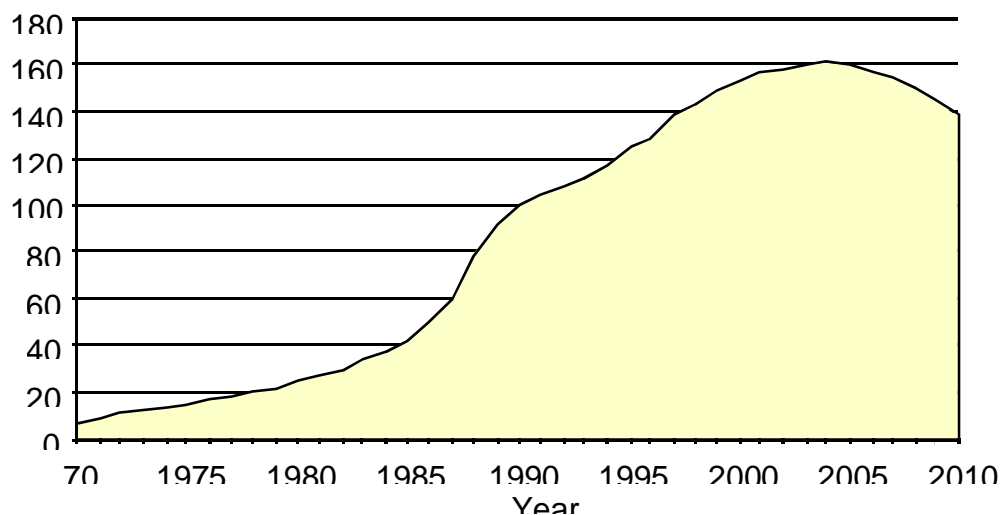
California APC Revenues	Total Cos.	Total Revs	% of Ind.	Avg. Revs
\$20 Million–\$50 Million	0	0.0	0.0%	0
\$10 Million–\$20 Million	2	32.2	20.5%	16.1
\$5 Million–\$10 Million	6	44.4	28.3%	7.4
\$1 Million–\$5 Million	27	62.1	39.6%	2.3
<\$1 Million	45	18.2	11.6%	0.4
Total	80	156.9	100.0%	2.0

Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-33 Top Environmental Instrument Companies in 2002

\$200 Million–\$300 Million
Thermo Instrument Systems
Agilent Technologies (Formerly Hewlett-Packard)
\$100 Million–\$200 Million
PerkinElmer Corp.
Varian Inc.
Hach Co.
\$20 Million–\$100 Million
Rosemount Analytical
Bristol Babcock
KVB/Analect (Hamon Research-Cottrell)
Foxboro Company
Graseby Anderson
Andros
CEM Corp.

Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-34 Historical and Projected Growth in the California Air Quality Instruments Segment

Source: Environmental Business International Inc. (San Diego, Calif.) Sales in current dollars, units in \$ million.

Overall air monitoring and analysis have represented a significant share of the environmental instrument market worldwide at 30-35% of the total. Air instrumentation involves three basic groups: detectors and monitors; analyzers; and continuous emissions monitoring. Driven by the Clean Air Act (CAA), air quality instrumentation in the early 1990's enjoyed brisk double-digit growth. Heading towards maturity, the market for detectors, monitors and analyzers is growing steady at a modest 4-5% annually. This includes portable hydrocarbon detectors, other portable gas monitors and fixed area gas monitors. Analyzers include SO₂, multiple gas FTIR multiple gas and chromatograph multiple gas. The market for continuous emissions monitoring has taken a bit more of an up-and-down path, but strategies under compliance assurance monitoring (CAM) sustain demand. Demand exists for real-time particulate matter instruments as well.

Fueled by the 1990 amendments to the Clean Air Act (CAA), new economic incentives and a strong global demand for U.S.-made instruments, air quality instruments, particularly CEMS experienced renewed impetus in the early 1990s. Sales of air monitors to utility stations had been declining in the late '80s, until the 1990 CAA amendments triggered a sharp increase in CEM activity. In 1992-1995, CEM equipment sales to the utility segment peaked but ever since have been struggling to maintain an upward momentum.

Generally, the status of the air pollution control market foreshadows what's ahead for air quality instruments. While some companies have been able to offset some flat time in domestic sales by selling

abroad, CEMS vendors have worked the enhanced monitoring under Compliance Assurance Monitoring (CAM) which came in first in 1996. Before CAM, the only viable choice for continuous compliance monitoring was continuous emissions monitoring. However, CAM requirements contrasts from the previously proposed enhanced monitoring rule by opening the field for different strategies, namely involving the monitoring of operation and maintenance of pollution control equipment. Under CAM rules, strategies including predictive emissions monitoring systems, parametric monitoring and operations and maintenance recordkeeping comes into play.

Exhibit 35 Primary Monitoring Strategies Expected Under CAM

Monitoring	Description
Continuous Emissions Monitoring	Extractive or in-Situ, provides direct measurement of pollutants exiting stacks on a continuous basis. Measures at least one sample every fifteen minutes. Has been the preferred method for past two decades. Does not monitor fugitive emissions.
Predictive Monitoring	Software-based system that estimates emissions indirectly by measuring operating parameters that affect emissions, such as fuel flow, operating temperature and raw materials content.
Parametric Monitoring	Also known as demonstrated compliance parameter limits (DCPL), is similar to simple PEMS. However, does not attempt to estimate emissions on continual basis.
Operations and Maintenance (O&M) Recordkeeping Program	May be least expensive strategy because it requires no capital expenditure on equipment. Involves implementing a program to operate and maintain the pollution control equipment and keeping detailed records on the maintenance and quality assurance procedures.

SOURCE: Chemical Engineering Progress

While different strategies under CAM may be less expensive than a CEM installation, CEM manufacturers argue that direct monitoring provide the most advantages. For example, a large number of parameters can cause PEMS estimates to be skewed. The wide spread application of PEMS has yet to be realized. Also, a plant's DCPL readings may be out of compliance with respect to its permit even though its emissions are actually less than what regulations allow. Depending on the particular plant, however, any of the choices may be valid. With respect to CEMS installations, under CAM, there would be about 5,000-10,000 orders, according to one expert. This is far below the once anticipated 20,000 installations under the enhanced monitoring rule. Under CAM, however, sales in analyzers such as IR multiple gas are expected to be sustained.

FTIR CEM, manufacturers are also anticipating the passing of Hazardous Air Pollution CAA Title III to trigger sales, particularly to monitor for multiple gases. However, end-users may be inclined to consider alternatives such as hiring for periodic sampling by a stack testing company. In many cases, periodic

sampling will meet the regulatory requirements for HAPs. Currently, periodic stack sampling is the only method in use while an FTIR CEM system has yet to meet compliance application.

The worldwide CEM equipment sales will exceed \$300 million during 2003 and will grow at double-digit rates over the next several years. A large number of gas turbines are now on order for new power plants in the United States, and these plants will have to reduce NO_x emissions to very low levels. The opportunity to create excess emissions credits through overcompliance will spark a need for accurate, continuous measurement. The market for the continuous monitoring of hazardous air pollutants will also grow at double-digit rates in response to regulatory initiatives in the United States, Europe, and Japan.

One analyst predicts the opening of a “whole new market” for CEMs in the area of mercury emissions measurement. Electric power plants have been identified as a leading source of mercury in the environment, and waste combustion facilities constitute another major source. Because the market value of mercury will be many millions of dollars per ton, it will be economically justifiable to measure mercury emissions to the nearest ounce. the mercury monitoring market could generate revenues totaling about \$70 million annually at its peak in 2010, says one forecast.

3.6. Consulting & Engineering

In 2001, the total market for all environmental consulting & engineering services was \$17.8 billion. The market for air consulting services represents 7% of this figure, at \$1.25 billion. The business activities of environmental consulting and engineering firms related to air quality can be divided into three categories:

Exhibit 3-36 Components of the Nationwide U.S. Air Consulting & Engineering Market

Category	Description	2001 (\$Mil.)
'Front-end' Consulting	Testing, modeling permitting, preparing specifications, and process engineering for pollution prevention	0.50
Engineering Design	Implementation of the air pollution control solution and integration of APC components	0.30
Construction Engineering	Engineering for construction of units to house major APC systems	0.45
Total Air Consulting Market		\$1.25

Source: Environmental Business Journal

Construction engineering represents costs for engineering services only and actual construction and internal costs are not included. The cost in materials and labor to build the large-scale FGD systems, scrubbers, etc. is high. These non-design “construction costs” not related to integrating APC equipment

are not accounted for in EBI's definition. However, these numbers are reflected in EPA's much larger estimates of annual expenditures on air pollution control, which range from \$20 billion to \$30 billion.

Exhibit 3-37 Air Consulting & Engineering (Air Quality Sales of California-based Operations)

California APC Revenues	Total Cos.	Total Revs	% of Ind.	Avg. Revs
\$20 Million–\$50 Million	0	0.0	0.0%	0
\$10 Million–\$20 Million	0	0.0	0.0%	0
\$5 Million–\$10 Million	6	39.6	24.2%	6.6
\$1 Million–\$5 Million	22	46.2	28.2%	2.1
<\$1 Million	472	77.9	47.6%	0.2
Total	500	163.7	100.0%	0.33

Source: Environmental Business Journal

The following is a list of top consulting and engineering firms listed in the order of their revenue size from air quality-related consulting businesses in the total U.S. C&E market in 2001.

Exhibit 3-38 Top 30 Environmental Consulting & Engineering Firms
Ranked by Revenues from U.S. Air Quality Consulting, 2001

Company	HQ City	State
>\$100 Million		
AECOM Technology Corp	Los Angeles	CA
Foster Wheeler Environmental Corp. (purchased by Tetra Tech in 2002)	Waltham	MA
\$50 Million–\$100 Million		
Bechtel Group Inc.	San Francisco	CA
TRC Companies Inc.	Windsor	CT
CH2M Hill Inc.	Englewood	CO
\$20 Million–\$50 Million		
Earth Tech	Long Beach	CA
ERM Group	Exton	PA
Shaw Group (Stone & Webster, IT Group)	Baton Rouge	LA
Battelle Memorial Institute	Columbus	OH
URS Corporation	San Francisco	CA
Trinity Consultants, Inc.	Dallas	TX
Jacobs Engineering Group	Pasadena	CA
\$10 Million–\$20 Million		
ENSR International	Westford	MA
AMEC	Atlanta	GA
Parsons Engineering Science	Pasadena	CA
Tetra Tech Inc.	Pasadena	CA
HDR Inc.	Omaha	NE
Clean Air Engineering, Inc.	Palatine	IL
\$5 Million–\$10 Million		
Burns & McDonnell	Kansas City	MO
ENVIRON Holdings Inc.	Arlington	VA
BE&K Inc.	Birmingham	AL
Mactec Inc.	Golden	CO
Ecology & Environment Inc.	Lancaster	NY
RMT Inc.	Madison	WI
Clayton Environmental Consultants	Novi	MI
Black & Veatch Corporation	Kansas City	MO
Braun Intertec	Bloomington	MN
LFR Levine-Fricke	Emeryville	CA
Science Applications International Corp. (SAIC)	San Diego	CA
Blasland, Bouck & Lee, Inc.	Syracuse	NY

Source: Environmental Business International Inc., Annual Survey of C&E Firms (San Diego, CA); virtually all firms listed have offices in California

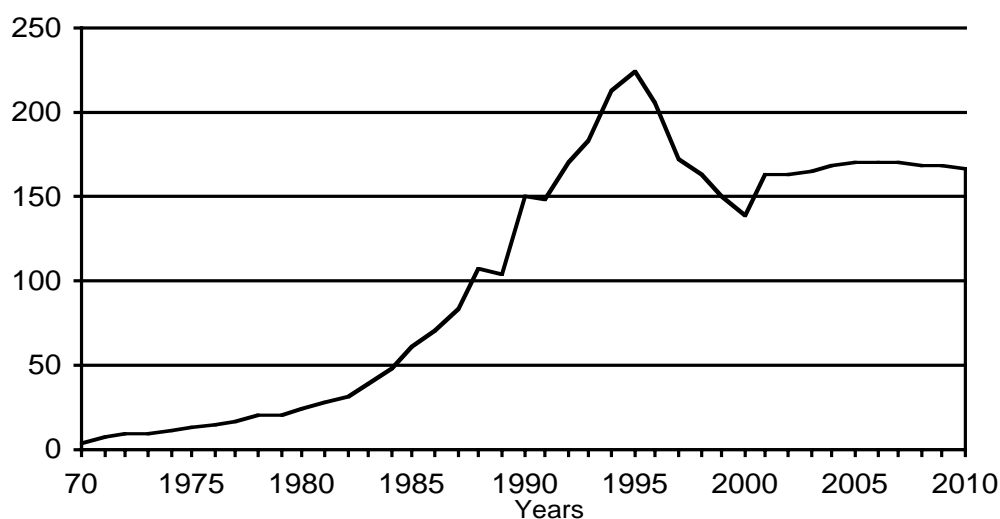
3.6.1. Historical Development of Air Quality Consulting & Engineering Markets

Demand for air quality Consulting & Engineering Services grew fairly steadily throughout the 70s and 80s in California. Clients were primarily major stationary sources hiring consultants to monitor and assess their air emissions, and engineers to design and build systems to control them. Consultants also

worked for agencies in research, health studies, technical support, monitoring, institution building and even enforcement.

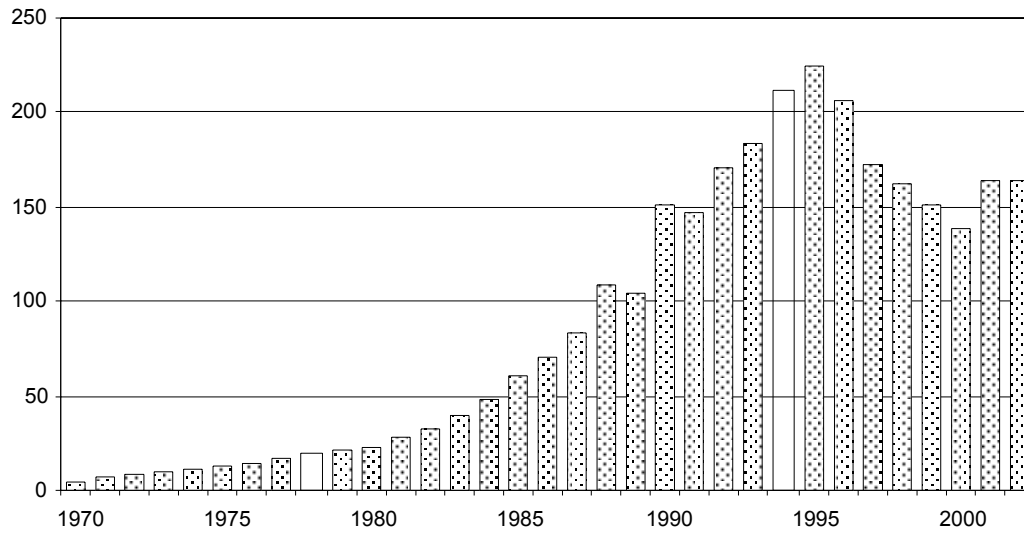
The 1990s brought new Clean Air Act Amendments and with them Title V which required operating permits for most significant sources. This sustained growth until the mid 90s when revenues in air quality consulting in California fell back due to 1) some saturation in the market as many major sources were addressed and few new programs required the support of consultants, and 2) competitive issues in the C&E business that reduced billing rates.

Exhibit 3-39 Historical and Projected Growth in the California Air Quality Consulting & Engineering Services Segment (in \$million)



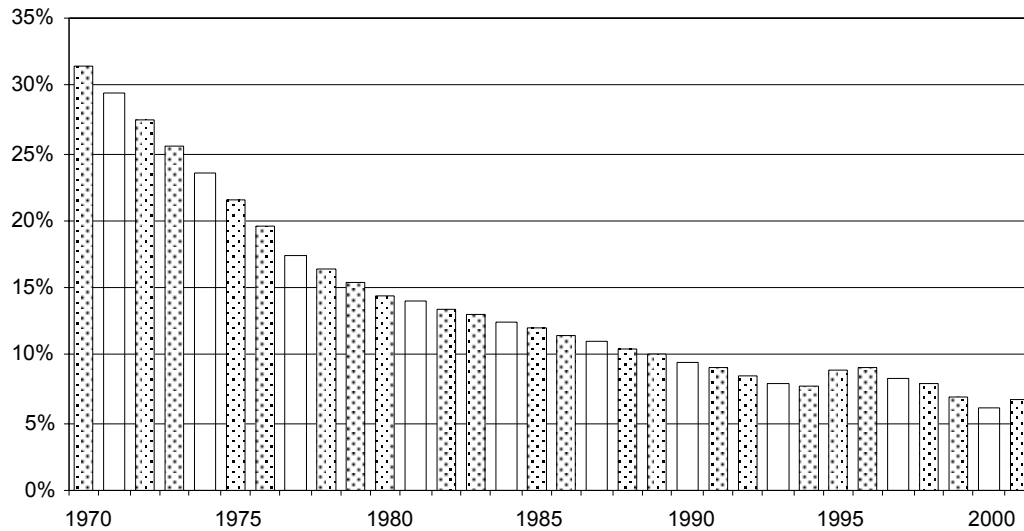
Source: Environmental Business International Inc. (San Diego, Calif.) Sales in current dollars, units in \$ million.

Exhibit 3-40 California Air Quality C&E Revenues, 1970 – 2002 (\$mil)



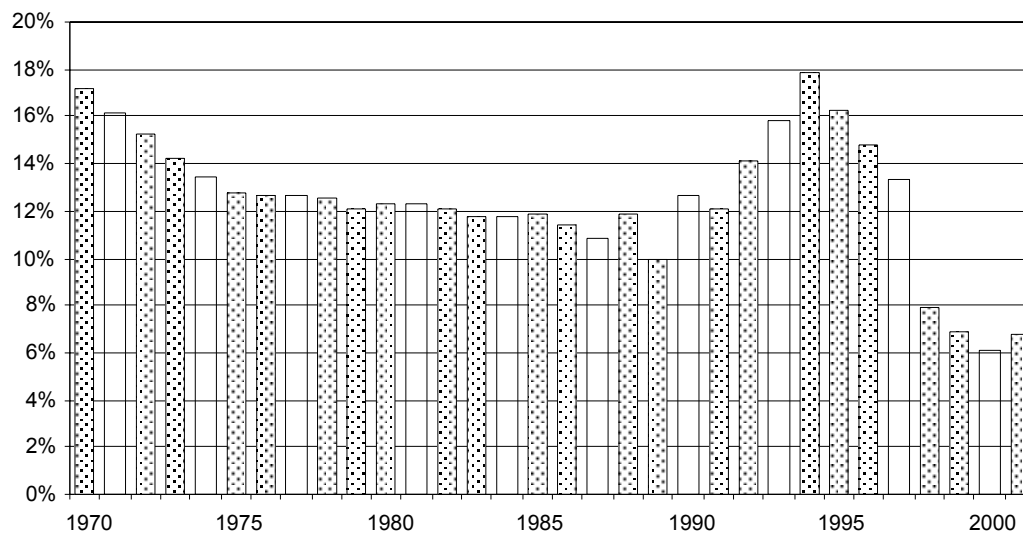
Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-41 Percent of US C&E Market that is Air Quality, 1970 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 3-42 Percent of US C&E Air Market that is California, 1970 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

3.6.2. Current Trends in Air C&E Markets and Market Drivers

For air-quality consulting and engineering firms, the sound U.S. economy through 2000 and the associated boom in the expansion of electricity-generating capacity had been the source of substantial business opportunity. The siting of new power plants prompted robust permitting activity, and EPA's aggressive enforcement of the Clean Air Act's New Source Review (NSR) provisions meant solid business as well, as the targeted power and petrochemical companies in particular responded by developing long-term compliance and emissions reduction strategies, either on their own or under the terms of settlements with the federal government. The NSR enforcement initiative is still creating demand despite the Bush Administration NSR reforms, which have put regulated parties and their vendors on edge, but the economic good times have abated, leaving air-quality consultants scrambling for other market opportunities. The sector's growth prospects are therefore not very promising, yet some opportunity exists.

EPA's issuance of new maximum achievable control technology (MACT) standards for sources of hazardous air pollutants (HAP), or "air toxics," has been slower than most consultants and equipment suppliers have hoped for, but the forthcoming MACT "hammer" will have each facility in about 30 industrial categories struggling to develop their own MACT proposals. Consultants will undoubtedly be called upon to do the work, and perhaps the bulk of it, even if EPA does provide some relief, as expected.

Recently promulgated Tier II standards for reformulated gasoline are prompting production changes at refineries, triggering modifications of permitting requirements.

In addition, Title V work—the all-too-brief bubble that sparked consulting activity in the mid-1990s—is still available in bits and pieces. Some states have not yet met EPA’s schedule to issue Title V permits, or they have not received EPA’s approval of their Title V programs. The CAA Part 71 default program has thereby kicked in for those states, requiring sources to file new applications for air-quality permits.

EPA’s regional haze rule is also a driver, leading to modeling work for regional coalitions of sources. Down the line, the Title III “residual risk” standards are looming as a potentially more stringent level of emissions control for HAP sources, which will have to devise perhaps dramatically new compliance strategies.

Another trend affecting the air-quality sector is the increased inclination by industrial companies to farm out their environmental management work. “Clients are doing less and less in house,” said one C&E executive. “For example, I’m doing modeling and permitting for a chemical company that, five years ago, had the skills to do it in house, but doesn’t now. They’re operating leaner.” Other consultants affirm that litigation support is adding to a stable base of work.

Meanwhile, the Title V market is a fragment of its former heft. “There’s a small chunk of Title V work, representing maybe about 20% of our business,” said one firm. “It’s Title V remediation, if you will—work for companies that are constantly changing the nature of their business.” The Title V worked peaked in 1995, and with that decline went a substantial portion of the competition in the air-quality consulting market.

The field of consulting firms available to take advantage of the new opportunities is now somewhat diminished compared with the mid-1990s population. The bursting of the Title V bubble triggered a shakeout in the air-quality consulting sector, one that has largely run its course moving into the new century. Competition is still intense, but consolidation has been negligible since **URS Corp.** (San Francisco, Calif.) completed its rollup of **Woodward Clyde** and **Dames & Moore**, which itself boasted the air prowess of previously acquired **Radian International**. Now, national-level pure plays in air consulting are virtually nonexistent—**Trinity Consultants** (Dallas, Tex.) is a notable exception—while smaller, regional concerns battle it out with much larger engineering firms that include air consulting in their portfolio but only in rare cases present the practice as a headliner.

3.7. Testing Labs

Environmental laboratory/analytical service companies perform a small amount of their business in air sample testing. This represents \$60-million of the \$1.3-billion analytical services segment nationally. Many labs report losing air-testing business to fixed monitoring devices and onsite test kits. Lab revenues from air samples in California totaled just \$6.4 million in 2001.

3.8. Vehicle Smog Testing Stations & Repair

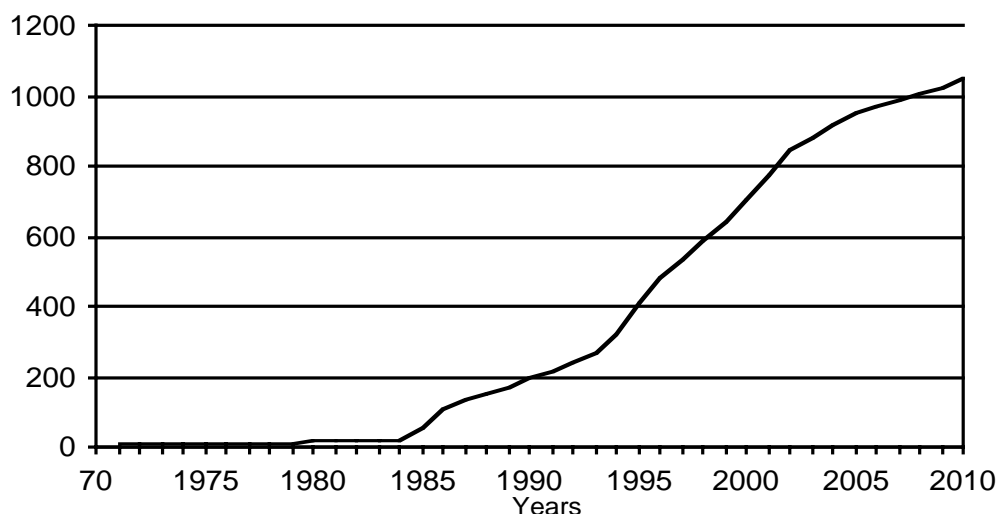
Exhibit 3-43 Number of Companies in Vehicle Smog Testing Stations & Repair

California APC Revenues	Total Cos.	Total Revs	% of Ind.	Avg. Revs
\$20 Million–\$50 Million	0	0.0	0.0%	0
\$10 Million–\$20 Million	0	0.0	0.0%	0
\$5 Million–\$10 Million	5	30.5	3.9%	6.1
\$1 Million–\$5 Million	44	48.4	6.3%	1.1
<\$1 Million	3,851	694.7	89.8%	0.2
Total	3,900	773.6	100.0%	0.2

Source: Environmental Business International Inc. (San Diego, Calif.)

The earliest history of vehicle exhaust testing was in Los Angeles in the late 60's. Testing continued on a moderate scale in a few regions until ARB took it up on a larger scale in 1980. The year 1984 saw the California Smog Check Program go into effect and kick-start the private vehicle testing industry statewide. Smog Check II was signed into law in 1994 bringing the 'enhanced program' or the dynamometer test on line, with a particular emphasis on 'gross polluters'. Continued growth of the program has resulted in almost 3,900 companies (some large chains and retail outlets of oil companies, many franchises and many small independent businesses together representing 8,600 service stations) that offer smog check, generating more than \$800 million in 2002. Forecasts are for continued growth of the program.

More detailed information is available from the California Department of Consumer Services, Bureau of Automotive Repair (BAR, autorepair.ca.gov or smogcheck.ca.gov) which administers the Smog Check program. BAR states that it "licenses and regulates more than 8,600 Smog Check stations, nearly 14,000 Smog Check technicians and 34,000 automotive repair dealers across the state."

Exhibit 3-44 Historical and Projected Growth in the California Vehicle Smog Testing Stations & Repair Services Segment

Source: Environmental Business International Inc. (San Diego, Calif.) based on material obtained from the California Bureau of Automotive Repair (BAR) Public Information Office. Annual sales in current dollars in units of \$ million.

3.9. Research & Development for A, B & C

Research and development investment into air pollution control progressed steadily as the APC market grew. However the APC market is not a market where there is a large amount of R&D. Much of the basic technology used for APC was formulated and adapted in the 70s and 80s and few major breakthroughs with significant market impact occurred. Many industry participants characterize the industry as very cost-conscious whereby the regulated community seeks to escape its regulatory situation as quickly and cheaply as possible with no stomach for testing new processes, systems or equipment. Many developers have been unsuccessful bringing innovation into the market. Developers and vendors of APC equipment also frequently comment on the standards and ‘technology-prescriptive’ systems like MACT (maximum available control technology) or BACT (best available control technology) as limiting the prospects for new technology.

R&D in clean alternatives and renewable energy have paced the growth of air-quality-related R&D in the past decade or so. Since the late 90s in particular, when investment capital was flowing, companies in fuel cells and other technology-based alternative energy sources have been able to throw significant amounts of money into R&D for clean energy systems and technology.

3.10. Emissions Trading

Based on its widely acclaimed success, EPA's SO₂ emissions credit trading system under the Acid Rain Program will continue to be cloned for programs regulating other emissions, such as nitrogen oxides (NO_x), volatile organic compounds (VOCs), mercury, fine particulate matter (PM_{2.5}) and—further out—greenhouse gases (GHGs). Indeed, NO_x credits have been trading among Northeast sources under the Ozone Transport Commission's (OTC's) NO_x Budget Program since 1999, and in 2000, the first NO_x trades were executed under EPA's SIP Call and Section 126 programs. For example, a trade brokered in June 2001 under the SIP Call/Section 126 regime involved an exchange of 50 tons per year of NO_x emissions from 2003 to 2007 at a price of \$3,400 per ton.

Other states and regions have developed emissions credit trading programs for NO_x, carbon monoxide, VOCs, and particulate matter (PM₁₀). Southern California has the Regional Clean Air Incentives Market (RECLAIM) for NO_x and SO₂, while in the Chicago area, VOC sources are trading Volatile Organic Material Allotment Trading Units (VOM ATUs) under the Illinois Emission Reduction Market System (ERMS) cap-and-trade program.

Emission reduction credits (ERCs) have been trading under the Clean Air Act's New Source Review (NSR) "offset" program—which differs from cap-and-trade in key respects—since the mid-1970s. Under the offset program, a party that proposes to build a new emission source must secure a commitment from an existing source in the area to reduce its emissions by an amount in excess of the new entrant's proposed emissions, and then it must purchase the associated credits. Regulators are involved in the process end to end; under a cap-and-trade program, regulators must verify reductions below assigned caps but are not involved in the trades themselves.

Credit-trading markets are certainly active, and despite some stumbles, proponents of cap-and-trade systems expect solid growth and expansion to new categories of pollutants. According to brokers, one stumble involved the RECLAIM market, which had been successful up until the California power crisis of 2000-2001, when the price of RECLAIM Trading Credits (RTCs) leaped from about \$1 to \$62 in response to the elevated demand. The power providers were removed from the program as part of the response to the crisis, and after Governor Gray Davis imposed price controls and the RECLAIM market was renewed, RTC prices fell back to well below \$1. "Some people are now scratching their heads, wondering if the changes made are having the intended effects," said a brokerage executive. "Prices that low don't provide much of an incentive to make the investments to put in controls."

In general, air-pollution control companies praise cap-and-trade programs as providing their clients with more compliance options. Industrial companies and electric utilities are factoring credits trading into the

life-cycle costs of their capital purchases, and the system vendors are learning how to market their products with these life-cycle costs in mind.

3.11. The Non-Traditional APC Industry or the Clean Air Products Industry

Although it possess the potential to revolutionize the way we consume resources and pollute the air—and even to render a significant portion of the core APC business obsolete— what we are calling the non-traditional APC industry is very hard to define and quantify. At what level does a product or piece of machinery become ‘low-emitting’ or ‘clean’? No doubt EPA and ARB have wrestled with such distinctions for decades now (as in LEV and ZEV for low emission vehicles and zero emission vehicles), but the issue remains understandably unsettled.

The summary of analysis on this portion of the APC industry and the economy will certainly be much less comprehensive than the analysis for the core APC business due to its lack of clarity as a distinct business segment or segments. Nevertheless we have provided some estimates of the clean products and clean manufacturing and clean energy business that follow.

Exhibit 3-45 California 'Non-Traditional' APC Industry or Clean Air Products Industry in 2001

C. Non-Traditional	APC' Revenue 2001 (\$mil)	Employment 2001	Total Sales of All Items(\$mil)	Estimated Percent APC
'Clean' Consumer Goods	42	163	4,233	1.0%
'Clean' Industrial Machinery	309	1,630	18,968	1.6%
Non-Polluting/Less Polluting Vehicles	203	390	80,565	0.3%
Alternative Energy Sources *	3,249	14,503	3,249	100%
'Clean' Alternative Fuels	67	151	28,144	0.2%
'Clean' Paints & Coatings	73	277	3,672	2.0%
Clean Air Products Industry	3,943	17,113	138,831	3%

* counts all power sales and equipment sales

Source: Environmental Business International Inc. (San Diego, Calif.)

- Alternative Energy Sources or Clean Energy accounts for 82% of the California Clean Air Products Industry.
- Clean consumer goods, machinery, vehicles and other products in aggregate are estimated to be only a 0.5% subset of their ‘traditional’ counterparts.

Exhibit 3-46 California 'Non-Traditional' APC Industry, 1970, 1980, 1990 and 2000 (Revenues in \$mil)

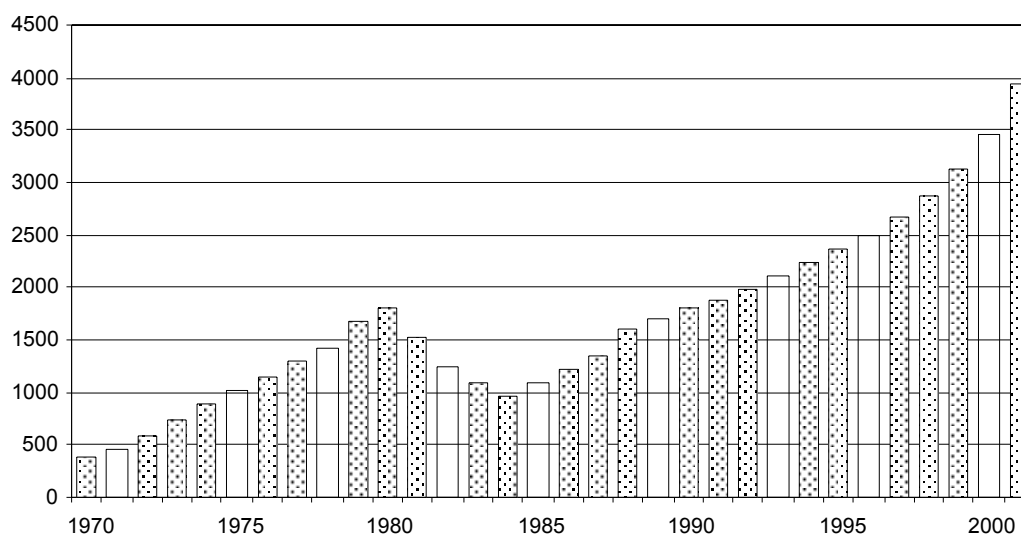
C. Non-Traditional	1970	1980	1990	2000
'Clean' Consumer Goods	0	1	21	41
'Clean' Industrial Machinery	0	21	93	286
Non-Polluting/Less Polluting Vehicles	0	1	18	172
Alternative Energy Sources	380	1,770	1,630	2,825
'Clean' Alternative Fuels	0	2	14	62
'Clean' Paints & Coatings	0	2	20	68
Total Revenues (\$mil)	380	1,798	1,796	3,454

Source: Environmental Business International Inc. (San Diego, Calif.)

C. Non-Traditional	Growth in the 70s	Growth in the 80s	Growth in the 90s
'Clean' Consumer Goods		2297%	95%
'Clean' Industrial Machinery		341%	209%
Non-Polluting/Less Polluting Vehicles		1279%	836%
Alternative Energy Sources	366%	-8%	73%
'Clean' Alternative Fuels		519%	351%
'Clean' Paints & Coatings		1109%	233%
Total Growth	373%	0%	92%

Source: Environmental Business International Inc. (San Diego, Calif.)

- Growth in renewable energy markets skyrocketed in the 1970s with tax credit and subsidy programs—both at state and federal levels. These were subsequently reduced or removed in the early 1980s, leading to an overall decline in renewable energy in that decade.
- Consistent momentum in air quality regulation and growing consumer awareness has led to the gradual emergence of clean consumer goods in the past 10-15 years. The list provided in Section 1 of this report provides examples of the categories of products that have some contribution from 'clean' consumer goods from hair care products to spot removers to bug sprays. However these products, nor their claims, are regulated to address a definition of clean.
- Considerably higher growth has been seen in the clean vehicles, clean fuels and industrial machinery and coating markets because, in addition to consistent momentum in air quality regulation and growing consumer awareness, these areas have been more often the subject of direct regulation on their 'traditional' counterparts. Examples include fuel mandates and LEV and ZEV programs by ARB for automobiles and fuels, and specific emission standards and enforcement mechanisms for industrial emissions (like MACT standards) or metal finishing and coating.

Exhibit 3-47 Total Revenues in the California 'Clean Air Products' Industry (\$mil), 1970 - 2001

Source: Environmental Business International Inc. (San Diego, Calif.)

3.11.1. Employment Trends in the Non-Traditional APC Industry or the Clean Air Products Industry

Exhibit 3-48 California 'Non-Traditional' APC Jobs, 1970, 1980, 1990 and 2000

C. Non-Traditional	1970	1980	1990	2000
Clean' Consumer Goods	0	4	90	158
Clean' Industrial Machinery	0	137	546	1,524
Non-Polluting/Less Polluting Vehicles	0	3	39	334
Alternative Energy Sources **	2,310	9,740	8,117	12,739
Clean' Alternative Fuels	0	6	34	141
Clean' Paints & Coatings	0	8	86	259
Total Employment	2,310	9,898	8,912	15,155

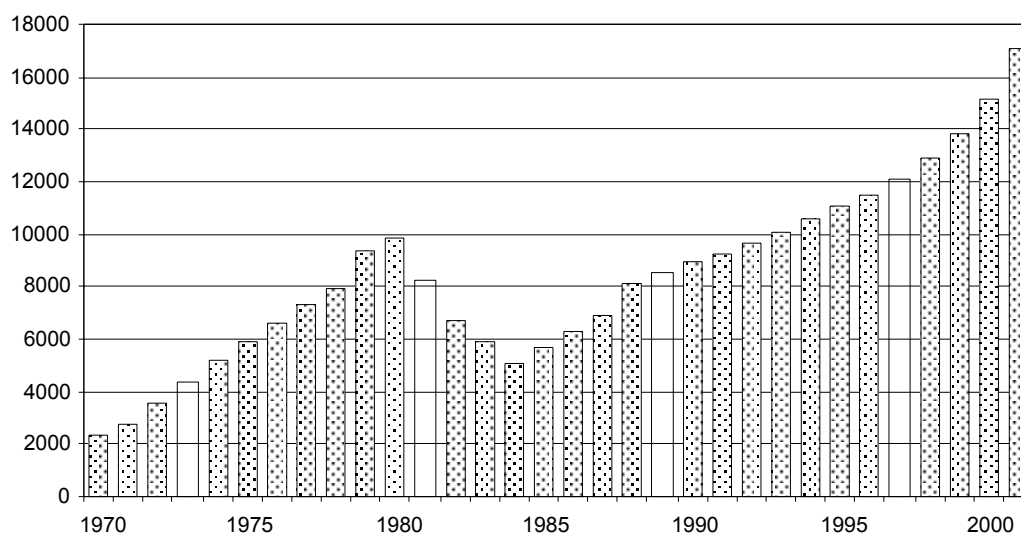
C. Non-Traditional	Jobs Added in the 70s	Jobs Added in the 80s	Jobs Added in the 90s
Clean' Consumer Goods	4	86	69
Clean' Industrial Machinery	137	409	979
Non-Polluting/Less Polluting Vehicles	3	36	294
Alternative Energy Sources **	7,431	(1,623)	4,622
Clean' Alternative Fuels	6	28	106
Clean' Paints & Coatings	8	78	173
Total Growth	7,588	(986)	6,243

Source: Environmental Business International Inc. (San Diego, Calif.)

The Economic Contribution of the California Air Pollution Control Industry

- Job growth has been quite phenomenal in the emerging clean air products industry in California, from 2,300 in 1970 to 15,000 in 2000. Employment almost doubled during the 1990s, primarily driven by clean energy, but also by contributions from all other subcategories.

Exhibit 3-49 Total Employment in the California 'Clean Air Products' Industry (number of total employment each year), 1970 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

3.11.2. Clean Consumer Goods

Exhibit 3-50 California Consumer Products Industry, 1997 and 2001

	Est. 2001 Sales (\$mil)	Est. 2001 Low- Emission Sales (1%, \$mil)
Soaps, cleaners, and toilet goods	2,910	29.1
Agricultural chemicals, n.e.c. (e.g. household)	156	1.6
Adhesives and sealants	467	4.7
Chemical preparations, other	700	7.0
Total	4,233	42

Source: Derived from US Census of Manufacturing and estimates from interviews, product lists and store visits.
(n.e.c. is 'not elsewhere classified' in Census documents)

- This figure represents only consumer goods with 'clean air' versions and not all consumer goods sold in the state, so the \$4.23 billion does not represent all consumer goods. A review of products available in retail stores results in an estimate of 1% that could be characterized as clean.

- Consumer Products listed by ARB with emissions concerns include, but are not necessarily limited to: Adhesives, Air Fresheners, Automotive Brake Cleaners, Automotive Rubbing or Polishing Compounds, Automotive Was/Polish/Sealant/Glaze, Automotive Windshield Washer Fluids, Bathroom and Tile Cleaners, Bug and Tar Remover, Carburetor or Fuel-injection Air Intake Cleaners, Carpet and Upholstery Cleaner, Charcoal Lighter Material, Dusting Aids, Engine Degreasers, Fabric Protectants, Floor Polishes/Waxes, Floor Wax Stripper, Furniture Maintenance Products, General Purpose Cleaners, General Purpose Degreasers, Glass Cleaners, Hair Mousses, Hair Shine, Hair Styling Gels, Hairsprays, Heavy-duty Hand Cleaners or Soap, Insect Repellents, Insecticides, Laundry Prewash, Laundry Starch Products, Metal Polish/Cleanser, Multi-purpose Lubricant, Nail Polish Removers, Non-selective Terrestrial Herbicide, Oven Cleaners, Paint Remover or Stripper, Penetrant, Personal Fragrance Products, Rubber and Vinyl Protectant, Sealants and Caulking Compounds, Shaving Creams, Silicone-based Multi-purpose Lubricant, Spot Remover, Tire Sealants and Inflators, Undercoating, Wasp and Hornet Insecticide

3.11.3. Clean Industrial Machinery

Exhibit 3-51 California Clean Industrial Machinery Industry in 2001

(2) Industrial Machinery	Est. 2001 Low-Emission Sales (\$mil)
a. Low NOx boilers	111.2
b. Low emission generators	120.3
c. Low-polluting equipment of all types	77.2
Total	308.8

CA: Industrial Machinery	Est. 2001 Sales (\$mil.)	Est. 2001 Low-Emission Sales %	Est. 2001 Low-Emission Sales (\$mil)
Boilers	1,112	10%	111.2
Generators	2,407	5%	120.3
Other Industrial Machinery*	15,449	1%	77.2
Total	18,968	2%	308.8

* Includes Construction machinery, Mining machinery, Oil field machinery, Textile machinery, Woodworking machinery, Paper industries machinery, Printing trades machinery, Food products machinery, Special industry machinery, n.e.c., Pumps and pumping equipment, Ball and roller bearings, Air and gas compressors, Blowers and fans, Packaging machinery, Speed changers, drives, and gears, Industrial furnaces and ovens, Power transmission equipment, n.e.c., Refrigeration and service machinery (n.e.c. is 'not elsewhere classified' in Census documents)

Source: Derived from US Census of Manufacturing and interviews with power equipment manufacturers

- Low-emitting boilers are estimated to account for 10% of boilers made in California (mostly low NOx), but one observer estimated this could be as high as 20-30%

- Growth in low-emission power generating equipment is ‘steady if not strong’ said one mainstream manufacturer, although low-emission distributors claim they have trouble maintaining any inventory because of strong demand.
- Opinion is that most new industrial machinery is more efficient than previous generations of equipment, but that emissions are generally not a significant factor in new design, and most emissions issues tend to be controlled end-of-pipe.

3.11.4. Non-Polluting/Less Polluting Vehicles

Exhibit 3-52 Non-Polluting/Less Polluting Vehicles Industry in the US and California 2001

	Estimated Number in US	Estimated Average Price	% Made in Calif	California Low- Emission Sales (\$mil)
Cars	20,000	\$30,000	10%	60
Buses, trucks and other forms of transportation	10,000	\$150,000	5%	75
Parts, supply, fueling/power infrastructure				68
Total				203

Source: Derived from interviews with automotive industry experts

- Although U.S. Department of Commerce estimates new automobile sales at \$690 billion in 2001, the portion of Non-Polluting or Less Polluting Vehicles is very small. In California auto sales totaled \$80 billion in 2001, but only \$200 million in sales are estimated to come from zero emission or ‘ultra’ low emission vehicles in that year. Presumably, more accurate statistics will emerge on vehicles sold of each model in the state as this figure has become more substantial in the years 2002 and 2003.
- The definitional issue is very important in this category, because a significant portion of vehicles are lower or low emission vehicles, and/or are fuel efficient vehicles. For the purposes of a ‘clean air industry’ we have chosen to categorize only ‘alternative’ vehicles which run on hydrogen/fuel cells, electricity, compressed natural gas or fall in the ‘hybrid’ category of part gasoline and part electric as ‘clean’ vehicles. ‘Cleaner’ cars with lesser emission profiles or highly efficient cars that burn gasoline or diesel are not counted here, rather the components sold to reduce their emissions are counted distinctly as mobile emissions controls devices in the ‘core APC industry’ detailed above.

3.11.5. Alternative Energy Sources

Exhibit 3-53 California Alternative Energy or 'Clean Energy' Sources Industry in 2000

	US Systems Sales, \$mil	US Electricity Sales, \$mil	California Systems Sales, \$mil	California Electricity Sales, \$mil	California Total Sales, \$mil	California Systems Sales, % of US	California Electricity Sales, % of US
Solar Power	1,200	40	576	30	606	48%	74%
Biomass**	480	2,400	48	223	271	10%	9%
Wind Power	450	350	117	217	334	26%	62%
Landfill Gas	160	1,000	17.6	86	104	11%	9%
Mini-Hydros	150	600	24	77	101	16%	13%
Geothermal	120	1,440	72	1279	1,351	60%	89%
Fuel Cells	100	70	35	25	60	35%	35%
Total	2,660	5,900	890	1,936	2,825	33%	48%

**Biomass does not include wood and waste-to-energy.

Source: Environmental Business International Inc. (San Diego, Calif.); Derived from DOE's Energy Information Administration, company surveys and a variety of other sources.

- California has long been a leader in the renewable energy field. In 2000, it accounted for 48% of 'clean energy' power sales in the United States and 33% of systems sales—considerably higher proportions than any other segment of the air quality industry analyzed in this report. Initial boosts provided by state tax credits and national PURPA legislation (see section 2) were broadly supported by state air quality requirements to create a business climate more conducive to renewable energy development in California. In addition natural resources, particularly in the solar and geothermal areas, are more abundant in California. Interestingly wind power, of which California represented over 85% of the global capacity (and virtually 100% of the U.S. capacity) as late as the late 1980s, is not necessarily more abundant in the form of wind resources in California, but state policies to stimulate investment created the early movement in the state. Current national and global trends in the renewable or clean energy segments are discussed in more detail below.

3.11.6. Clean Alternative Fuels

Exhibit 3-54 California Alternative Fuels Industry in 2001

	CA Energy Consumption (quads)	2001 Dollars per Million Btu	% Clean Fuels	Clean Fuels (\$mil)
Compressed Natural Gas	0.001	6.91	100%	6.9
Liquefied Petroleum Gas	0.07	12.24	5%	42.8
Ethanol	0.001	17.72	100%	17.7
Total	0.072			67.5

Source: Derived from US DOE's Supplement Tables to the Annual Energy Outlook 2003

- Clean fuels provide a similar challenge in definition. At one end, one could argue that unleaded fuel is ‘clean’ in that it is cleaner than fuel still commonly used in developing nations, in spite of the fact that unleaded gas is virtually ubiquitous in the United States. At the other end, one could argue that not any combusted fuel could be characterized as ‘clean’ since emissions result. For the sake of this economic study, we have chosen to count Compressed Natural Gas, Liquefied Petroleum Gas (only a portion of which is used for transportation fuels) and Ethanol as clean fuels.

3.11.7. Clean Paints & Coatings

Exhibit 3-55 California Paint & Coatings Industry in 2001

	Est. 2001 Sales (\$mil)	Est. 2001 Low- Emission Sales (2%)
Paints and allied products	1,898	38.0
Asphalt felts and coatings	638	12.8
Metal coating and allied services	1,136	22.7
Total	3,672	73

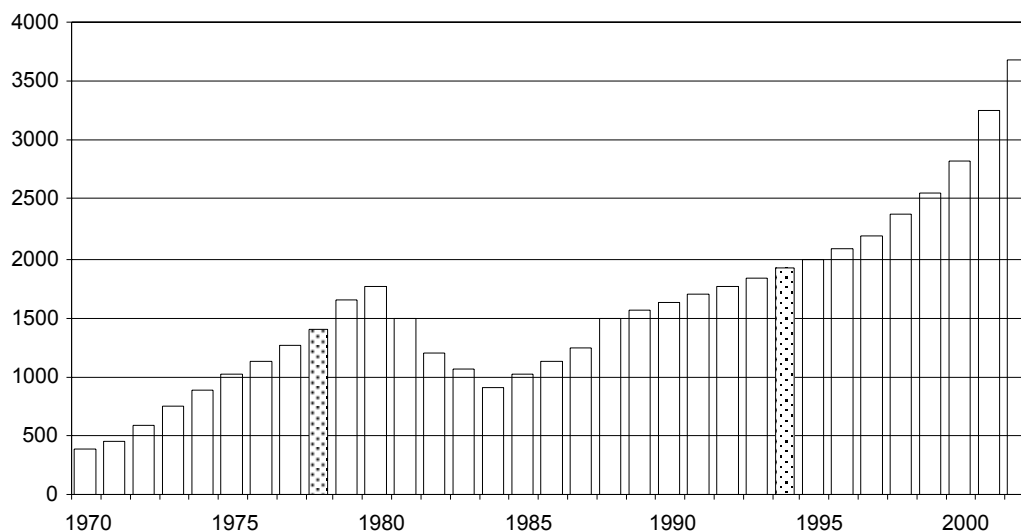
Source: Derived from the US Census of Manufacturing

- Clean Paints & Coatings are estimated to be 2% of the total paint & coatings market. Coatings listed by ARB that contribute to air emissions include: Art Fixatives or Sealants, Auto Body Primers, Automotive Bumper and Trim Products, Aviation or Marine Primers, Aviation Propeller Coatings, Corrosion Resistant Brass, Bronze, or Copper Coatings, Exact Match Finishes, Floral Sprays, Glass Coatings, Ground Traffic/Marking Coatings, High Temperature Coatings, Hobby/Model/Craft Coatings, Marine Spar Varnishes, Photograph Coatings, Pleasure Craft Finish Primers, Surfacer or Undercoaters, Pleasure Craft Topcoats, Shellac Sealers, Slip-Resistant Coatings, Spatter/Multicolor Coatings, Vinyl/Fabric/Leather & Polycarbonate Coatings, Webbing/Veil Coatings, Weld-Through Primers, Wood Stains, Wood Touch-Up, Repair or Restoration Coatings

3.12. Renewable Energy

3.12.1. Historical Development of Renewable Energy

Exhibit 3-56 Total Sales in the California Renewable Energy Industry (\$mil), 1970 - 2002



Source: Environmental Business International Inc. (San Diego, Calif.), includes systems and power sales in \$mil

3.12.2. Current Trends in Renewable Energy

As energy security and job creation join low emissions and reduced climate-change impacts as motivations for adopting renewable energy technologies, renewables proponents are looking forward to a period when the mixed fortunes of recent years could make the transition to a consistently rising tide for all sectors. The key to success in virtually all of those sectors—including those, like wind and solar, that have enjoyed solid growth recently—will be new state and federal incentives to adopt “green” power solutions. Congress appears to have heard the arguments, especially those related to reducing dependence on foreign energy sources. Although the House and Senate energy bills in 2002 included provisions for boosting supply from all domestic energy sources, renewables are expected to get a long look in bills in 2003 and 2004, particularly in Senate.

“We could be on the verge of the biggest boom for renewables ever—at least since the 1970s,” says Karl Gawell, executive director of the **Geothermal Energy Association** (GEA; Washington, D.C.). “I say that with caution, because many of these proposals have a ways to go.” Nationwide, the enthusiasm for electricity market deregulation, which was supposed to offer more consumer choice and give green power a boost, has waned and created market uncertainty. “Green power” programs exist in many states,

but they target the environmentally conscious consumer, who must pay a premium, and power providers still can't present their renewables options on a cost-competitive basis. Even for wind power, which is approaching fossil fuels in terms of price, the production tax credit makes all the difference. Provisions beneficial to renewable energy developers in Congress' energy package include expanded research and development funding, tax credits, a federal renewable portfolio standard (RPS), streamlined licensing procedures, and inclusion in or extension of the Production Tax Credit (PTC) that has been so kind to the wind sector.

Wind Power

Wind energy has been the biggest success story in the renewables field of late. Worldwide turbine sales have grown by an average of 40% annually over the past five years, according to the **European Wind Energy Association** (Brussels). The year 2001 marked a record in the installation of new U.S. wind energy generating capacity, with about 1,700 megawatts (MW) of new capacity, or \$1.7 billion in dollar value (much of it imported European wind power technology), adding to an installed base of 2,600 MW. The state of Texas accounted for 915 MW of new capacity, sufficient to break the previous U.S. record for yearly added capacity all on its own. The final tally of 1,694 MW added in the U.S. in 2001 was more than double the previous record year of 1999, when 732 MW were installed, and boosted the industry's total generating capacity by more than 60% over the amount in place a year earlier. Installed U.S. capacity at the start of 2002 was 4,258 MW, and there are wind turbine installations in 26 states.

The U.S. wind power industry got a tax credit boost, when President Bush signed an economic stimulus bill that contained a two-year extension of the federal wind energy Production Tax Credit (PTC) on March 9th, 2002. The PTC, which had expired on December 31, was extended retroactively from that date to December 31, 2003. It provides a 1.5 cent-per-kilowatt-hour tax credit for electricity generated by wind turbines. The delay until March for the PTC extension for wind energy, among other factors, will stunt 2002 growth at 400 to 450 MW, estimates the **American Wind Energy Association** (AWEA; Washington, D.C.). AWEA is projecting installations totaling a record of more than 2,000 MW in 2003, however, which would break all previous records. "We have been stating that projection for much of this year, and our projection remains unchanged," AWEA Executive Director Randall Swisher said in August, 2002.

In Europe, the promise is even brighter, as wind power moves off shore in a big way. Energy market analyst **BTM Consult** (Ringkøbing, Denmark) projects Europe's installed base to grow from about 17,800 MW in 2001—72% of the world's capacity—to more than 54,000 MW by 2006. Worldwide wind energy capacity is expected to grow from 22,800 MW in 2001 to nearly 79,400 in 2006, according

to BTM Consult. (That estimate was issued before AWEA revised its 2002 projection to no more than 450 MW, substantially below BTM's prediction of 1,450 MW in new U.S. capacity this year.)

In terms of turbine sales, European firms such as **Gamesa** of Spain, **Nordex** of Germany, and **BONUS Energy**, NEG Micon, and **Vestas** of Denmark dominate the market. In the United States, only **Enron Wind**—now part of **GE Power Systems** (Atlanta, Ga.)—rivals these giants, several of which are now moving into U.S. turf (where, incidentally, their early technology was originally developed). Vestas, for example, is opening a production facility in Portland, Oregon.

Solar Energy

The solar energy market is also growing at a rapid pace. “Annualized growth is about 20% over the past decade, and about 40% over the past two years,” states Glenn Hamer, executive director of the **Solar Energy Industries Association** (SEIA; Washington, D.C.). “In 2001, we set a record with 400 MW of photovoltaic [PV] cells manufactured.” PV is a \$2-billion industry employing 20,000 people in the United States, according to SEIA, which itself consists of about 400 member companies. “We expect that, by 2020, there will be 150,000 jobs in the United States related to the production of solar energy systems,” says Hamer. “It’s difficult to think of an area where the United States could do better in developing jobs than in the high-tech renewables industry, whether solar, biomass, or wind,” he added. “This area should be a focus for all those interested in jobs.”

The fastest-growing segment of the solar energy business is the grid-connected market, in the United States and abroad. “That’s a result of incentive programs in places like California, where we believe solar will be a sustainable industry,” says Hamer. California has a rebate program that can help the consumer reduce the installation cost by half. Illinois has a rebate program as well, while New Jersey is in the process of developing one. Meanwhile, New York has launched an initiative to power its schools with solar energy.

As with other renewable energy technologies, cost remains an issue. The price of PV systems has decreased tenfold since 1980, to the point where it now ranges from between 17-18 cents per kilowatt-hour (kWh) in some areas to 30 cents/kWh in others, according to Hamer. “As a baseload power source, coal is going to come out cheaper than just about anything, but that doesn’t factor in the environmental effects and the health impacts.” Still, “the good news is that the cost of manufacturing is decreasing, and the cost of installation is decreasing as more and more units are installed,” says Hamer. “There’s a thriving distribution network, and now, on the residential side, one of the really exciting developments

is that certain home builders are installing PV and solar hot water as standard items for homes. Those are selling briskly, and the resale value has been excellent.”

AstroPower (Newark, Del.), for example, established an agreement with **Home Depot** in September 2001 to distribute residential solar power systems in the San Diego area, and the two companies expanded the agreement in 2002 to include the Delaware, New Jersey, and New York markets. On the commercial side, several companies, such as **Shell Solar** (Amsterdam), **BP Solar** (London), and **PowerLight Corp.** (Berkeley, Cal.), are installing systems that can generate 500 kW to more than 1 MW.

Fuel Cells

For fuel cells, the market has taken longer to materialize. Although more than 1,000 companies are active in the fuel-cell industry globally, as fuel-cell makers or as developers of other essential elements of the hydrogen infrastructure, few companies are actually selling units. Notable exceptions are **UTC Fuel Cells** (South Windsor, Conn.), with more than 250 installations of its phosphoric acid PC25 units, and **Plug Power Inc.** (Latham, New York), with 132 of its stationary power units installed at about 40 locations.

In general, however, the fuel-cell industry has not lived up to expectations that were perhaps too high. The story stocks such as Plug Power and **Ballard Power Systems** (Vancouver, B.C.) fell well off their early-2000 peaks along with other technology stocks and the slump in capital markets in general, and R&D “burn rates” have become a concern. Claiming that its estimates are more conservative than others, **Business Communications Co.** (Norwalk, Conn.) projects an average annual growth rate of 20.7% in fuel-cell sales over the next five years and an overall market size of \$642 million in 2007 (which translates into roughly 300-350 MW). The “big four” technologies—phosphoric acid, proton exchange membrane (PEM), solid oxide, and molten carbonate—will account for \$608 million of those sales, while alkaline fuel cells will generate about \$22 million in sales and metal-air units a mere \$12 million, according to BCC.

Whereas a future in which fuel cells provide significant stationary power capacity is a bit delayed, the future of fuel-cell-powered vehicles is far down the road—at least a decade, by most accounts, and probably more. **Honda** and **Toyota** are racing to putting a fuel-cell-powered motor vehicle on the road later this year, but those will be a handful of units driven by parties that have easy access to the required hydrogen fuel. The build-out of the hydrogen infrastructure involves nothing less than a major overhaul of the fossil-fuel economy and will no doubt require extensive federal support to ameliorate the chicken-

egg problem faced by the private sector: Why mass-produce the cars if the infrastructure is not in place, and why build out the infrastructure before mass-production of the motor vehicles is assured?

The Department of Energy (DOE) appears to recognize its role. DOE officials now say that the sun is setting on fossil fuels, and that the hydrogen economy is the future. In 2001, DOE announced the \$150-million Freedom CAR project, in which DOE and the **U.S. Council for Automotive Research** (USCAR) are collaborating in bringing hydrogen-powered vehicles to the marketplace. Although the \$150 million is more a transfer of existing funds from fuel economy research than new funding for fuel-cell vehicles and the related infrastructure, “there is a consensus that, whether the hydrogen economy is 10, 20, or 30 years away, the time to start working on these issues is now,” said a USCAR executive.

Bioenergy

One potential source of the hydrogen for fuel cells is biomass gasification, which the **American Bioenergy Association** (ABA; Arlington, Va.) sees as a growth market for bioenergy over a 10- to 20-year horizon. The most significant near-term opportunity for large-scale biomass use is co-firing with coal at electric power plants. “If you co-fire 15% biomass with coal, you get an 18% reduction in greenhouse-gas emissions,” says ABA Co-Director Katherine Hamilton. “We think this potential represents a huge opportunity for the coal industry to begin transitioning to a more sustainable energy source.” ABA characterizes bioenergy’s potential to contribute to the overall energy mix as the most substantial of any renewable resource, potentially accounting for half of the nation’s gasoline usage or all U.S. nuclear power. Biomass consumption—mostly firewood and charcoal in developing countries—totals about 47 quadrillion Btu worldwide and 3.5 quadrillion Btu in the United States. DOE’s Energy Information Administration (EIA) projects electricity generation from biomass power to increase from 38 TWh in 2000 to 64 TWh in 2020, or 1% of the total supply.

Currently, the 1,000 biomass power plants are predominantly captive facilities at pulp & paper plants, generating with a poor 20% efficiency. “The newer gasification technology is growing its percentage within the biomass field, but it’s not growing at the rate it could, because the incentives aren’t in place,” notes Hamilton. “The PTC is probably the biggest provision for our people... The wind industry currently gets it. The biomass industry gets it only for two things: dedicated energy crops, which nobody is doing because of the expense, and poultry litter, and there are no plants running in that sector. We’re looking to open up the PTC for residues, and for co-firing with coal.” ABA’s ultimate goal is to gain support for the “biorefinery” concept. “A biorefinery would be like an oil refinery, but using biomass as the fuel,” says Hamilton. “It would make transportation fuels, chemicals and other end products, such as plastics, pharmaceuticals and fibers for clothing.”

Ethanol

One other sector of the bioenergy market that has grown at a rapid rate is ethanol production, spurred most recently by California's decision to terminate the sale of gasoline containing methyl tertiary butyl ether (MTBE). According to the **Renewable Fuels Association** (RFA; Washington, D.C.), growth during the past three years has been at a record pace. Currently, 66 fuel-ethanol plants produce 2.55-billion gallons of product, and another 11 facilities are under construction. While **Cargill** (Minneapolis, Minn.) and **Archer Daniels Midland** (Decatur, Ill.) are big players in the ethanol market, eight of the 11 facilities under construction are farmer-owned limited liability corporations, according to RFA.

"In 2002, we had three new plants come on line, bringing us up to 2.7-billion gallons," says Monte Shaw, RFA's communications director. "In 1999, we were at 1.7-billion gallons, so we've done a little less than 1-billion gallons in each of the first two decades, and now we've done a billion in three years. Another 400 million gallons is under construction." Over the next decade, "we expect to see the use of cellulosic ethanol to continue to grow," notes Shaw. Current feedstocks include wood waste and wheat straw, and the industry is working to expand the range of viable feedstocks. Municipal solid waste (MSW) is a potential source that will take some time to develop, according to Shaw. "MSW is being used as an ethanol feedstock right now at the bench level, and some companies are working to develop industrial-size plants." For example, **Iogen Energy Corp.** (Ottawa, Ont.), which received a large cash infusion from **Shell** in May, "is further out in front than others." Another company, **Masada Resource Group** (Birmingham, Ala.), is developing the first MSW plant in New York.

Landfill Gas

Landfill gas—approximately 50% methane and 50% CO₂, with some trace organic elements—is also making some strides as a useful fuel for generating power. Yet while the number of landfill-gas-to-energy (LFG-energy) projects appears to be growing throughout the United States, the market is presenting the practitioners with a bumpy ride. There are currently more than 325 operational, LFG-energy projects nationwide, with another 200 projects under construction or somewhere in the development phase, according to EPA. **Waste Management Inc.** (Houston, Tex.) has 42 LFG-energy projects at its landfills, and in 30 of these projects, **Caterpillar Financial Services** (Nashville, Tenn.) is a partner.

"Frustrating" is how Paul Pabor, Waste Management's director of landfill gas management, describes the LFG-energy market. Under the current IRS tax structure, the landfill owner must generate actual gas sales to a third party in order to earn Section 29 gas credits. "In many of the projects, the tax credits are

more valuable than the amount we sell the gas for, so the tax-credit requirements drive the business structure of LFG-energy projects,” notes Pabor. “Green energy opportunities relate to whether we can find a third party that believes it can get high value from the gas and thereby pay us more, so it’s more complicated than just going out and selling green energy.”

What does the LFG-energy market need to take off? “A federal RPS [renewable portfolio standard] would be nice, but there isn’t a whole lot of hope for that right now,” Pabor says. Section 45 tax credits, which do not require sale of the product to a third party but are earned simply by generating energy from renewable resources, “would provide an immediate increase in renewable energy from LFG,” Pabor notes. He adds that “the Section 45 credits right now apply to other renewables, but not to landfill gas.” The House energy bill would remedy that oversight as well as extend the Section 29 credits, while the Senate’s energy bill would only extend the existing Section 29 tax credit for landfill gas.

The RPSs enacted by about a dozen states are helpful as well, according to Pabor, who reports that the market varies widely in these states. “The green energy premium is worth \$20 or more per MWh in some states, and down to \$2 to \$3 per MWh in others. California’s recent RPS legislation has already created a lot of interest,” he reports. “There are also a lot more utilities that offer green power to their customers, even without the stimulus of an RPS. So far, however, there has been very little translation of that activity into higher prices for our green power. We’re optimistic about how the market may develop in the next few years, and we anticipate additional project developments, but we’re not seeing a whole lot of dollars right now.”

Geothermal

The geothermal energy sector was flat during the 1990s, but there are signs of life lately, according to GEA’s Karl Gawell. The last large plants came on line during 1992 and 1993, and the industry remains concentrated in California, Nevada, Utah, and Hawaii. Yet there’s new action in Arizona, Colorado, Idaho, New Mexico, and Oregon, however. Outside the United States, “there’s lots of growth in Asia and Central America,” he adds. “We estimate that 75% of all developing world geothermal projects involve U.S. companies as the primary developer or as a substantial technology provider.” GEA consists of about 80 companies, the largest of which are natural gas developer **Calpine** (San Jose, Calif.) and **Mid-American Energy** (Baxter, Minn.).

Gawell identifies three primary drivers for the U.S. geothermal market. First, “the transition of state and federal laws regarding electricity markets appears to be reaching an end, at least in the West. Whether that’s true or not, Investors are beginning to say, ‘we think we know what the rules are.’” Second is the

emergence of state RPSs—California enacted an aggressive 20% RPS in September—and the potential for a federal RPS. Third, says Gawell, is the growing interest in a variety of incentives for renewables in addition to RPSs.

Hydropower

Struggling more than any of the other renewables markets is hydroelectric power. The market was flat in during the 1990s, as the best sites for large dams have long since been developed. Understandably, “there’s very, very little new development in the United States,” according to Linda Church Ciocci, executive director of the **National Hydropower Association** (NHA; Washington, D.C.). Current U.S. hydropower capacity totals about 98,200 MW. NHA estimates that the potential U.S. capacity is approximately 128,000 MW. About 8,500 MW of that new capacity would come from new dams—most likely small-scale facilities—but the bulk would come from reconfiguring non-power dams for power (17,000 MW) or upgrading existing hydropower facilities (4,300).

In the United States, the upgrades and reconfigurations needed to expand hydropower capacity will require administrative changes. “We need hydro licensing reform; we will not expand capacity without it,” NHA’s Ciocci stresses. The relicensing processes takes 10 years on average, and can be much longer, she notes. “The costs are exceedingly high, and the money goes into this process rather than towards environmental upgrades,” she explains. Furthermore, too many federal and state agencies are involved in the licensing decisions, and Clean Water Act Section 401 certification only adds to the burden. A second major issue for hydropower development is the high cost of expanding capacity or reconfiguring for power. “Hydropower is capital intensive,” notes Ciocci. “We need the same incentives as the other renewables, such as the Pollution Tax Credit (PTC), as well as recognition in the states and green power programs.”

4. The Air Pollution Control Industry's Contribution to California's Economy

4.1. Summary of the California Air Quality Industry as a Function of the State Economy

The California Air Quality Industry, accounting for \$6.18 billion in revenues generated in 2001, represented just less than 0.5% of the California economy in 2001. Starting from virtually nothing in 1970 (with the exception of renewable energy) the California Air Quality Industry accounts for approximately one out of every two hundred dollars in revenues generated in the state. When just examining the 'Core' Air Pollution Control (APC) industry of companies generating revenue mostly as a direct result of government air quality programs, this component represents 0.16% of the California economy in 2001, or one out of every \$625 in revenues generated in the state.

Exhibit 4-1 The California APC Industry as a Function of the State Economy

	2001 (\$mil)	% of CA Economy
California Gross State Product (GSP)	1,359,265	100%
California Core APC Industry	2,234	0.16%
California Non-Traditional or Clean Air Products Industry	3,943	0.29%
California Total Air Quality Industry	6,177	0.45%

Source: Environmental Business International Inc. (San Diego, Calif.) and U.S. Dept. of Commerce

Comparing the air quality industry's contribution to that of other prominent industries in the state reveals some interesting parallels. The air quality industry's contribution at 0.45% of the state GSP is larger than that of motor vehicle manufacturing and apparel & textiles, for example, which respectively account for 0.27% and 0.36% of the GSP. The air quality industry is not much less of a contributor to the GSP than hotels & lodging (0.7%) and social services (0.6%).

The larger environmental industry, which represented \$27.5 billion in revenues in California in 2001 and 2.0% of the GSP, is on par with agriculture (1.8% of GSP) and electronic equipment (1.8%). The environmental industry is measurably larger in revenue contribution than considerably more prominent industries such as motion pictures (1.4%) and 'other transportation equipment' (0.7%) which is mostly aerospace and aircraft manufacturing. (Note: A detailed definition and listing of segments in the environmental industry is included in section 4.5 below.)

Exhibit 4-2 Revenue Contribution of the California APC Industry Compared to Other Industries in California

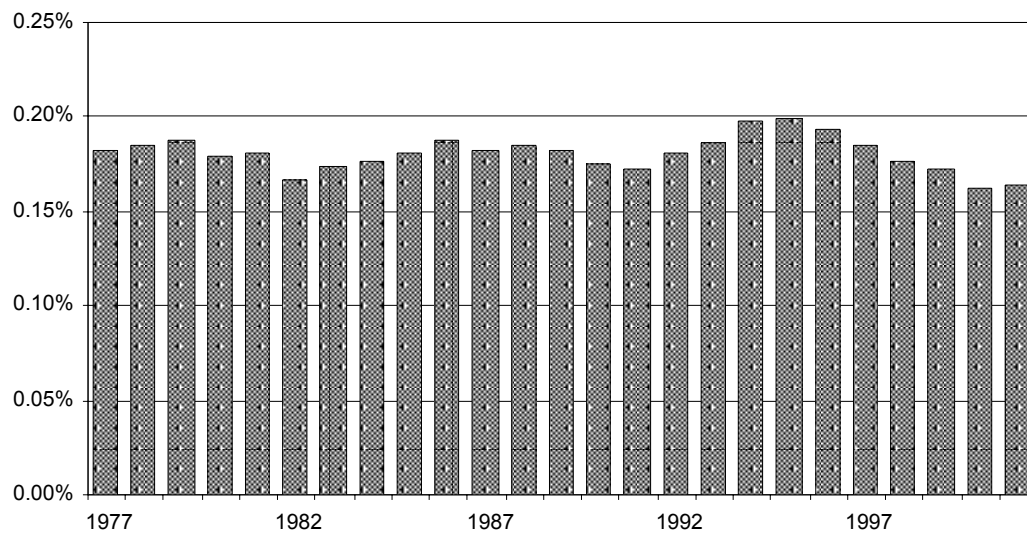
Industry	Gross State Product 2001 (millions of current dollars)	Share
Total Gross State Product	1,359,265	100%
Agriculture, forestry, fish	24,435	1.8%
Agricultural services	11,667	0.9%
Mining	8,623	0.6%
Construction	57,712	4.2%
Industrial machinery	24,603	1.8%
Electronic equipment	24,565	1.8%
Motor vehicles	3,612	0.3%
Other transport. equip.	10,190	0.7%
Instruments and related	17,343	1.3%
Other Durable goods	23,801	1.8%
Food & kindred products	14,383	1.1%
Apparel & textile	4,881	0.4%
Printing & publishing	11,455	0.8%
Chemicals	15,064	1.1%
Petroleum products	6,356	0.5%
Other nondurable goods	7,588	0.6%
Transportation & utilities	92,421	6.8%
Wholesale trade	89,384	6.6%
Retail trade	127,073	9.3%
Financial & Real Estate	317,481	23.4%
Hotels & lodging	9,601	0.7%
Personal services	8,423	0.6%
Business services	93,691	6.9%
Auto repair & parking	14,613	1.1%
Motion pictures	19,541	1.4%
Amusement and recreation	13,230	1.0%
Health services	64,278	4.7%
Legal services	21,057	1.5%
Educational services	9,131	0.7%
Social services	8,697	0.6%
Other services	63,857	4.7%
Government	152,176	11.2%
Environmental Industry	27,500	2.0%
APC Industry	6,177	0.5%
Core APC Industry	2,234	0.2%
Clean Air Products Industry	3,943	0.3%

Source: Environmental and APC Industry data from Environmental Business International Inc. (San Diego, Calif.). All industry data from U.S. Dept. of Commerce

4.2. The 'Core' California APC Industry

From just over \$70 million in revenues in 1970 when the major regulatory era in air quality began, the core APC business in California grew rapidly to roughly 6 times as large when it became an industry accounting for more than \$400 million in 1977. At that time the industry reached around 0.17% of the state economy and has remained in that range as economic growth and APC industry growth in California has been fairly similar, with some exceptions, since the late 1970s.

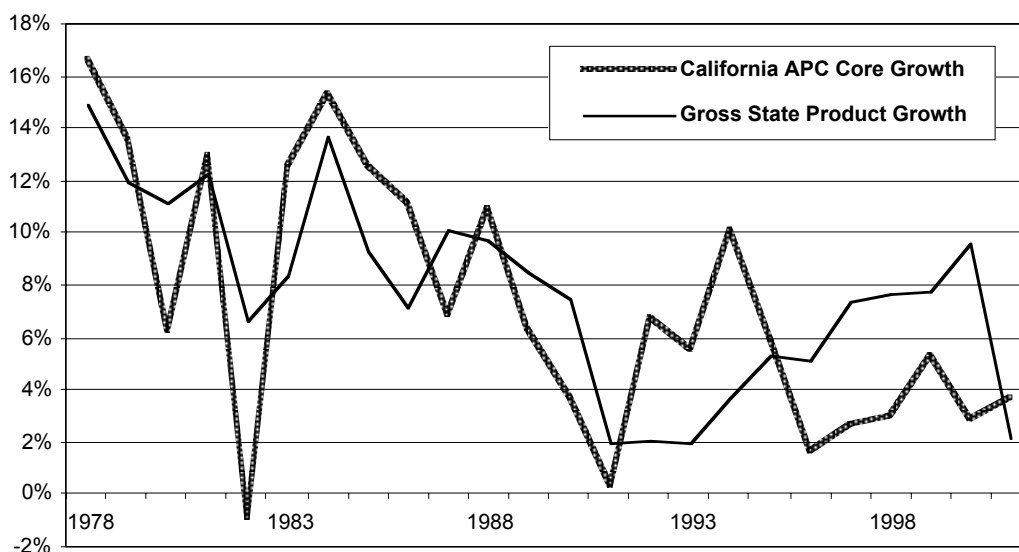
Exhibit 4-3 California 'Core' APC Industry Percentage of the State Economy, 1977 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

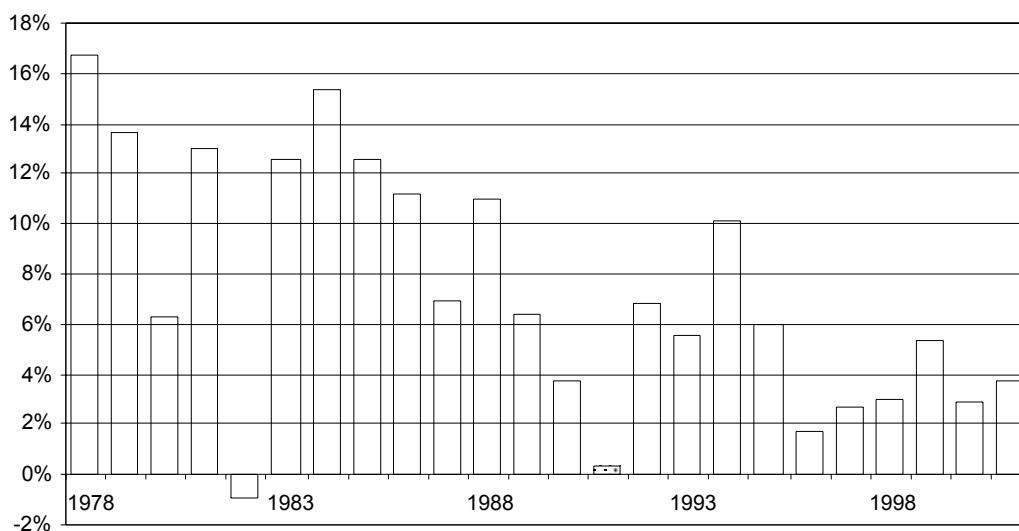
After the high-growth period of the early 1970s, the history of the APC industry in California has seen some overlapping eras where certain segments experienced considerable growth while other segments slowed or even experienced decline. In aggregate the core APC industry has remained in the range of 0.17% to 0.20% of the economy from 1977 to 2001.

Exhibit 4-4 Growth of California's Core APC Industry v.s. Gross State Product, 1978-2001



Source: Environmental Business International Inc. (San Diego, Calif.)

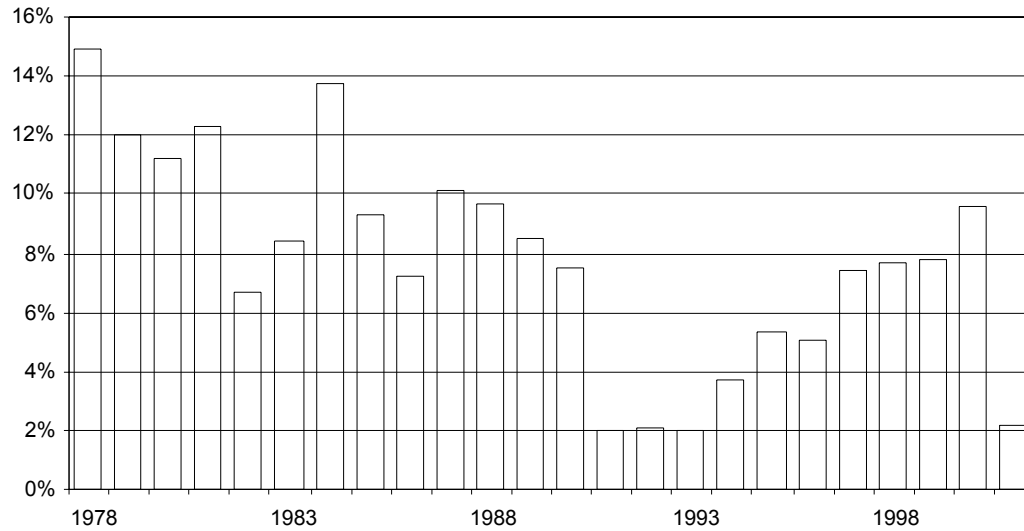
Exhibit 4-5 Annual Growth Rate of California 'Core' APC Industry, 1978 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

A decline in 1982 resulted from the first decline in the stationary source APC market after fairly continuous growth from 1970-1981.

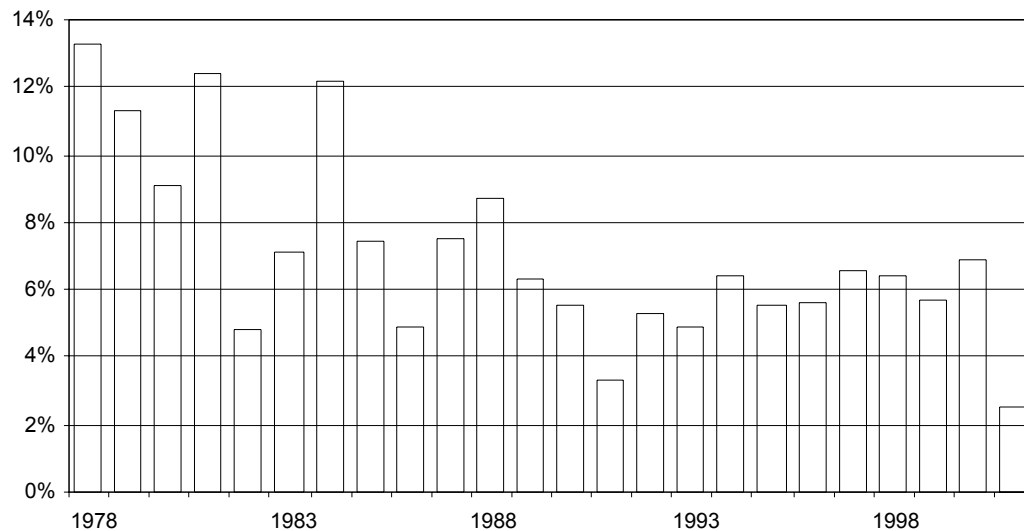
Exhibit 4-6 Annual Growth Rate of California Economy or GSP, 1978 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

The California GSP shows strong growth from 1977-1990 from 7-14% annually, a recession in 1991-1993 and a return to growth in the mid- to late 90s before a recession in 2001.

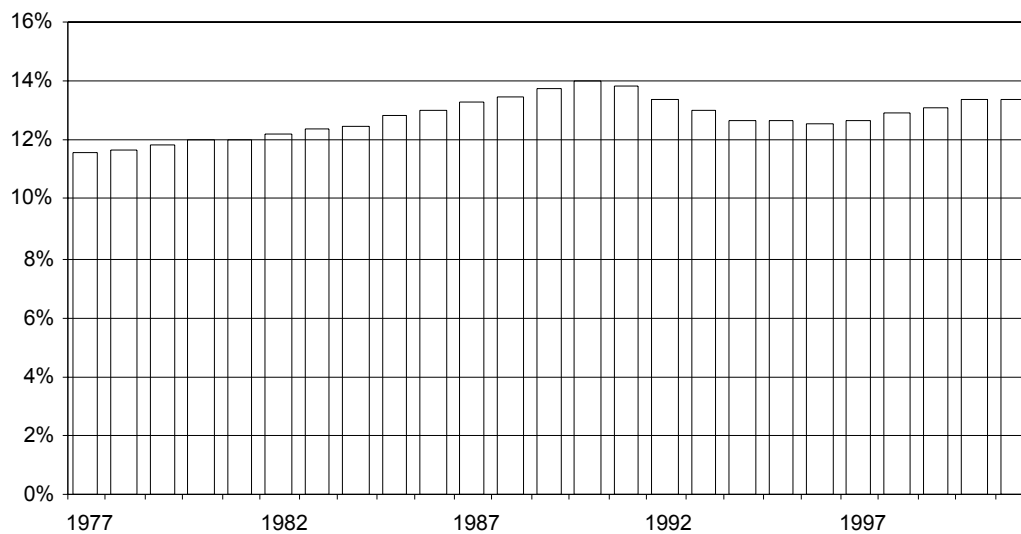
Exhibit 4-7 Annual Growth Rate of the US Economy or GNP, 1978 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

Trends in the U.S. economy are less exaggerated than in the California economy.

Exhibit 4-8 California Economy as a Percentage of the US Economy, 1977 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

California represented 13.4% of the U.S. economy in 2001 after growing from 11% to 14% from the mid-70s to 1990 and subsequently dipping to 12% in 1996.

4.3. The California Core APC Industry Compared to the US Core APC Industry

California is correctly regarded as the US and global leader in air quality programs. It is clear from research of the APC industry and numerous conversations with APC executives that the California APC market is also more advanced, or at least at a more advanced or evolved state, than APC markets and APC industries in other states. This fact has meant that programs have started in California and sales have resulted for APC companies earlier, but it also means that sales have ‘matured’, grown more slowly or even declined in some segments sooner in California. Also as other regions adopt California standards or at least belatedly adopt national standards or programs, this means their markets have grown faster than California’s markets in many of the past 20 years or so as these areas have striven to ‘catch up’ to California.

The California APC industry accounted for 17% of the U.S. total APC industry in 1970. By 2001, while the California APC industry was still growing fairly steadily, this figure was down to 10% as other states have gradually taken a larger share with higher growth rates. The following exhibit shows how

this percentage varies by segment in the core APC industry and subsequent figures for 1980 and 1990 show the same data for their respective time periods.

Exhibit 4-9 California Core APC Industry Compared to US Core APC Industry (\$mil)

	2001 US	2001 CA	CA %
Stationary Source Equipment Manufacturers	3,750	407	11%
Mobile Source Emission Control Systems Manufacturers	15,020	670	4%
Air Quality Instrument & Information Systems	809	157	19%
Consulting & Engineering Services	1,250	164	13%
Commercial testing labs	60	6	11%
Vehicle smog testing stations & repair	2,016	773	38%
Research & Development	368	55	15%
Emissions Trading	5	1	25%
Total US Core APC	23,279	2,234	10%

Source: Environmental Business International Inc. (San Diego, Calif.)

- Mobile Source Emission Control Systems Manufacturers: Few of the largest companies in mobile systems have large operations in California. Only 3-4% of the US employees in the automotive manufacturing sector and the automotive parts & supplies sector (of which mobile systems predominantly are) are in the state of California, according to Census data. Therefore California is in effect a net 'importer' of mobile emissions systems as most of its vehicles (and their components) are manufactured and assembled out of state.
- Vehicle smog testing stations & repair were pioneered in California on a large scale and remain commensurately more prevalent in the state. Smog check programs are also more advanced in California in requiring more stringent testing for each automobile.
- Air Quality Instrument & Information Systems has two of the largest firms with their largest facilities in the state so this segment is almost 20% in California.
- Stationary Source Equipment Manufacturers have a number of specialty firms in California, but virtually all the 'big-ticket' items for power generation, waste incineration and major industry are made and used outside of the state.

Exhibit 4-10 California Core APC Industry Compared to US Core APC Industry in 1980 (\$mil)

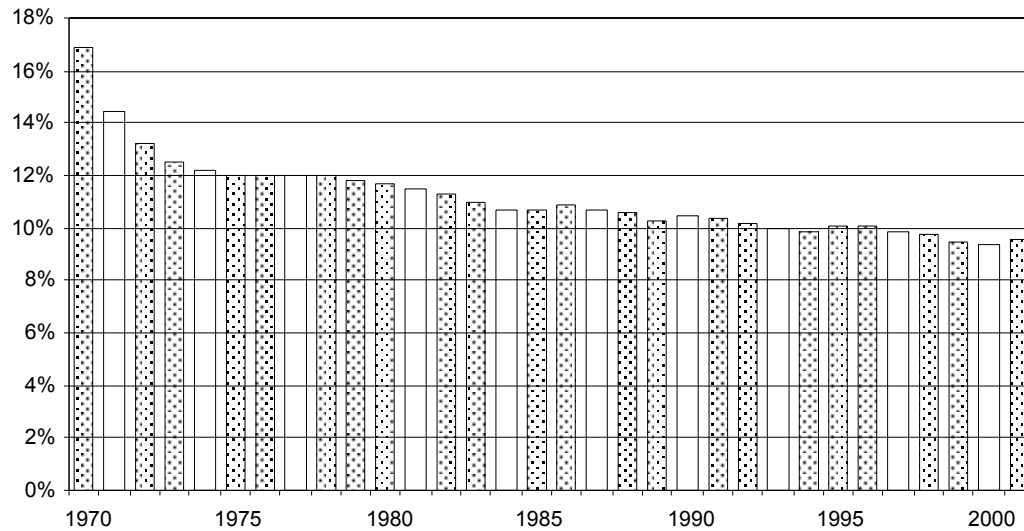
	1980 US	1980 CA	CA %
Stationary Source Equipment Manufacturers	2,768	300	11%
Mobile Source Emission Control Systems Manufacturers	1,766	201	11%
Air Quality Instrument & Information Systems	124	24	19%
Consulting & Engineering Services	190	23	12%
Commercial testing labs	17	2	11%
Vehicle smog testing stations & repair	16	14	86%
Research & Development	152	23	15%
Emissions Trading	0	0	
Total US Core APC	5,033	587	12%

Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 4-11 California Core APC Industry Compared to US Core APC Industry in 1990 (\$mil)

	1990 US	1990 CA	CA %
Stationary Source Equipment Manufacturers	3,740	406	11%
Mobile Source Emission Control Systems Manufacturers	7,346	511	7%
Air Quality Instrument & Information Systems	515	100	19%
Consulting & Engineering Services	1,188	151	13%
Commercial testing labs	68	7	11%
Vehicle smog testing stations & repair	248	192	78%
Research & Development	215	32	15%
Emissions Trading	0	0	
Total US Core APC	13,320	1,399	11%

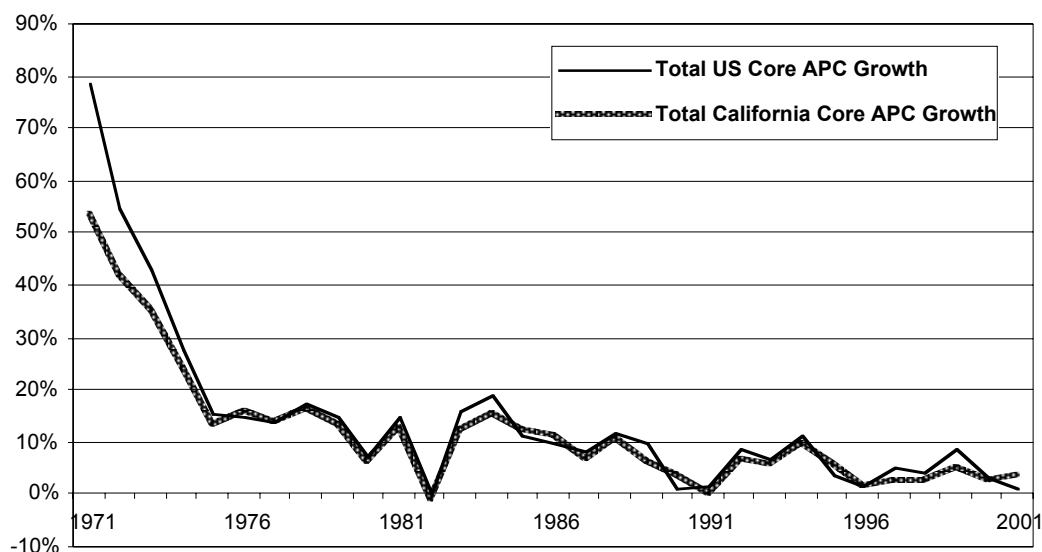
Exhibit 4-12 California APC Industry as a Percentage of the US APC Industry, 1970 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

In a sense California's role as a pioneer in the APC industry could be seen to have 'worked against' its ability to hold a growing share of the U.S. and even global market for air pollution control. In this case as standards or enforcement mechanisms across the nation evolved to catch up to California's, their APC revenues grew at a higher rate to the more mature markets in California. Lacking any concerted effort by the state or its APC industry to focus on out-of-state or export sales, California's share of the APC industry has declined fairly steadily since 1970.

Exhibit 4-13 Growth of Core APC Industry, US v.s. California, 1970-2001



Source: Environmental Business International Inc. (San Diego, Calif.)

4.4. The California Clean Air Products Industry Compared to Estimates of the US Clean Air Products Industry

California has historically been and remains a leader in renewable energy programs. California is also a clear leader in the renewable energy or clean energy business accounting for 33% of national revenues. This compares favorably to California's overall 13.4% contribution to the U.S. economy. California is also estimated to be proportionally larger in its production of Clean Consumer Goods, Clean Alternative Fuels, Clean Paints & Coatings. However the relative lack of overall manufacturing base accounts for California having less than its share of the Clean Industrial Machinery and Non-Polluting/Less Polluting Vehicles manufacturing market, although it is estimated that the state has a significantly higher than proportional usage of these two categories.

Overall the California Clean Air Products industry accounted for 22% of the U.S. total Clean Air Products industry in 2001.

Exhibit 4-14 California Clean Air Products Industry Compared to US Clean Air Products Industry, 2001 (\$mil)

	2001 USA	2001 CA	CA %
Clean' Consumer Goods	151	42	28%
Clean' Industrial Machinery	3,860	309	8%
Non-Polluting/Less Polluting Vehicles	2,930	203	7%
Alternative Energy Sources **	9,964	3,249	33%
Clean' Alternative Fuels	307	67	22%
Clean' Paints & Coatings	408	73	18%
Clean Air Products Industry	17,619	3,943	22%

Source: Environmental Business International Inc. (San Diego, Calif.) Note: Since definitions of these categories are not firmly established and national estimates are based on even less information than available on California sales, the level of accuracy is not high. **Includes equipment and power sales.

4.5. The California APC Industry Compared to the California Environmental Industry and the US Environmental Industry

Although not officially recognized in most sets of government statistics, the environmental industry has been the subject of study by Environmental Business International since 1988. The following set of exhibits present: definition and detail on the California environmental industry; compares California's environmental industry to the US environmental industry; and compares the California APC industry to California's environmental industry. First is the definition of the environmental industry as used by EBI.

Exhibit 4-15 Environmental Industry Segments

Segment	Description	Examples of Clients
Environmental Services (Environmentally Preferable Services)		
Environmental Testing & Analytical Services	Provide testing of “environmental samples” (soil, water, air and some biological tissues)	Regulated industries, Gov’t, C&E, Hazardous waste and remediation contractors
Wastewater Treatment Works	Collection and treatment of residential, commercial and industrial wastewaters. Facilities are commonly know as POTWs or publicly owned treatment works.	Municipalities, Commercial Establishments & All industries
Solid Waste Management	Collection, processing and disposal of solid waste	Municipalities & All industries
Hazardous Waste Management	Collection, processing and disposal of hazardous, medical waste, nuclear waste	Chemical, Petroleum, Mfgs Government agencies
Remediation/Industrial Services	Cleanup of contaminated sites, buildings and environmental cleaning of operating facilities	Government agencies Property owners Industry
Environmental Consulting & Engineering (C&E)	Engineering, consulting, design, assessment, permitting, project management, O&M, monitoring, etc.	Industry, Government Municipalities, Waste Mgmt. companies, POTWs
Environmental Equipment (Environmentally Preferable Goods)		
Water Equipment & Chemicals	Provide equipment, supplies and maintenance in the delivery and treatment of water and wastewater.	Municipalities & All industries
Instruments & Information Systems	Produce instrumentation for the analysis of environmental samples. Includes info systems and software.	Analytical services, Gov’t Regulated companies
Air Pollution Control Equipment	Produce equipment and tech. to control air pollution. Includes vehicle controls.	Utilities, Waste-to-energy Industries, Auto industry
Waste Management Equipment	Equipment for handling, storing or transporting solid, liquid or haz waste. Includes recycling/remediation equipment.	Municipalities Generating industries Solid waste companies
Process & Prevention Technology	Technology for in-process pollution prevention and waste recovery	All industries
Environmental Resources		
Water Utilities	Selling water to end users (mostly public sector)	Consumers, Municipalities & All industries
Resource Recovery	Selling materials recovered and converted from industrial by-products or post-consumer waste	Municipalities Generating industries Solid waste companies
Clean Energy Power & Systems	Selling power and systems in solar, wind, geothermal, small scale hydro, energy efficiency and DSM	Utilities All industries and consumers
Environmental Consumer Goods (Environmentally Preferable Products or EPPs)		
Sustainable Agriculture Products	Agricultural products or finished food products derived from certified organic materials and processes.	Consumers, Food manufacturing companies, Food service companies
Sustainable Forestry Products	Timber or finished forest products derived from certified sustainable forestry programs.	Consumers Manufacturers
Eco-Tourism	Tourism revenues derived from certified eco-tourism locations that minimize ‘environmental footprint’ in transportation and lodging facilities	Consumers

Source: Environmental Business International Inc. (San Diego, Calif.)

4. The Air Pollution Control Industry's Contribution to California's Economy

California accounts for 13% of the U.S. environmental industry generating revenues of \$28.5 billion in 2002 and employing 184,000 Californians.

Exhibit 4-16 US and California Environmental Industry, 2002

ENVIRONMENTAL INDUSTRY SEGMENT	US Revenues (\$bil)	California Revenues (\$mil)	California % of US	California Jobs
SERVICES				
Analytical Services	1.8	230	13%	2,590
Wastewater Treatment Works	29.6	4,160	14%	16,910
Solid Waste Management	42.0	4,880	12%	32,110
Hazardous Waste Management	4.7	490	10%	3,990
Remediation/Industrial Services	12.2	1,070	9%	9,850
Consulting & Engineering	18.8	2,470	13%	25,030
EQUIPMENT				
Water Equipment and Chemicals	20.8	2,480	12%	15,910
Instruments & Information Systems	3.9	540	14%	4,230
Air Pollution Control Equipment	19.0	1,070	6%	14,940
Waste Management Equipment	9.6	810	8%	5,980
Process & Prevention Technology	1.3	90	7%	2,680
RESOURCES				
Water Utilities	31.6	5,050	16%	21,600
Resource Recovery	14.9	1,450	10%	11,120
Clean Energy Systems & Power	11.3	3,740	33%	16,680
TOTAL Environmental INDUSTRY:	221.4	28,530	13%	183,620

Source: Environmental Business International Inc. (San Diego, Calif.)

Overall 11% of the California environmental industry's revenues are derived from outside the United States. Equipment segments, notably Instruments & Information Systems and Water Equipment and Chemicals, are substantially more involved in exports than other segments. In addition, the 28% of the revenues generated by the Resource Recovery segment are from sales of secondary materials, principally to Asia.

Exhibit 4-17 California Environmental Industry and Exports, 2002

ENVIRONMENTAL INDUSTRY SEGMENT	Revenues (\$mil)	Exports (\$mil)	Exports %
SERVICES			
Analytical Services	230	8	3.6%
Wastewater Treatment Works	4,160	21	0.5%
Solid Waste Management	4,880	12	0.2%
Hazardous Waste Management	490	16	3.2%
Remediation/Industrial Services	1,070	96	8.9%
Consulting & Engineering	2,470	477	19.3%
EQUIPMENT			
Water Equipment and Chemicals	2,480	886	35.7%
Instruments & Information Systems	540	279	51.6%
Air Pollution Control Equipment	1,070	151	14.1%
Waste Management Equipment	810	127	15.7%
Process & Prevention Technology	90	5	5.7%
RESOURCES			
Water Utilities	5,050	15	0.3%
Resource Recovery	1,450	401	27.7%
Clean Energy Systems & Power	3,740	607	16.2%
TOTAL INDUSTRY:	28,530	3,102	10.9%

Source: Environmental Business International Inc. (San Diego, Calif.)

To put the California environmental industry in the context of the California air quality industry and the core APC industry as defined in this study, the following table is included. Note that part of the core APC industry, vehicle emissions testing, has not historically been counted as part of the environmental industry. In addition, a number of clean consumer goods or clean equipment sales have not been included as well.

Exhibit 4-18 California Environmental Industry and California APC Industry, 2002

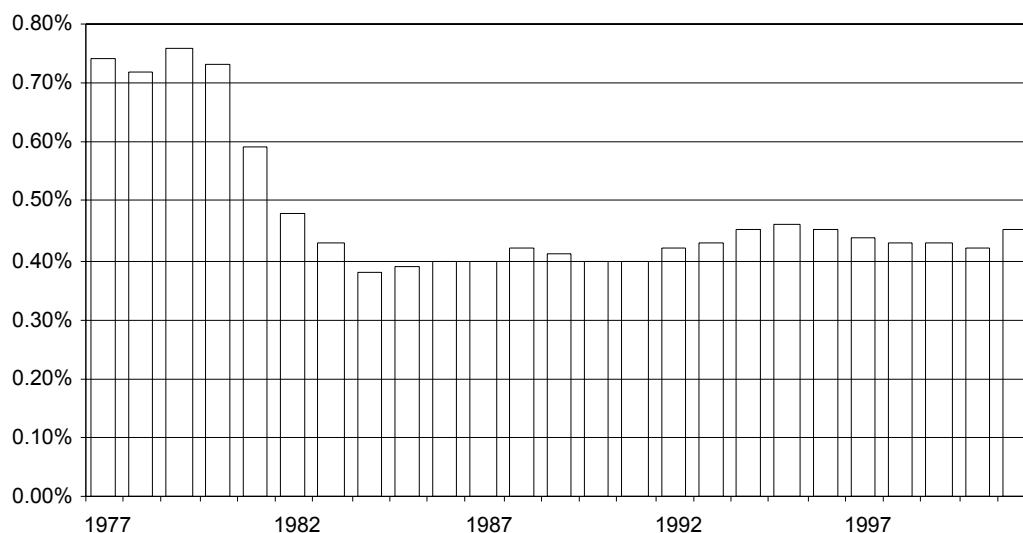
ENVIRONMENTAL INDUSTRY SEGMENT	Revenues (\$mil)	Air Quality Revenues (\$mil)	Air Quality Percentage
SERVICES			
Analytical Services	230	6	3%
Wastewater Treatment Works	4,160		0%
Solid Waste Management	4,880		0%
Hazardous Waste Management	490		0%
Remediation/Industrial Services	1,070		0%
Consulting & Engineering	2,470	222	9%
EQUIPMENT			
Water Equipment and Chemicals	2,480		0%
Instruments & Information Systems	540	159	30%
Air Pollution Control Equipment	1,070	1,070	100%
Waste Management Equipment	810		0%
Process & Prevention Technology	90		0%
RESOURCES			
Water Utilities	5,050		0%
Resource Recovery	1,450		0%
Clean Energy Systems & Power	3,740	3,740	100%
TOTAL ENVIRONMENTAL INDUSTRY:	28,530	5,197	18%
Other 'Core' APC Segment: Smog Test		842	
Other 'Non-Traditional' APC Segments: Mostly Clean Products		736	
TOTAL		6,775	

Source: Environmental Business International Inc. (San Diego, Calif.)

4.6. The Contribution of the California Air Quality Industry to the State Economy

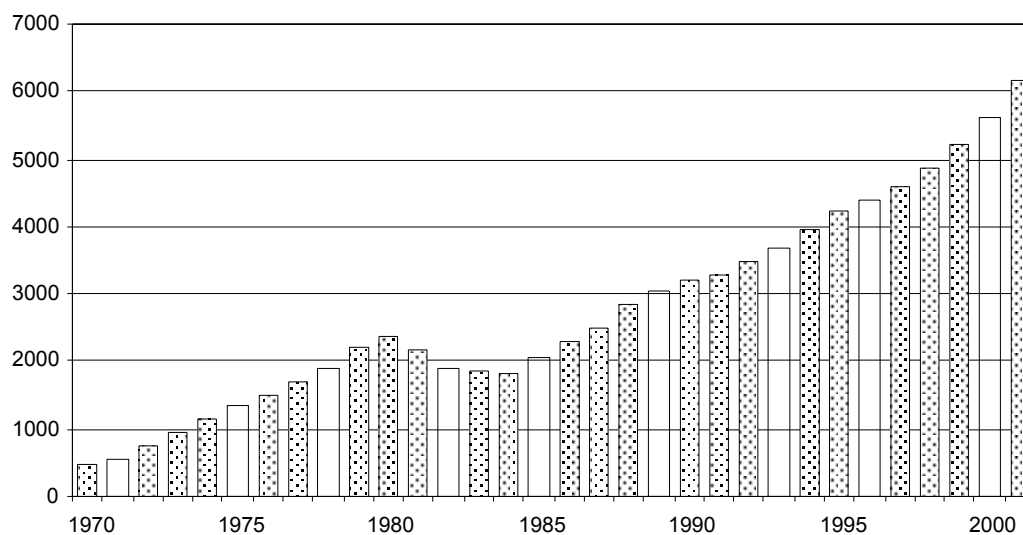
The air quality industry represents 0.45% of the California economy in 2001, and this proportion has been fairly steady between 0.40% and 0.45% since the early 1980s. In the 1970s, when a large portion of the air quality industry was in the renewable energy sector, the air quality industry accounted for as much as 0.74% of the state's economy. The decline of that sector in the early 80s, however, resulted in overall decline of the entire air quality industry for four years and the significant drop-off in the percentage of the overall air quality industry as a function of the California economy.

Exhibit 4-19 California Total Air Quality Industry as a Percentage of the State Economy, 1977 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

Exhibit 4-20 Total Revenues in the California Total Air Quality Industry (\$mil), 1970 - 2001



Source: Environmental Business International Inc. (San Diego, Calif.)

4.7. Forecast of Future Trends and Growth Scenarios for the California Air Quality Industry

Research performed for this study of the California APC industry affirms the following basic premise regarding environmental policy and the environmental industry. We believe that as environmental problems are identified and then solutions are required, developed and subsequently sold as a product or service by companies in some form two things happen.

- First an industry springs up to mitigate these environmental problems—but ultimately the costs of this mitigation create an incentive for the regulated community to avoid these costs, and hence the industry that sprang up ultimately faces declining demand for its products and services.
- Second as environmental concerns increasingly have an economic consequence for all manufacturers and resource consumers, preferable alternatives are developed to their products or energy sources that ultimately replace the standard product of one era with a newly standard product of a new era.

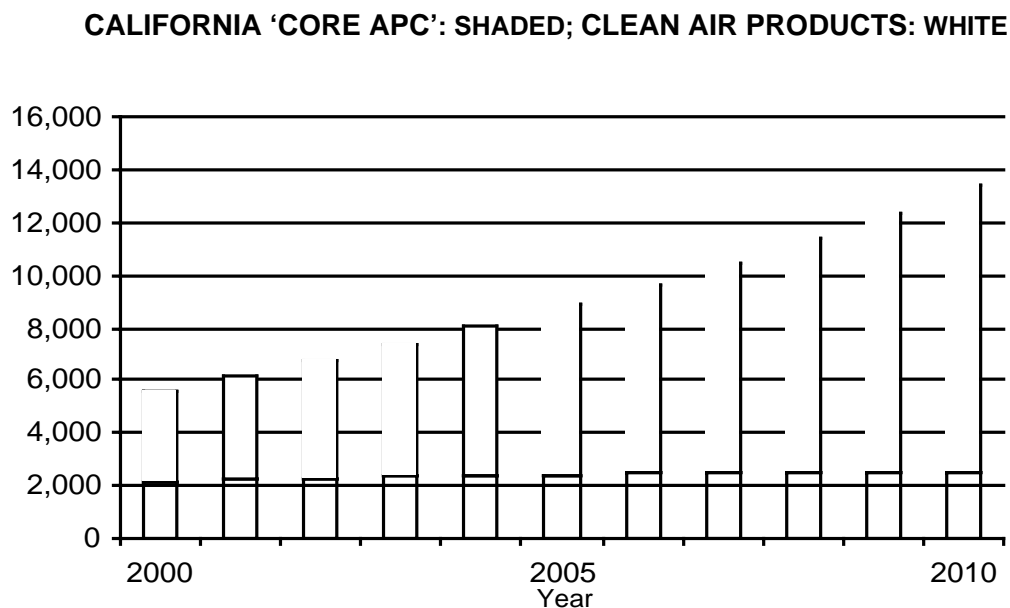
This latter effect may be accelerated by direct regulation in the form of product or material bans and/or new product standards, or it may occur gradually as rules or regulations are invoked upon the negative environmental impacts of the product or process in question. Alternatively, economic instruments in the form of emissions credits, emissions trading or perhaps emissions taxes or resource consumption fees are, or can be, used. These economic instruments can serve to create an incentive to reduce emissions on an ongoing basis—or perhaps more effectively to create a disincentive to generate ongoing emissions if there is an incremental negative economic consequence to each incremental unit of emissions.

All of these factors are in play in the air quality arena in the state of California. And as we enter the middle of the first decade of the 21st century, we are perhaps at an important crux in the industry's development. The historical emphasis on traditional air standards and enforcement measures may be in the process of shifting towards requirements or incentives for a new generation of products that will replace the pollution-generating products prevalent in the 20th century.

When attempting to forecast the growth of the air quality industry for at least the rest of this decade, it is hard to find much scope for growth in the traditional air pollution control segments of the industry that we have characterized as the 'core APC industry' in this study. We believe monitoring and auto emissions testing will continue to grow, but this growth barely makes up for the inevitable decline in the traditional APC equipment segments as stationary sources in particular have evolved to more a maintenance and replacement market for what is increasingly an antiquated manufacturing and energy

generation infrastructure. On the automotive side, it is forecasted that the demand for mobile emissions systems and components will show modest growth (much of it due to the relatively new focus on diesel emissions), but the real growth will occur in the shift to alternative vehicles and fueling systems.

Exhibit 4-21 Projected Growth in the California 'Core APC' and the Clean Air Products Segments (\$mil)



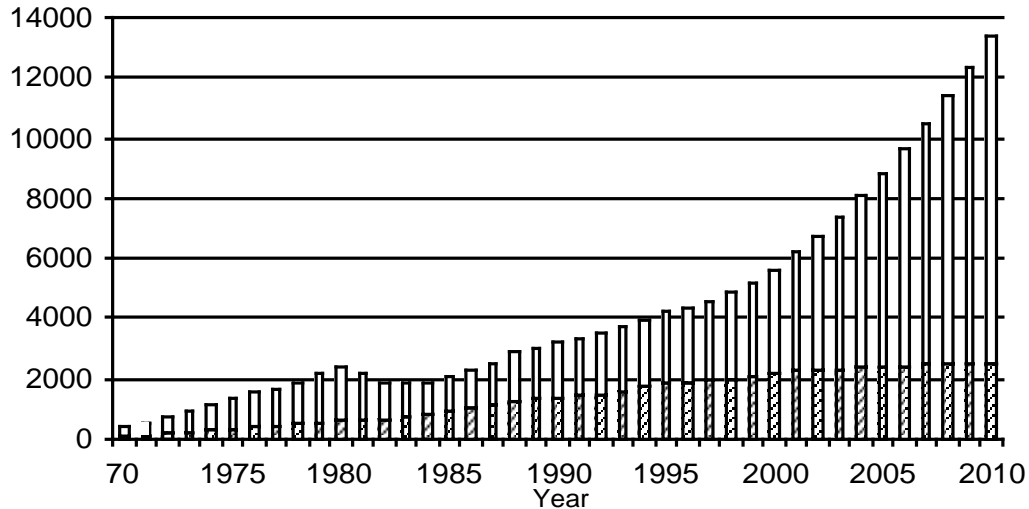
Source: Environmental Business International Inc. (San Diego, Calif.)

Overall the annual growth of the aggregated Core APC industry is forecasted at 1-2% on average from 2003-2010. On the other hand the growth of the aggregated Clean Air Products industry is forecasted at 10-12% on average from 2003-2010.

Alternative products currently represent a very small portion of their conventional counterparts and therefore offer tremendous potential for growth provided there are enough economic incentives for alternative of cleaner products to overcome current biases in the market. For this reason, forecasting growth of clean consumer products, clean paints & coatings and alternative fuels at 20% per year may be quite conservative, especially considering that these market are really quite small today. Alternative vehicles or LEVs and ZEVs are perhaps the largest unknown since their growth will likely be more dependent on a number of factors such as oil prices, direct government policies, competitive dynamics in the auto industry and the development of new technology and infrastructure for future vehicle fueling systems.

In spite of these unknowns, as the figures above and below demonstrate, we believe that growth in the air quality industry will be paced by alternative products or what we have defined as the clean air products industry.

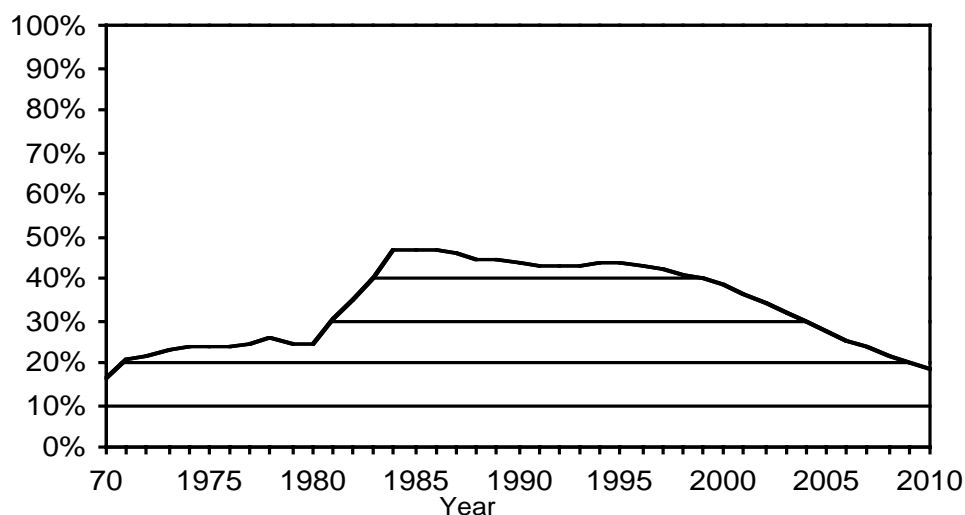
Exhibit 4-22 The California 'Core APC' and the Clean Air Products Segments (sales in \$mil), 1970-2010; California 'Core APC': SHADED; Clean Air Products: WHITE



Source: Environmental Business International Inc. (San Diego, Calif.)

From a historical perspective it is interesting to note that the core APC industry reached about 50% of the total air quality industry in the early to mid 1980s, and sustained at nearly that level for more than 10-12 years until the growth of alternative products, in particular energy, started to take off again at the end of the 1990s.

Exhibit 4-23 Percentage of the Air Quality Market Represented by The California 'Core APC' versus the Clean Air Products Segments, 1970-2010; California 'Core APC': SHADED; Clean Air Products: WHITE



Source: Environmental Business International Inc. (San Diego, Calif.)

In conclusion it is worth noting that while the traditional forms of air pollution control are declining in terms of contribution to the industry, they are by all means not to be de-emphasized, nor are the policies that got the APC industry to its current level of sales. Whereas we believe that the traditional prescriptive regulatory approach to air quality that has gotten the state to what could be characterized as acceptable levels of air quality today, in order to achieve continuous improvements in air quality or even to approach excellence or industrial sustainability, these measures will have to be maintained and enhanced with the addition of economic instruments to provide more economic validation for the next generations of cleaner products.

5. California Air Pollution Companies Directory

This chapter presents the APC-related companies located in California. All companies are presented in 3 sections:

- APC Service Providers (Page 113)
- APC Equipment Manufacturers (Page 152)
- APC Non-Traditional Sources (Page 183)

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pptv analysis of ambient air to identifying
organics in a high level source emission. the
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last several years co

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Forensic Analytical

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Business Description: APC lab testing; Asbestos, lead-based paint, and indoor air quality consulting/laboratory services. site assessments, haz-waste testing, mold, bacteria.

Fossil Energy Research

23342 C South Pointe
Laguna Hills, CA 92653
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Richard Thompson
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Business Description: APC consulting; Consulting services related to NOx control and performance improvement of gas, oil, and coal-fired boilers and industrial combustion devices. specialists in optimization of combustion and post-combustion processes.

Foster Wheeler Environmental

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Joseph Franco
Vice President
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Foster Wheeler Environmental

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Fugro Inc.

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Mel Willis
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Fugro McClelland

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Business Description: APC consulting; Environmental and landfill gas consulting and operations.

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Business Description: APC consulting; Consulting, reg. compliance and environmental permitting

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Geo Analytical Laboratories

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Laboratory analysis of soil, waters, hazardous
waste, drinking water

Geomatrix Consultants, Inc (Costa Mesa)

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Business Description: APC consulting;
Environmental, geotechnical and seismic-related
consulting services

Global Futures

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Phone: 916-486-5999
Fax: 916-486-5990
Bill Shireman
President, V.P.
Email: INFOGLOBALFF.ORG
Business Description: APC consulting; Conflict
management between business and
environmental advocates market-based

environmental policy and program development
cost-benefit assessments of environmental
programs and policies eco-accounting.
industrial ecology training.

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Business Description: APC consulting

Golder Assoc Inc

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Green Environmental

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Bob Brown
Geologist
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Green Environmental

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in air and hazardous waste.

Haley & Aldrich

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Harding Ese, Inc.

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Steve Howell
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ese has established a reputation for excellence
in the fields of environmental assessment,
geology and hydrology, hazardous and solid
waste management, database development,
mining, wastewater management programs, civil
and geotechnical engineeri

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Dawn Schroder
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HDR Eng

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President
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Business Description: APC lab testing; Industrial hygiene; safety; analytical lab; health physics; training; asbestos; lead; confined spaces; air & bulk sampling & analysis; noise; et. al.

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Insitech, Inc.

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Hugh Worth
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IT Corp.

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Jacobs Engineering Group

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Noel Watson

President
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Jacobs Engineering Group

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Environmental consulting to the industrial
community for air and water pollution issues.
industries served include the mining and
processings of construction aggregates,
chemical, petroleum dredging, coating, printing
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Water&waste water service sound enclosures

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Eric J. Hinzl
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Consulting engineering and scientific services in
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process engineering, environmental compliance
and engineering, industrial water treatment and
conveyance, industrial wastewater treatment,
waste minimization

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Tom C Ries
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Russ Carey
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geotechnical engineering

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Environmental and water resources consulting
services.

Kraim Environmental

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Consulting services in the area of environmental
compliance and technology. primary areas of
practice are: air pollution control, hazardous
waste. also, perform phase i property
assessments and certifications for the pbr
regulations.

LC. G Boyd & Associates

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Owner
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Environmental engineers, scientists, contractors,
program management, construction
management, water & wastewater design.

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Lindmark Engineering

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Ulf Lindmark
President
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Business Description: APC consulting; Lindmark engineering is an environmental services firm committed to provide innovative & cost-effective, high quality solutions to our client's problems.

Logic Beach, Inc.

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Business Description: APC lab testing; Portable, remote site data collection systems for environmental & performance test monitoring.

Malcolm Pirnie Inc

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Marmac Engineering

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Fred R. McLaren
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Dan Vistica
V.P. Finance & CFO
Business Description: APC consulting; Nationwide provider of turn-key environmental engineering, consulting and contracting services.

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Charles Moine
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Installation/removal of underground storage tanks

Morrison Knudsen Engineers

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Hugh Hempill
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Network Environmental Systems

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Fax: 916-853-8526
Bruce Lalarus
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Environmental training and consulting, training
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industrial hygiene consulting.

Ogden Environmental & Energy

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PIC Environmental Services

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soil remediation, groundwater assessment and
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Pollution Prevention International

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emphasizing legal services in the primary areas
of bankruptcy, business commercial and

complex litigation, employee benefits, environment, estate planning, finance, intellectual property, labor, real estate, tax and technology.

Professional Service Ind

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Professional Service Ind Inc

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Professional Services Group

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Professional Services Ind

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Raytheon Service Company

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RBF Consulting

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President
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and the environment.

RGA Environmental, Inc.

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Hazardous materials management;
asbestos/lead management, abatement, HVAC
and air quality, personal exposure assessments;
site assessments; underground storage tanks

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Business Description: APC lab testing;
Environmental, hazardous materials and
industrial hygiene (healty & safety)
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lead paint, storage tanks, soils, indoor air
quality, noise - surveys, testing, remedial design
& specifications, construction pha

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consulting firm, with construction management,
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serve private and public sector clients
throughout california and in other states.

SCEC

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CEO
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Bob Simpson
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Business Description: APC lab testing;
Simpson's hot-dust for h-c-old matrix-simpson triad. for cooh- old matrix - analytical-services. consulting - clean up.

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TRC

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URS Greiner

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Assessment, design & construction of
contaminated sites requiring treatment systems.
design and contruction of hazardous materials
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engineering provides air quality consulting
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President

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geochemistry, hydrology, petroleum
hydrocarbon analysis by gc/ms, biomarkers,
oxygenates, product identification,

APC Equipment Manufacturer

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minimization for the petroleum industry

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Advanced Pollution Instrumentation

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Precision analytical equipment for measurement
of ambient air & stack level gases; SO₂, H₂S,
TR_S, NO_x, CO, CO₂, NH₃, and O₃

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Carl Von Wolffradt
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air purification equipment, industrial and
commercial

Air Chem Systems

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Chris Blair
Business Description: APC equipment
manufacturer

Air Chem Systems

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Business Description: APC equipment
manufacturer (thermal oxidizer)

Air Chem Systems, Inc.

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Air Cleaning Specialists

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Air Cleaning Systems

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Air Cleaning Technology

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Air Factors-Lok

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Business Description: APC equipment manufacturer; Manufactures and distributes air products, related ceiling products

Air Instruments & Measurements

Website: www.aimanalysis.com
PMB391, 3579 E. Foothill Blvd.
Pasadena, CA 91107
Phone: 626-813-1460
Fax: 62-338-2585
Email: aimanalysis.com
Business Description: APC instrumentation

Air Instruments & Measurements

Website: www.aimanalysis.com
PMB39, 3579 E Foothill Blvd.
Pasadena, CA 91107
Phone: 626-813-1460
Fax: 626-338-2585
Email: aimanalysis@earthlink.net
Business Description: APC instrumentation (analyzers, monitors)

Air Instruments & Measurements, Inc.

Website: www.aimanalysis.com
13300 Brooks Drive
Suite A
Baldwin Park, CA 91706-2272
Phone: 818/626-813-146
Fax: 626-338-2585
Email: www@aimanalysis.com
Business Description: APC equipment manufacturer

Air Instruments & Measurements, Inc.

Website: www.aimanalysis.com
1300 Brooks Dr., Ste A
Baldwin Park, CA 91706
Phone: 626-813-1460
Fax: 626-338-2585
Harry Lord
President
Email: aimanalysis@earthlink.net
Business Description: APC instrumentation;
Designs and manufactures gas analyzers and
systems for monitoring environmental and
greenhouse gases, in the ambient air, vehicle
exhaust and stack gases

Air Monitor Corporation

Website: www.airmonitor.com
1050 Hopper Avenue
Santa Rosa, CA 95403
Phone: 707-544-2706
Fax: 707-526-9970
Dean Debaun
President
Email: amcsales@airmonitor.com
Business Description: APC instrumentation;
Airflow/gasflow measurement and control
instrumentation.

Air Pollution Control Co.

4703 River Ave.
Newport Beach, CA 92663-2509
Phone: 714-631-8752
Dr. Ilya London
Business Description: APC equipment
manufacturer

Air Pollution Control Co.

8766 Tulare Dr., Apt. E 404
Huntington Beach, CA 92646
Phone: 714-536-6310
Email: apcco@surfside.net
Business Description: APC equipment
manufacturer (scrubbers)

Aircorp

65 Pine Ave, Suite 108
Long Beach, CA 90802
Phone: 714-264-9422
Fax: 310-847-6237
Dale Hinkens
CEO
Email: AIRCORPCEO@aol.com
Business Description: APC equipment
manufacturer; Aircorp environmental services -
fabrication and operation of pcb and chlorinated
oil remediation systems. fabrication of waste
water systems, industrial chemical systems, and
air pollution control systems. aircorp
environmental products imports and dis

Airex Corp. Div. Of Adwest

1175 N. Van Horne Way
Anaheim, CA 92806
Phone: 714-632-9801
Fax: 714-632-9812
Email: info@adwest.cc
Business Description: APC equipment
manufacturer (thermal oxidizer)

Airfoil Management Company

18502 Laurel Park
Compton, CA
Phone: 310-635-0795
John Slee
Business Description: APC equipment
manufacturer

Airguard Industries of California

PO Box 2169
Corona, CA 91718-2169
Phone: 909-272-0708
Fax: 909-272-0123
Joan Rodriguez
General Manager
Business Description: APC equipment
manufacturer; Manufactures air filtration
products

Airtech

Website: www.airtechlaminarflow.com
4260 West Artesia Ave
Fullerton, CA 92833-2667
Phone: 714-562-9295
Fax: 714-562-9273
Kenneth Carpenter
President
Email: kclfb@aol.com
Business Description: APC equipment manufacturer; Manufactures clean air systems - laminar flow workstations, clean air systems, hepa units - designed for clean rooms

Airx Products

1254-3 Cravens Ln
Carpinteria, CA 93013
Phone: 805-683-2987
Fax: 805-684-7438
Business Description: APC instrumentation

Alita Industries Inc.

Website: www.alita.com
Box 660932
Arcadia, CA 91066
Phone: 626-280-7383
Fax: 626-350-1638
Email: sales@alita.com
Business Description: APC equipment manufacturer

Allied Environmental Technologies, Inc.

Website: WWW.ALENTECINC.COM
One Pacific Plaza 7755 Center Ave., Suite 1100
Huntington Beach, CA 92647
Phone: 714-372-4946
Fax: 714-372-4969
Dr. Henry V. Krigmont
President & CEO
Email: ALENTEC@ALENTECINC.COM
Business Description: APC equipment manufacturer; Custom engineering, air pollution control equipment, electrostatic precipitation, renewable energy, combined cycle power plant development & integrated gasification combined cycle technology.

Alphagaz

2121 N. California Blvd.
Walnut Creek, CA 94596
Phone: 510-977-6500
Bernadette Eikani
Public Relations
Business Description: APC equipment manufacturer

Alzeta Corp.

2343 Calle Del Mundo
Santa Clara, CA 95054-1008
Phone: 408-727-8282
Robert M. Kendall
President
Business Description: APC equipment manufacturer

Alzeta Corp.

2343 Calle del Mundo
Santa Clara, CA 95094
Phone: 408-727-8282
Fax: 408-272-9740
Business Description: APC equipment manufacturer (thermal oxidizer)

Alzeta Corporation

Website: www.alzeta.com
2343 Calle Del Mundo
Santa Clara, CA 95054
Phone: 408-727-8282
Fax: 408-727-9740
Andy Minden
Manager, Marketing And Sales
Email: aminden@alzeta.com
Business Description: APC equipment manufacturer; Alzeta corp is a market leading supplier of clean gas combustion products and technologies providing unique value added solutions to oem partners, end users, consultants and contractors world wide.

Applied Air Technology

4101 Alken St
Suite B1
Bakersfield, CA 93308
Phone: 805-589-8601
Armando G Gonzalez
Director
Business Description: APC equipment
manufacturer

Applied Utility Systems, Inc.

Website: www.auscorp.com
9371 Irvine Blvd.
Irvine, CA 92618
Phone: 949-387-4439
Fax: 949-387-8021
Donald Titus
Executive Vice President
Email: don@auscorp.com
Business Description: APC equipment
manufacturer; Low emissions burners for
gaseous and liquid fuels; selective catalytic
reduction systems

Baghouse Services Inc

10572 Chestnut St
Los Alamitos, CA 90720-2150
Phone: 310-594-0905
Nancy Nicola
President
Business Description: APC equipment
manufacturer

Baghouse Services, Inc.

Website: WWW.BAGHOUSESERVICES.COM
10572 Chestnut St.
Los Alamitos, CA 90720-2150
Phone: 562-594-0905
Fax: 562-598-9456
Nancy A Nicola
CEO
Business Description: APC equipment
manufacturer; Manufactures, installs and
services air pollution control and shot blast
equipment

Baker Furnace Inc.

3780 Prospect Avenue
Yorba Linda, CA 92886
Phone: 714-223-7262
Fax: 714-223-7283
Email: sales@bakerfurnace.com
Business Description: APC equipment
manufacturer (catalytic oxidizer)

Baker Furnace, Inc.

Website: www.bakerfurnace.com
3780 A Prospect Ave.
Yorba Linda, CA 92886
Phone: 714-223-7262
Fax: XXX-XXX-XXXX
Ernie Bacon
President
Email: sales@bakerfurnace.com
Business Description: APC equipment
manufacturer; We manufacturer industry ovens
and thermal oxidizers.

Bambeck Systems, Inc.

1921 E. Carnegie Ave.
Santa Ana, CA 92705
Phone: 949-250-3100
Fax: 949-757-1610
Robert Bambeck
President
Email: BAMBECK@EARTHLINK.NET
Business Description: APC equipment
manufacturer; Combustion control - boilers &
heaters

Banyan Industries

Website:
<http://www.packinpotty.com/eliminating-solution.ht>
15507 Moorpark St. #101
Encino, CA 91436-1670
Phone: 818-789-5152
Fax: 818-783-3324
David Rodriguez
Owner
Email: sales@packinpotty.com
Business Description: APC equipment
manufacturer; B.E.S.T. (banyan eliminating

solution & treatment) organic odor and organic waste elimination - safe on the skin, harmless to animals and very good for the environment

Belilove Company - Engineers

Website: www.belilove.com
14680 Doolittle Dr
San Leandro, CA 94577
Phone: 510-895-6186
Fax: 510-352-8748
Carl Gutermann
Vice President
Email: belilove@aol.com
Business Description: APC instrumentation;
Manufacturer's representative of instrumentation to monitor and control level, pressure, temperature and flow of liquids and gases.

Bioscreen Testing Services

3892 Del Amo Blvd.
Suite
Torrance, CA 90503
Phone: 310-214-0043
Business Description: APC equipment manufacturer

Biosolve Western States

10251 Pua Dr.
Huntington Beach, CA 92646
Phone: 714-964-2071
Jim Figueira
Pres.
Business Description: APC equipment manufacturer

California Analytical Instruments Inc.

Website: www.gasanalyzers.com
1238 W. Grove Avenue
Orange, CA 92865
Phone: 714-974-5560
Fax: 714-921-2531
Business Description: APC instrumentation (analyzers)

California Clean Air, Inc

1584 Oak Canyon Drive
San Jose, CA 95120
Phone: 408-268-8120
Dave Rudick
Business Description: APC equipment manufacturer

California Environmental Consulting Assocs., Inc.

3380 Industrial Blvd., Suite 102
West Sacramento, CA 95691
Phone: 916-373-3384
Fax: 916-373-0754
Steven Leung
President
Email: sklceca@cs.com
Business Description: APC instrumentation; Ceca, inc. provides environmental consulting services and distribution of u.s. manufactured environmental equipment and instrumentation. scope of consulting services include: air/water pollution control/treatment and prevention; energy and environmental

Callidus Technologies

2309 Silverbank Pl.
Rowland Heights, CA 91748
Phone: 626-965-1357
Fax: 626-965-1357
Dick Bell
Regional Manager
Email: DICK_BELL@CALLIDUS.COM
Business Description: APC equipment manufacturer; All aspects of combustion related equipment for refineries, petrochemical, chemical, pharmaceutical, off-shore gas & oil industries.

Caltest Instruments, Inc.

Website: WWW.CALTEST.COM
126 Marina Ave.
Willington, CA
Phone: 800-449-6909
Fax: 310-835-0723
Business Description: APC instrumentation

CALVERT Environmental

5985 Santa Fe St
San Diego, CA 92109-1623
Phone: 619-272-0050
Ronald G. Patterson
President
Business Description: APC equipment
manufacturer

Camfil Farr

Website: www.farrco.com
2201 Park Place
El Segundo, CA 90245-4909
Phone: 310-536-6300
Fax: 310-643-9086
John Martin
Pollution Control Prod. Div.
Email: farr@farrco.com
Business Description: APC equipment
manufacturer

Car Sound Exhaust Systems

www.car-sound.com
22961 Arroyo Vista
Rancho Santa Margarita, CA 92688
800-824-8664
949-858-3600
converter@car-sound.com
Business Description: APC equipment
manufacturer (mobile)

Catalytic Solutions

Website: www.catsolns.com
1700 Fiske Place
Oxnard, CA 93033
Phone: 805-486-4649
Fax: 805-486-0511
William Anderson
CEO
Email: wra@ibexllc.com
Business Description: APC equipment
manufacturer; Coatings for catalytic converters.

Catalytica

430 Fergurson Drive
Mountain View, CA 94043-5272
Phone: 650-940-6382
Fax: 650-968-7129
Alice Galloway
Mgr. Corp. Comm.
Business Description: APC equipment
manufacturer

CCI Controls

Website: www.ccicontrols.com
5052 Cecelia St.
South Gate, CA 90280-3511
Phone: 800-500-0224
Fax: 323-560-1136
William G. Johnson
President
Email: mktsls@ccicontrols.com
Business Description: APC equipment
manufacturer; Manufactures electronic
consumer, industrial, home detectors; air
pollution devices, n.e.c.

CJI Process Systems, Inc

11904 Burke St.
Santa Fe Springs, CA 90670-2508
Phone: 562-907-1100
Fax: 562-907-1105
Archie Cholakian
President
Email: jcccji@aol.com
Business Description: APC equipment
manufacturer; CJI Process Systems
manufactures and installs fume exhaust
systems, collection & disposal systems and
components, holding and treatment tanks, waste
treatment equipment, and wastewater treatment
systems. We also manufacture wastewater
evaporators.

Cleaire

www.cleaire.com
14775 Wicks Blvd.
San Leandro, CA 94577
800-308-2111
510-347-6181

info@cleaire.com

Business Description: APC equipment
manufacturer (mobile)

Clean Air Partners

Website: www.cleanairpartners.com

5141 Santa Fe St.

San Diego, CA 92109

Phone: 858-332-4852

Fax: 858-332-4892

John Kelly Iii

Manager Special Projects

Email: jkelly@cleanairpartners.com

Business Description: APC equipment
manufacturer; Direct fuel injection for 2-4 stroke
engines, natural gas fueled engine development,
dual fuel systems, forensic engineering

Clean Air Partners

5066 Santa Fe Street

San Diego, CA 92109

R. Pieplow

Product Mgr.

Business Description: APC equipment
manufacturer; Fuel injectors (LNG, CNG, LPG),
fuel filters, fuel systems, fuel system
development for LNG, CNG, LPG.

Clean Air Products Technology

Alameda Point 2701 Monorch St., Suite 130

Alameda, CA 94501

Phone: 510-864-3160

Fax: 510-864-3159

Timothy Perry

President

Email: TIM@CAPTCO.COM

Business Description: APC equipment
manufacturer; Manufactures hepa filtered
vacuum systems, self clean.

Clean Cam Technology Systems

Website: www.cctsit.com

1901 Mineral Ct, Suite A

Bakersfield, CA 93308

Phone: 661-391-4520

Fax: 661-391-4525

Cary Nikkel

Controller

Email: wendyh@garydrilling.com

Business Description: APC equipment
manufacturer; Diesel engine retrofit & rebuild
systems epa certified & patents

Coen Company Inc.

1510 Rollins Road

Burlingame, CA 94010

Phone: 415-697-0440

Fax: 415-579-3255

Tom DeHaan

Business Description: APC equipment
manufacturer

Combustion Associates Inc

2161 Railroad Street

Corona, CA 91720

Phone: 909-272-6999

Fax: 909-272-8066

Mukund Kavia

President

Email: CAI3@AOL.COM

Business Description: APC equipment
manufacturer; Manufacturing, sales, installation,
assembly and testing of industrial boilers,
burners, furnaces, heaters and incinerators.
provide environmental engineering r&d. all
products adhere to strict pollution guidelines.

Conserve Engineering Company, Llc

303 Broadway, Suite 212

Laguna Beach, CA 92651

Phone: 949-494-6440

Fax: 949-494-9918

Daniel T. Miles

President

Email: DTMILES@AOL.COM

Business Description: APC equipment
manufacturer; Design and provide ventilation
and air pollution control equipment for metal and
plastic finishing operations such as: plating,
anodizing, pickling, stripping, etching, chemical
milling, and paint finishing.
products: scrubbers, fans, hoods, duct, mist el

Corning APT

Website: www.corning.com
6300 Gateway Drive
Cypress, CA 90630
Phone: 714-816-8300
Fax: 714-816-8400
Business Description: APC equipment
manufacturer (mobile source)

Crown Chrome

14660 Arminta St.
Van Nuys, CA 91405
Phone: 818-374-1074
Larry Smith
Process Eng.
Business Description: APC equipment
manufacturer

Dasibi Environmental

Website: WWW.DASIBI.COM
506 Paula Ave.
Glendale, CA 91201
Phone: 818-247-7601
Fax: 818-247-7614
Anthony Reneau
Sales Engineer
Email: DASIBI@DASIBI.COM
Business Description: APC instrumentation;
Manufacture ambient air monitoring
instrumentation.

Dasibi Environmental Corp.

506 Paula Avenue
Glendale, CA 91201
Phone: 818-247-7601
Fax: 818-247-7614
Business Description: APC instrumentation
(analyzers)

Davy Environmental

2440 Camino Ramon
San Ramon, CA 94583
Phone: 415-866-6330
Christine Polley
Bus. Dev. Mgr.

Business Description: APC equipment
manufacturer

Delatech Incorporated

830 Latour CT
NAPA, CA 94558-6258
Roger Mckinley
Business Description: APC equipment
manufacturer

Delta Circuits Tech, Inc.

16028 Arminta St.
Van Nuys, CA 91406
Phone: 818-782-0406
Fax: 818-782-8015
Pete Vaghurbia
Vice President
Business Description: APC equipment
manufacturer

Du-All Safety

Website: DU-ALL.COM
49151 Milmont Dr.
Fremont, CA 94538
Phone: 510-651-8289
Fax: 510-651-8937
Mike Connelly
Director of Operations
Email: SAFETY@DU-ALL.COM
Business Description: APC equipment
manufacturer

Dynamic Air Engineering Inc

620 E Dyer Rd
Santa Ana, CA 92705-5612
Business Description: APC equipment
manufacturer

E-N-G Mobile Systems, Inc.

Website: www.e-n-g.com
2245 Via De Mercados
Concord, CA 94520
Phone: 925-798-4060
Fax: 925-798-0152
Dick Glass
President
Email: daglass@e-n-g.com

Business Description: APC instrumentation; E-N-G mobile systems designs and manufactures a complete line of mobilab(TM) truck and trailer based mobile lab systems for all environmental and industrial applications. E-N-G has over 10 years experience building over 150 mobile lab systems, instrumen

Eagle Monitoring Systems

3211 Shannon Street
Santa Ana, CA 92704
Phone: 714-438-9280
Fax: 714-438-9275
Business Description: APC instrumentation

Eco-Air Products Inc

9455 Cabot Dr
San Diego, CA 92126-4312
Phone: 858-271-8111
Fax: 858-578-3816
Len Setchco
President
Business Description: APC equipment manufacturer

Eldridge Products Inc.

2700 Garden Road, #A
Monterey, CA 93940
Phone: 831-648-7777
Fax: 831-648-7780
Email: sales@epiflow.com
Business Description: APC equipment manufacturer

Electric Power Technologies, Inc

Website: ELECTRICPOWERTECH.COM
830 Menlo Avenue, Suite 201
Menlo Park, CA 94025
Phone: 650-322-1547
Fax: 650-322-8931
Ron Mosso
Director of Business Developme
Email: danept@aol.com
Business Description: APC equipment manufacturer; Specializes in the upgrading of gas, oil, and coal combustion equipment for performance improvements, emissions reductions, and increased fuel flexibility. ept

also provides project management and consulting engineering services for new technology devel

Emcotek Corp.

8220 Doe Ave.
Visalia, CA 93291
Phone: 559-651-2000
Fax: 559-651-2007
S.A. Hickerson
CEO
Email: EMCOTEK@EMCOTEK.COM
Business Description: APC equipment manufacturer; We design, manufacture and service wet scrubbers for incinerators and industrial furnaces, ferflews of 1000 to 20,000 sefm and inlets up to 2000`f

Energy and Environmental Research (EER)

18 Mason
Irvine, CA 92618
Phone: 949-859-8851
Fax: 949-859-3194
Blair A. Folsom
Sr. Vice President
Email: blair.folsom@ps.ge.com
Business Description: APC equipment manufacturer; NOx emission control

Engelhard Corporation

Website: www.engelhard.com
12874 Bradley Avenue
Sylmar, CA 91342
Phone: 818-367-1821
Fax: 818-367-1825
Business Description: APC equipment manufacturer (mobile source)

Engelhard Environmental Technologies

6489 Calle Real
Goleta, CA 93117
Phone: 805-964-1699
Fax: 805-964-3680
Business Description: APC instrumentation (monitors)

Engelhard-CLAL LP

Website: www.engelhard.com
46820 Fremont Blvd.
Fremont, CA 94538
Phone: 510-490-2150
Fax: 510-252-1871
Business Description: APC equipment manufacturer (mobile source)

Entech Instruments Inc.

2207 Agate Ct.
Simi Valley, CA 93065
Phone: 805-527-5939
Fax: 805-527-5687
Email: entech@entechinst.com
Business Description: APC instrumentation

Envir-Alert Inc

30 Mauchly
Irvine, CA 92718-2337
Phone: 714-753-7895
Ronald G. Crane
President
Business Description: APC equipment manufacturer

Enviro Board Corporation

Website: www.enviroboardcorporation.com
4735 Sepulveda Blvd. Suite 356
Sherman Oaks, CA 91403
Phone: 818-981-2290
Fax: 818-981-2071
Glenn Camp
Chairman
Email: gcampebi@aol.com
Business Description: APC equipment manufacturer; The company has patented and trademarked a fiber-processing mill and fiberboard product. the fiberboard panel is made from rice straw and can be used to build homes, soundwalls, door cores and insulation panels (also office partitions).

Envirocare International Inc

27 Commercial Blvd Ste M
Novato, CA 94949-6115
John Tate
Business Description: APC equipment manufacturer

Environmental Combustion Sys.

1963 North Main St
Orange, CA 92667
Phone: 714-282-5646
W.e. Daugherty
Sales Manager
Business Description: APC equipment manufacturer

Environmental Emission Systems, Inc.

13875 Cerritos Corporate Dr.
Unit B
Cerritos, CA 90703
Phone: 562-802-1246
Fax: 562-802-3186
Nick Detor
Business Description: APC equipment manufacturer

Environmental Emissions Systems, Inc.

13875 Cerritos Corp. Dr. Unit B
Cerritos, CA 90703
Phone: 562-802-1246
Fax: 562-802-3186
Nick Detor
Project Manager
Email: EESI@RFPARTRIDGE.COM
Business Description: APC equipment manufacturer; SCR NOx & oxidation co abatement systems; cem maintenance

Environmental Engineering Concepts Inc.

1229 So. Gene Autry Trail
Palm Springs, CA 92264
Phone: 760-322-1111
Fax: 760-322-4341
William Falkenstein
VP & Gen. Mgr.
Business Description: APC equipment manufacturer

Environmental Filter Corp

265 Roberts Ave
Santa Rosa, CA 95407-6925
Phone: 707-522-8110
Fax: 707-525-1025
James Leek
Business Description: APC equipment manufacturer

Environmental Instruments

2170 Commerce Ave
Concord, CA 94502
Phone: 510-686-4474
Barry Zvibleman
CEO
Business Description: APC equipment manufacturer

Environmental Instruments

5650 Imhoff Dr., Suite A
Concord, CA 94520
Phone: 925-686-4474
Fax: 925-686-4608
Bill Stort
Operations Manager
Email: MANDALCK@AOL.COM
Business Description: APC instrumentation; Rental, repair, and distributor of environmental remediation products (air, water, and soil)

Environmental Silica Products

18020 National Trails Hwy
Oro Grande, CA 92368-9593
Business Description: APC equipment manufacturer

Environmental Software

Website: WWW.ENVSOFT.COM
5882 Bolsa Ave. Suite 100
Huntington Beach, CA
Phone: 714-379-7003
Fax: 714-379-7001
Susan Perrell
VP. Business Development
Email: SPERRELL@ENVSOFT.COM
Business Description: APC instrumentation; Environmental software develops environmental, health & safety information management system software products. our clients include: fortune 100 companies managing air emissions inventories, soil and groundwater demediation, and eh&s auditing.

Environmental Solutions Int'L

2265 Gladwin Drive
Walnut Creek, CA 94596
Phone: 925-937-6595
Fax: 925-937-6595
Allen Hamilton
Marketing Director
Email: ENVIROLOG@AOL.COM
Business Description: APC equipment manufacturer; Air and water purification products. products for residential, commercial and industrial use. new technology using super activated oxygen for air purification. manufacture and represent manufacturers who use our marketing systems to expand sales to gl

Envirosupply and Service Inc.

Website: www.envirosupply.net
1791 Kaiser Avenue
Irvine, CA 92614
Phone: 800-201-8150
Email: mcraig@envirosupply.com
Business Description: APC equipment manufacturer

Envirosupply and Service Inc.

Website: www.envirosupply.net
1791 Kaiser Avenue
Irvine, CA 92614
Phone: 800-201-8150
Email: mcraig@envirosupply.com
Business Description: APC equipment manufacturer

Envirosupply and Service Inc.

Website: www.envirosupply.net
1791 Kaiser Avenue
Irvine, CA 92614
Phone: 800-201-8150
Email: mcraig@envirosupply.com
Business Description: APC instrumentation

Envirotech Financial, Inc.

Website: www.etfinancial.com
1851 E 1St Street Ste., 900
Santa Ana, CA 92705-4066
Phone: 714-532-2731
Fax: 714-532-2786
Gene Beck
President
Email: gbeck@etfinancial.com
Business Description: APC equipment manufacturer; Financing of capital equipment and environmental products internationally and domestically. open credit for your customers of up to 180 days and fixed term financing for up to seven years.

Envirotrol

Website: envirotrolproducts.com
1986 Portsmouth Dr.
El Dorado Hills, CA 95762
Phone: 916-939-7924
Fax: 916-939-3480
Jeff Frey
General Manager
Email: envirotrol@starband.com
Business Description: APC equipment manufacturer; Manufactures rep organization providing water-wastewater treatment equipment industry and municipalities-environmental engineering

EOO. Inc.

Website: IYPN.COM/EOOINC
269 North Mathilda Ave.
Sunnyvale, CA 94086
Phone: 408-738-5390
Fax: 408-738-5399
Dan Radecki
Vice President-Business Develo
Email: EOOINC@AOL.COM
Business Description: APC instrumentation; Design and development of electro-optic systems in the areas of laser communications, laser radar, and optical remote sensing. prototypes & pre-production products have included high data rate laser communication terminals, scattered light communication

ESA Engineering Corp.

24422 Avenida Carlota
Laguna Hills, CA 92653
Phone: 949-770-0802
Fax: 949-770-3183
Michael Medock
President
Business Description: APC equipment manufacturer

ESS

Website: www.essvial.com
9601 San Leandro Street
Oakland, CA 94603
Phone: 510-562-4988
Fax: 510-562-4987
Email: matthewm@essvial.com
Business Description: APC equipment manufacturer

Extengine Transport Systems

www.extengine.com
1370 S. Acacia Ave.
Fullerton, CA 92831
714-774-3569
714-774-4036
Phillip Roberts
proberts@extengine.com
Business Description: APC equipment manufacturer (mobile)

Florence Filter Corporation

530 W. Manville St.
Compton, CA 90220
Phone: 310-637-1137
Fax: 310-631-4323
Florence Ann Anhood
President
Business Description: APC equipment manufacturer; Federal i.d. #95-2789026, calif. resale #sr aa-11-646997, business license #00002767. specialties: distribute and manufacture air filtratin products. air quality: all ac/h filters

Forney Corporation

Website: www.anarad.com
534 East Ortega St.
Santa Barbara, CA 93103
Business Description: APC equipment manufacturer

Fuel Master Technologies, Inc.

Website: www.emission-master.org
1453 Third Street Promenade, Suite 430A
Santa Monica, CA 90401
Phone: 310-434-1997
Fax: 310-394-5574
Thi (Tee) Hoang
President
Email: emissionmaster@hotmail.com
Business Description: APC equipment manufacturer; Catalyst installed into fuel line that preconditions fuel before combustion to produce less exhaust from diesel and gasoline engines. effective in reducing black smoke and tsp(total suspended particulates)

Gas Tech Inc.

8407 Central Ave.
Newark, CA 94560
Phone: 510-794-6200
Cust. Svs. Dept.
Business Description: APC equipment manufacturer

GC Industries Inc.

49050 Milmont Dr.
Fremont, CA 94538-7301
Phone: 510-226-1329
Ramesh Chand
President
Business Description: APC equipment manufacturer

General Monitors

Website: www.generalmonitors.com
26776 Simpatica Circle
Lake Forest, CA 92630
Phone: 949-581-4464
Fax: 949-581-1151
Alan Austin
Business Development Manager
Email: sales@generalmonitors.com
Business Description: APC equipment manufacturer; Manufacturer of combustible and toxic gas monitoring equipment and flame detection monitoring systems.

General Precision Inc

25356 Rye Canyon Rd
Santa Clarita, CA 91355-1209
Business Description: APC equipment manufacturer

Hal Murphree and Associates

439 Georgetown Ave
San Mateo, CA 94402-2251
Phone: 415-348-2464
Verdery Erwin
President
Business Description: APC equipment manufacturer

Harel International, Ltd.

765 3rd Ave, Ste 300-18
Chula Vista, CA 91910-5844
Phone: 619-691-6926
Johnathan Lindley
Dir. of Mktg.
Business Description: APC equipment manufacturer

Harrier Inc.

2200 Pacific Coast Hwy
Hermosa Beach, CA 90254
Phone: 213-376-7721
Kevin Devito
Dir of Marketing USA
Business Description: APC equipment
manufacturer

Harrington Environmental Eng.

720 E Carnegie Dr., Suite 100
San Bernardino, CA 92408
Phone: 909-890-3744
Fax: 909-890-0595
Business Description: APC equipment
manufacturer (thermal oxidizer)

Harrington Industrial Plastics Inc.

14480 South Yorba Ave.
Chino, CA 91710
Phone: 909-597-8641
Business Description: APC equipment
manufacturer

Harrington Industrial Plastics, Inc.

Website: www.harringtonplastics.com
720 E. Carnegie Dr. Suite 100
San Bernardino, CA 92408
Phone: 909-890-3744
Fax: 909-890-0595
Dan Herber
VP
Email: DHHERBER@HIPCO.COM
Business Description: APC equipment
manufacturer; Fiberglass air pollution control.

HASSTECH

Website: WWW.HASSTECH.COM
6985 Planders Dr.
San Diego, CA 92121
Phone: 619-457-5880
Fax: 619-457-8115
J Young
President
Email: JYOUNG@MILL.NET

Business Description: APC equipment
manufacturer; Environmental products to
prevent air and water pollution: gasoline vapor
recovery; sve remediation equipment

Hepa Corporation

3071 E Coronado St
Anaheim, CA 92806-2698
Phone: 714-630-5700
Fax: 714-630-2894
Richard Braman
Business Description: APC equipment
manufacturer

HI-Q Environmental Products

Website: www.HI-Q.com
7386 Trade Street
San Diego, CA 92121
Phone: 858-549-2820
Fax: 858-549-9657
Email: info@hi-q.net
Business Description: APC equipment
manufacturer

HI-Q Environmental Products

Website: www.HI-Q.net
7386 Trade Street
San Diego, CA 92121
Phone: 858-549-2820
Fax: 858-549-9657
Email: info@hi-q.net
Business Description: APC instrumentation
(analyzers, monitors)

HI-Q Environmental Products Co.

Website: WWW.HI-Q.NET
7386 Trade Street
San Diego, CA 92121
Phone: 858-549-2820
Fax: 858-549-9657
Marc A Held
President
Email: INFO@HI-Q.NET
Business Description: APC equipment
manufacturer; HI-Q Environmental Products
Company is a leading manufacturer of air
sampling equipment and accessories. Stack

samplers, total suspended particulate, TSP, PM-10, PM-25, Radiation air monitors.

HI-Q Environmental Products Company

Website: www.HI-Q.net
7386 Trade Street
San Diego, CA 92121
Phone: 858-549-2820
Fax: 858-549-9657
Marc A. Held
President
Email: info@HI-Q.net
Business Description: APC equipment manufacturer

Honeywell

2525 W. 190Th St.
Torrance, CA 90504
Phone: 310-512-1693
Fax: 310-512-3559
Prakash Joshi
Leader, HS&E/ECS
Email: prakash.joshi@honeywell.com
Business Description: APC equipment manufacturer; Manufactures environmental controls, heat, transfer, electric and power management and generation systems and aircraft landing and engine systems for aerospace

Horiba Instruments Inc.

Website: www.envIRON.hii.horiba.com
17671 Armstrong Avenue
Irvine, CA 92614
Phone: 949-250-4811
Fax: 949-250-0924
Email: julie.countryman@horiba.com
Business Description: APC instrumentation (monitors)

Horiba Instruments, Inc.

17671 Armstrong Ave.
Irvine, CA 92714
Business Description: APC equipment manufacturer

Horiba Instruments, Inc.

Website: www.neptune.net/horiba
17671 Armstrong Ave.
Irvine, CA 92614
Phone: 949-250-4811
Fax: 949-250-0924
Business Description: APC instrumentation; Analytical instrumentation for water quality, air pollution, cems, ph, particle characterization, sulfur-in-oil & automotive emissions.

Hurd International Group

735 W. Imperial Highway
Los Angeles, CA 90044-4155
Phone: 213-777-1111
Fax: 213-777-9191
Art Hurd
President
Business Description: APC equipment manufacturer; Construction and equipment; environmental and pollution control; safety and security products

I Q Air

10606 Shoemaker Avenue
Santa Fe Springs, CA 90670
Phone: 562-903-7600
Fax: 562-903-7601
Email: info@iqair.com
Business Description: APC equipment manufacturer

Industrial Design Laboratories

3802 Mean St
suite 4
Chula Vista, CA 91911
Phone: 619-585-7635
Fax: 619-585-7637
Business Description: APC equipment manufacturer

International Sensor Technolog

3 Whatney
Irvine, CA 92718-2806
Phone: 714-863-9999
Jeff Lowe

Business Description: APC equipment manufacturer

International Sensor Technology

Website: www.intlsensor.com
3 Whatney
Irvine, CA 92618
Phone: 949-452-9000
Fax: 949-452-9009
Email: tom@intlsensor.com
Business Description: APC instrumentation

International Sensor Technology

Website: www.intlsensor.com
3 Whatney
Irvine, CA 92618
Phone: 949-452-9000
Fax: 949-452-9009
Email: tom@intlsensor.com
Business Description: APC instrumentation (analyzers, monitors)

J&M Printing Equipment

PO Box 611
Glendale, CA 91209-0611
Phone: 213-953-6538
Fax: 818-764-8232
James Jicken
Business Description: APC equipment manufacturer; Distributor of environmental abatement and ion exchange recovery equipment that wants to export to hong kong.

Jet Age Marketing

31604 Railroad Canyon Rd. #101
Canyon Lake, CA 92587
Phone: 909-245-7688
Fax: 909-245-5369
Joan Perez
Manager
Business Description: APC equipment manufacturer; Petroleum additive to lower emissions in automobiles and power plants.

Johnson Matthey (Shape Memory Applications Inc)

Website: www.matthey.com
1070 Commercial Street
Suite 110
San Jose, CA
Phone: 408-727-2221
Fax: 408-727-2778
Business Description: APC equipment manufacturer (mobile source)

Johnson Matthey Medical Products

Website: www.matthey.com
10070 Willow Creek Road
San Diego, CA 92131
Phone: 858-877-1100
Fax: 858-877-1186
Business Description: APC equipment manufacturer (mobile source)

Kavlico Corporation, USA

Website: www.kavlico.com
14501 Los Angeles Avenue
Moorpark, CA 93021
Phone: 805-523-2000
Fax: 805-523-7125
Email: sales@kavlico.com
Business Description: APC equipment manufacturer (mobile source)

Kenneth H Carpenter Inc.

2891 E Via Martens
Anaheim, CA 92806-1751
Kenneth H. Carpenter
Business Description: APC equipment manufacturer

KleenAir Systems Inc.

www.kleenairsystems.com
1711 Langley Ave.
Suite B
Irvine, CA 92614
949-955-3492
949-955-3497
kair@kair.com

Business Description: APC equipment manufacturer (mobile)

Kurz Instruments Inc.

Website: www.kurz-instruments.com
2411 Garden Road
Monterey, CA 93940
Phone: 831-646-5911
Fax: 831-646-8901
Email: sales@kurz-instruments.com
Business Description: APC equipment manufacturer

Kurz Instruments Inc.

2411 Garden Rd.
Monterey, CA 93940
Phone: 408-646-5911
Ram Shermarao
Sales Mgr.
Business Description: APC equipment manufacturer

KVB, Inc.

Website: www.kvb-enertech.com
9420 Jeronimo
Irvine, CA 92618
Phone: 949-766-4200
Fax: 949-855-2535
Joanne Randall
Sr. Manager, Sales & Marketing
Email: jrandall@kvb-enertech.com
Business Description: APC instrumentation; Continuous emissions monitoring system (cems) measuring NOx, SO2, CO, CO2, O2, THC, NH3, HC1, portable gas emission monitor (p-gem), particulate monitors, data acquisition systems (das) and associated services.

LINC Quantum Analytics Inc.

363 Vintage Park Dr.
Foster City, CA 94404
Phone: 415-312-0900
Bruce Harris
Prod. Mgr.
Business Description: APC equipment manufacturer

Liston Scientific Corp.

18900 Teller Ave.
Irvine, CA 92612
Phone: 949-756-1632
Fax: 949-756-1635
Frank Smith
V.P., G.M.
Email: LISTON@EARTHLINK.NET
Business Description: APC equipment manufacturer; Liston manufactures the enviromax line of high performance nondispersive infrared analyzers (ndir) for analysis of such gases as CO, CO2, SO2, O2, CH4, propane, acetone, carbon tetrachloride, and others by request. the enviromax features all digital elec

Magee Scientific Co.

Website: www.mageesci.com
1829 Francisco Street
Berkeley, CA 94703
Phone: 510-845-2801
Fax: 510-845-7137
Email: sales@mageesci.com
Business Description: APC instrumentation (analyzers)

Marketping.Com

Website: www.marketping.com
3333 Brea Canyon Rd. #225
Diamond Bar, CA 91765
Phone: 909-468-2770
Fax: 909-468-4918
Steve Walters
President / CEO
Email: swalters@marketping.com
Business Description: APC equipment manufacturer; Marketping.com is an online market place for environmental control equipment, service and software.

Megtec Systems

Website: WWW.MEGTEC.COM
18121 Gloria Circle
Villa Park, CA 92861
Phone: 714-288-6779
Fax: 714-288-6766
Bill Thompson

Product Design Specialist
Business Description: APC equipment
manufacturer; Air pollution control equipment
manufacturer

Mesa International

Website: www.mesagas.com
1754 Missouri St.
Costa Mesa, CA 92626
Phone: 714-434-7102
Fax: 714-434-8006
Donald A. Tyssee
President
Email: mail@mesagas.com
Business Description: APC equipment
manufacturer; Calibration gases & related gas
handling supplies

Met One Instruments Inc

Website: www.metone.com
1071 Clayton St.
San Francisco, CA 94117
Phone: 415 661 6639
Fax: 415 661 6629
Jo Ann Choi Pottberg
VP Marketing/Sales Development
Email: joann@metone.com
Business Description: APC equipment
manufacturer

Midac Corp.

17911 Fitch Avenue
Irvine, CA 92714
Phone: 949-660-8558
Fax: 949-660-9334
Email: info@midac.com
Business Description: APC instrumentation
(analyzers)

Mil-Ram Technology Inc.

1660 E. Campbell Ave.
San Jose, CA 95125
Phone: 408-254-1180
Carlos Ramirez
Pres.
Business Description: APC equipment
manufacturer

Mil-Ram Technology, Inc.

Website: WWW.MIL-RAM.COM
5423 Central Avenue, Suites 1-4
Newark, CA 94560
Phone: 510-818-0200
Fax: 510-818-0300
Carlos Ramirez
President
Email: SLS@MIL-RAM.COM
Business Description: APC instrumentation;
Manufactures gas detection instruments and
sensors, and specializes in fixed systems which
feature no false alarms. mil-ram technology's
wide range of dependable sensors and
controllers are designed to monitor and detect
hazardous gases, toxic and combu

Milram Technology Inc.

Website: www.mil-ram.com
5423 Central Avenue
Newark, CA 94560
Phone: 510-818-0200
Fax: 510-818-0300
Email: sls@mil-ram.com
Business Description: APC instrumentation

Milram Technology Inc.

Website: www.mil-ram.com
5423 Central Avenue
Newark, CA 94560
Phone: 510-818-0200
Fax: 510-818-0300
Email: sls@mil-ram.com
Business Description: APC instrumentation
(analyzers, monitors)

Mitsubishi Heavy Industries America Inc.

660 Newport Center Drive
Newport Beach, CA 92660
Phone: 714-640-4664
Fax: 714-640-6945
Kentaro Taki
General Manager
Business Description: APC equipment
manufacturer

Molino Ent.

266 E. El Molino , Office #11
Pasadena, CA 91101
Phone: 626-793-8810
Fred A. Romani
Business Description: APC equipment
manufacturer; Environmental engineering
company dealing in equipment and services

MTI Analytical Instruments

41762 Christy St.
Fremont, CA 94538
Phone: 510-490-0900
Dave Sherve
Marketing Mgr.
Business Description: APC equipment
manufacturer

Murphy-Rodgers, Inc

Website: www.murphy-rodgers.com
2301 Belgrave Ave
Los Angeles, CA 90255
Phone: 323-587-4118
Fax: 323-583-9540
Otto Seeman
President
Email: sales@murphy-rodgers.com
Business Description: APC equipment
manufacturer; Dust collectors and air pollution
control equipment.

Newlandex Corporation

2060 Knoll Dr
Suite 200
Ventura, CA 93003-7328
Phone: 805-654-8084
William E. Thompson
President
Business Description: APC equipment
manufacturer

Onion Enterprises

Website: www.onionenterprises.com
269 Cross Road
Alamo, CA 94597
Phone: 925-855-0905
Fax: 925-831-4960
Barry Zvibleman
Email: zweeb@aol.com
Business Description: APC equipment
manufacturer; Ground water, water, air and soil
treatment system. air-strippers, pumps, thermal
oxidizers, catalytic oxidizers, vapor extraction,
blowers, dual phase extraction, carbon,
concentrators. design and build soil, water,
vapor and air treatment systems, therm

Optomonitor Inc.

270 Polaris Avenue
Mountain View, CA 94043
Phone: 650-967-8992
Fax: 650-967-0286
Email: sales@optomonitor.com
Business Description: APC instrumentation
(monitors)

Ozonair International Corp.

Website: WWW.OZONAIR.COM
903 Grandview Drive
So. San Francisco, CA 94080
Phone: 650-952-9904
Fax: 650-952-1287
Karel Stopka
President
Email: OZONAIR@OZONAIR.COM
Business Description: APC equipment
manufacturer

Papros, Inc.

Website: WWW.PAPROS.COM
2355 Oakland Road, Suite 14
San Jose, CA 95131
Phone: 408-279-4271
Fax: 408-433-5950
Dr. N. Nagaraj
President & Director of Eng.
Email: SHAKA@USA.PIPELINE.COM

Business Description: APC instrumentation; Air, water & solid waste & pollution control services & software products are available for purchase over the internet on our web-site

Parker Hannifin Corp.

3400 Finch Road
Modesto, CA 95354
Phone: 209-521-7860
Fax: 209-529-3278
Terry Hoffman
Tech. Svcs.
Business Description: APC equipment manufacturer

Pego Systems, Inc.

Website: WWW.PEGO.COM
42 Digital Dr., Suite 1
Novato, CA 94949
Phone: 415-382-9266
Fax: 415-382-0554
Michael Caruana
President
Email: PEGONO@PEGO.COM
Business Description: APC equipment manufacturer; Provide air and gas handling equipment. individual air blowers or fans and compressors. we use these components to build complete systems to be used in landfill gas collection or wwtp.

Pollution Control Intl Inc

386 East H St
#209
Chula Vista, CA 91910-7485
Business Description: APC equipment manufacturer

Pollution Research & Control

515 W. Colorado St.
Glendale, CA 91204-1101
Phone: 818-247-7601
Fax: 818-247-7614
Keith Gosselin
President
Business Description: APC equipment manufacturer

Power Clean 2000, Inc

Website: WWW.POWERCLEAN2000.COM
3710 Avalon Blvd.
Los Angeles, CA 90011-5660
Phone: 323-235-2000
Fax: 323-235-6259
Candace Chen
President
Email: CANDACE@POWERCLEAN2000.COM
Business Description: APC equipment manufacturer; Pc2000 specializes in reducing vehicle emissions from gas and diesel engine by removing carbon without need to disassemble engine. product effectiveness extensively tested at general motors proving ground vehicle laboratory use.

Praxis Engineers, Inc.

Website: WWW.PRAXISENGINEERS.COM
852 North Hillview Drive
Milpitas, CA 95035
Phone: 408-945-4282
Fax: 408-263-2821
Vas Choudhry
Engineering Manager
Email: VAS@PRAXISENGINEERS.COM
Business Description: APC instrumentation; We provide utility and other industry with engineering and cost optimization software technologies, and provide engineering and r&d solutions for specific problems, and develop solid waste utilization. praxis developed plant and cost optimization system

Psp Industries

300 Montague Expy Ste 200
Milpitas, CA 95035-6830
Andrew Easton
Business Description: APC equipment manufacturer

Pyraponic Ind.

PO Box 27809
San Diego, CA 92198
Phone: 619-673-3527
Fax: 619-673-3525
Martin Ward

Senior Vice President
Business Description: APC equipment
manufacturer; Portable air purifiers

R K I Instruments Inc.

Website: www.rkiinstruments.com
1855 Whipple Road
Hayward, CA 94544
Phone: 510-441-5656
Fax: 510-441-5650
Email: mail4rki@rkiinstruments.com
Business Description: APC instrumentation

R.B. Morriss Co.

1531 Deer Crossing
Diamond Bar, CA 91765
Phone: 909-861-8671
Fax: 909-860-5272
Bob Morriss
President
Email: rbmorrissco@worldnet.att.net
Business Description: APC equipment
manufacturer; Mfg. live microbes for organic
waste bioremediation absorbent products.

RAE System Inc.

Website: www.raesystems.com
1339 Moffet Park Drive
Sunnyvale, CA 94089
Phone: 408-752-0723
Fax: 408-752-0724
Email: raesales@raesystems.com
Business Description: APC equipment
manufacturer

RAE System Inc.

Website: www.raesystems.com
1339 Moffet Park Drive
Sunnyvale, CA 94089
Phone: 408-752-0723
Fax: 408-752-0724
Email: raesales@raesystems.com
Business Description: APC instrumentation
(monitors)

RAE Systems Inc.

Website: www.raesystems.com
1339 Moffet Park Drive
Sunnyvale, CA 94089
Phone: 408-752-0723
Fax: 408-752-0724
Email: raesales@raesystems.com
Business Description: APC instrumentation

Rae Systems, Inc.

Website: www.raesystems.com
1339 Moffet Park Drive
Sunnyvale, CA 94089
Phone: 408-752-0723
Fax: 408-752-0724
Robert I. Chen
President
Email: RAESALES@RAESYSTEMS.COM
Business Description: APC instrumentation; Gas
detection instruments

Ray Burner Company

Website: <http://www.rayburner.com>
401 Parr Blvd
Richmond, CA 94801
Phone: 510-236-4972
Fax: 510-236-4083
Russ Westover
Pres
Email: rayburner@rayburner.com
Business Description: APC equipment
manufacturer; Ray burner company
manufactures burners used for industrial and
commercial heating. safety and low NOx
requirements can be met. ray also manufactures
way wolff ship heaters.

Remediation Service International

Website: www.rsi-save.com
4835 Colt Street, Suite D
Ventura, CA 93003
Phone: 805-644-8382
Fax: 805-644-8378
Email: rsi@rsi-save.com
Business Description: APC equipment
manufacturer

Resource Catalysts

1302 Fort Stockton Drive
San Diego, CA 92103
Phone: 619-497-0120
Fax: 619-497-0793
Shirley F. Rivera
Principal
Email: SFRIVERA@ADNC.COM
Business Description: APC equipment manufacturer; Air quality permitting, compliance and regulatory consulting. energy project setting and feasibility analyses. environmental communications and market assessments per environmental indicators.

Retech Services Inc

Website: www.retechinc.com
PO Box 997, 100 Henry Station Rd
Ukiah, CA 95482
Phone: 707-467-1643
Fax: 707-467-1638
David Reaney
Business Development Manager
Email: retech@pacific.net
Business Description: APC equipment manufacturer; Retech is the most fully integrated manufacturer of metallurgical and waste water treatment processing equipment in the world. our plasma arc centrifugal treatment (pact) system is the world's most versatile waste treatment process. it uses electrical en

Retech Services Inc.

Website: www.retechinc.com
PO Box 997, 100 Henry Station Rd.
Ukiah, CA 95482
Phone: 707-467-1643
Fax: 707-467-1638
David Reaney
Business Development Manager
Email: retech@pacific.net
Business Description: APC instrumentation; Retech is the most fully intergrated manufacturer of metallurgical and waste treatment processing equipment in the world. our plasma arc centrifugal treatment (pact) system is the world's most versatile waste treatment process. it uses electrical energy

RJ Environmental Inc

6197 Cornerstone CT E
San Diego, CA 92121-3710
Business Description: APC equipment manufacturer

RKI Instruments Inc.

Website: www.rkiinstruments.com
1855 Whipple Road
Hayward, CA 94544
Phone: 510-441-5656
Fax: 510-441-5650
Email: mail4rki@rkiinstruments.com
Business Description: APC instrumentation (analyzers, monitors)

Rodgers Murphy Inc

2301 Belgrave Ave
Huntington Park, CA 90255-2791
Business Description: APC equipment manufacturer

RW Manufacturing Co

15305 Manila St
Fontana, CA 92337-7261
Business Description: APC equipment manufacturer

S R I Instruments

20720 Earl Street
Torrance, CA 90503
Phone: 310-214-5092
Fax: 310-214-5097
Email: sales@srigc.com
Business Description: APC instrumentation

Safety Equipment Corp.

Website: www.safetysafetyequipmentcorp.com
1141 Old County Rd.
Belmont, CA 94002
Phone: 650-595-5422
Fax: 650-595-0143
Ken Hettman
President
Email: safetyequipmentcorp@aol.com

Business Description: APC equipment manufacturer; We are manufacturers specializing in storage and handling equipment for hazardous liquid chemicals and toxic gases, gas cabinets.

Safeware Environmental Systems

2841 Fargher Dr
Santa Clara, CA 95015
Phone: 408-248-5359
Morgan Lotfi
Marketing Dir.
Business Description: APC equipment manufacturer

Schilling Components Inc

1071 Serpentine Ln
Pleasanton, CA 94566-4759
Business Description: APC equipment manufacturer

Separation & Recovery Systems

1762 McGaw Ave.
Irvine, CA 92714
Phone: 714-261-8860
William J. Sheehan
VP Marketing
Business Description: APC equipment manufacturer

Sierra Monitor Corp

Website: www.sierramonitor.com
1991 Tarob Court
Milpitas, CA 95035
Phone: 408-262-6611
Fax: 408-262-9042
Email: sier@sierramonitor.com
Business Description: APC instrumentation (analyzers, monitors)

Sierra Monitor Corp.

1991 Tarob Ct.
Milpitas, CA 95035
Phone: 408-262-6611
Cathy Daigle
Inside Sales Mgr.

Business Description: APC equipment manufacturer

Slakey & Associates, Inc.

P.O. Box 944
Orinda, CA 94563
Phone: 925-254-4164
Fax: 925-254-0679
Philip Slakey
President
Email: slakeyco@aol.com
Business Description: APC equipment manufacturer; Consulting civil & mechanical engineers with over 30 years experience in indoor air quality & air pollution abatement. provide full service civil, mechanical, environmental engineering services; plus process design and equipment design.

Smith & Denison Inc.

3561 Arden Rd.
Hayward, CA 94545
Phone: 510-293-8700
Nicky Neau
VP Sales/ Mktg.
Business Description: APC equipment manufacturer

Smith Engineering Co.

2837 East Cedar St.
Ontario, CA 91761-8553
Phone: 714-923-3331
John Guffre
VP Sales/Mktg.
Business Description: APC equipment manufacturer

Smith Environmental Corp.

Website: www.smitheng.com
2837 East Cedar St.
Ontario, CA 91761-8553
Phone: 909-923-3331
Fax: 909-947-2006
Dennis Feidner
CFO
Email: dfeidner@smitheng.com
Business Description: APC equipment manufacturer

Smith Environmental Corporation

2837 E. Cedar St.
Ontario, CA 91761
Phone: 909-923-3331
Fax: 909-947-2006
Dawn Qualley
Email: dqualley@smitheng.com
Business Description: APC equipment manufacturer; Design & manufacture & service a full line of standard & custom thermal & catalytic oxidation & capture systems for sale or lease to control stack & fugitive emissions of volatile organic compounds (VOC), hazardous air pollutants (HAPs) & odors, halogens

SML Associates

Website: WWW.SMLASSOCIATES.COM
109 Peppertree Lane
Encinitas, CA 92024
Phone: 760-942-2359
Fax: 760-943-9544
Stephen Lord
Owner
Email: SLORD@SMLASSOCIATES.COM
Business Description: APC equipment manufacturer; Air pollution control system design and procurement; process analysis and improvement to minimize waste, increase production and profitability.

Soil-Therm Equipment Inc.

Website: www.soiltherm.com
5310 Derry Avenue C&D
Agoura Hills, CA 91301
Phone: 818-706-9875
Fax: 818-706-2145
Email: sales@soiltherm
Business Description: APC equipment manufacturer

Somatek

27114 Rexford Pl.
Valencia, CA 91354
Phone: 810-529-7837
Fax: 805-297-1893
Soma Selvarajah

Business Description: APC equipment manufacturer; Distributor of pollution control equipment iso trade leads for asia

Sonic Dry Clean Inc

12255 Kirkham Rd 200
Poway, CA 92064-6807
Business Description: APC equipment manufacturer

Space Imaging, West Region

Website: WWW.SPACEIMAGING.COM
3717 Buchannen, Suite 102
San Francisco, CA 94123
Phone: 415-929-9011
Fax: 415-921-0254
Eric Waldman
Southwest Regional Manager
Business Description: APC equipment manufacturer; Space imaging is the preeminent supplier of quality, high resolution, digital earth data and information products and services.

Specialty Vehicles, Inc.

16371 Gothard St., Suite C
Huntington Beach, CA 92647
Phone: 714-848-8455
Fax: 714-848-2114
Bonifacio Monge
Email: xxxx
Business Description: APC equipment manufacturer; Clean air fueled shuttles, buses, trams and trolleys.

Spectrex Corp.

3580 Haven Ave.
Redwood City, CA 94063
Phone: 415-365-6567
John Hoyle
Pres.
Business Description: APC equipment manufacturer

Spectrex Corp.

3580 Haven Avenue
Redwood, CA 94063
Phone: 650-365-6567
Fax: 650-365-5845
Email: spectrex@spectrex.com
Business Description: APC instrumentation

Sri Instruments

Website: WWW.SRIGC.COM
20720 Earl Street
Torrance, CA 90503
Phone: 310-214-5092
Fax: 310-214-5097
Douglas Gavilanes
Mgr., Technical Sales
Email: SALES@SRIGC.COM
Business Description: APC instrumentation;
Manufacture gas chromatography systems, data
systems, and accessories for use in field and lab
analysis of organic compounds.

Standard Filter Corporation

5928 Balfour CT
Carlsbad, CA 92008-7304
Einar Wiik
Business Description: APC equipment
manufacturer

Stealth Industries

Website: WWW.STEALTHINDUSTRIES.COM
2130 Orangewood Ave.
Anaheim, CA 92806
Phone: 714-923-2600
Fax: 714-923-2601
John Guffre
President
Email: STEALTHIND@EARTHLINK.COM
Business Description: APC equipment
manufacturer; Manufacturing/design air pollution
control equipment/soil remediation equipment.

Sur-Lite Corp.

8124 Allport Ave.
Santa Fe Springs, CA 90670
Phone: 310-693-0796
John Bermingham III
President
Business Description: APC equipment
manufacturer

Technichem, Inc.

Website: WWW.TECHNICHEM.COM
1250 45Th Street, Ste. 310
Emeryville, CA 94608
Phone: 510-652-5455
Fax: 510-652-5617
Mark J. Ng
President
Email: MJNG@TECHNICHEM.COM
Business Description: APC equipment
manufacturer; Specialized solvent recovery
systems, waste management engineering

Teledyne Advanced Pollution Instr

6565 Nancy Ridge Road
San Diego, CA 92121
Phone: 858-657-9800
Fax: 858-657-9816
Email: api-sales@teledyne.com
Business Description: APC instrumentation

Teledyne Analytical Instrument

16830 Chestnut St.
City of Industry, CA 91749
Phone: 818-961-9221
Jeff Burke
Sales Mgr.
Business Description: APC equipment
manufacturer

Teledyne Analytical Instruments

Website: WWW.TELEDYNE-AI.COM
16830 Chestnut St.
Industry, CA 91748
Phone: 626-934-1500
Fax: 626-934-1651
Tom Compas

Industrial Sales Manager

Email:

LEIGH_DEVEREAUX@TELEDYNE.COM

Business Description: APC equipment manufacturer; A leader in the manufacturing of gas and liquid analyzers. product line includes electrochemical sensors, analyzers, and custom systems.

Tellkamp Systems Inc

15520 Cornet St

Santa Fe Springs, CA 90670-5512

Business Description: APC equipment manufacturer

Temcor

Website: WWW.TEMCOR.COM

24724 S. Wilmington Ave.

Carson, CA 90745

Phone: 310-549-4311

Fax: 310-549-4588

Clark Margolf

Executive V.P.

Email: TEMCOR@COMPUSERVE.COM

Business Description: APC equipment manufacturer; Design & fabrication of aluminum domes and non circular covers for tanks of all sizes and shapes in the water, wastewater, petrochemical and bulk storage industries.

Terr-Aqua Enviro Systems

14643 Hawthorne Ave.

Fontana, CA 92335

Phone: 626-969-7531

Fax: 626-969-4827

Trina Jackson

President

Email: TERRAQUA@EARTHLINK.NET

Business Description: APC equipment manufacturer; Design, build, install and service air and water pollution control equipment.

Tesco International, Inc

1825 S. Grant St., Suite

San Mateo, CA 94402

Phone: 415-572-1683

Nate Uemura

Business Description: APC equipment manufacturer

The Penn Air Group

Website: pennairgroup.com

5941 Lakeshore Drive

Cypress, CA 90630

Phone: 714-220-9091

Fax: 714-220-1390

John Lee

Executive Vice President

Email: johnlee@pennairgroup.com

Business Description: APC equipment manufacturer; Indoor air quality/assessment hvac duct cleaning hvac refurbishment, test & balance engineering (HVAC), building commissioning, energy audits.

Thermatrix Inc.

Website: WWW.THERMATRIX.COM

101 Metro Drive, Suite 248

San Jose, CA 95110

Phone: 408-453-0490

Fax: 408-453-0492

Bill Binder

Sr. Applications Engineer

Email: BILL.BINDER@THERMATRIX.COM

Business Description: APC equipment manufacturer; Flameless thermal oxidizer for treatment of gaseous and liquid wastes. also engineer and manufacture turn-key waste reduction systems.

Thermochem Inc.

5347 Skyline Blvd.

Santa Rosa, CA 94503

Phone: 707-575-7932

Paul Hirtz

Dir.

Business Description: APC equipment manufacturer

Turbodyne Technologies Inc.

Website: WWW.TURBODYNE.COM

21700 Oxnard St., Suite 1550

Woodland Hills, CA 91367

Phone: 800-350-2031

Fax: 818-593-2283

Arjang Zendeheel
Director of Corporate Developm
Email: AZENDEHDEL@TURBODYNE.COM
Business Description: APC equipment manufacturer; Design, development, manufacturing and marketing of pollution control, fuel economy and performance enhancement technology (i.e. electrically powered supercharger system) for internal combustion engines.

Turlock Sheet Metal & Welding

301 S Broadway St
Turlock, CA 95380-5414
Robert Finnegan
Business Description: APC equipment manufacturer

Tylan General

9577 Chesapeake Dr.
San Diego, CA 92123
Phone: 619-571-1222
Business Description: APC equipment manufacturer

Ultrox International

2435 South Anne St
Santa Ana, CA 92704
Phone: 714-545-5557
Jerome T. Barich
Senior VP
Business Description: APC equipment manufacturer

US Turbine Corp

1099 N Cuyamaca St
El Cajon, CA 92020-1881
Business Description: APC equipment manufacturer

USFilter Westates

11711 Reading Road
Red Bluff, CA 96080
Phone: 530-527-2664
Fax: 530-527-0544
Email: cooktm@usfilter.com

Business Description: APC equipment manufacturer (scrubbers)

USFilter/ On Pure

960 Ames Ave.
Milpitas, CA 95035
Peter Gillcrist
Operations Manager
Business Description: APC equipment manufacturer; Industrial water purification equipment and service.

V M Technology Inc

23901 Remme RDG
Lake Forest, CA 92630-1776
Alfonz Viszolay
Business Description: APC equipment manufacturer

Vaisala Handar Business Unit

Website: www.vaisala.com
1288 Reamwood Ave
Sunnyvale, CA 94089
Phone: 408-734-9640
Fax: 408-734-0655
Kathryn Schlichting
Marketing Manager
Email: marketing.handar@vaisala.com
Business Description: APC instrumentation; Vaisala handar business unit manufactures products for hydrological, meterological and environmental monitoring, included are: data collection instruments, communication options (satellite, modem and radio), sensors, and accessories for a wide range of a

Valtronics

Website: WWW.GOLDRUSH.COM/~VTI
3463 Double Springs Rd.
Valley Springs, CA 95252
Phone: 209-754-0707
Fax: 209-754-0104
Don Van Noy
Mktg. & Sales Mgr.
Email: VTI@GOLDRUSH.COM
Business Description: APC instrumentation; Manufacture broad line of CO2 monitors (carbon dioxide), CH4 sensors for oem & resellers to end

users for process control, personnel safety, biotech, hvac, green house, enclosed public garage and wineries.

VIG Industries, Inc.

Website: WWW.VIGINDUSTRIES.COM
15010 Sierra Bonita Lane
Chino, CA 91710
Phone: 909-606-4100
Fax: 909-606-0432
Larry Juniper
Customer Service
Email: LARRY@VIGINDUSTRIES.COM
Business Description: APC equipment manufacturer; Manufactures, sells, services and rents a wide variety of analyzers for environmental testing. we have a wide variety of hydrocarbon analyzers, methane/non-methane (both fid based), and a variety of non-dispersive infrared (ndir) analyzers for measuring

Vividstar Int'L, Inc.

18310 Bedford Cir.
La Puente, CA 91744
Phone: 626-854-2772
Fax: 626-854-2776
Jason Fan
Vice President
Business Description: APC equipment manufacturer; Separator that cleans air

Vortex Company

121 S Indian Hill Blvd
Claremont, CA 91711-4921
Business Description: APC equipment manufacturer

W & P Enterprise, Inc.

P.O. Box 2807
San Anselmo, CA 94979-2807
Phone: 415-453-7256
Fax: 415-461-2186
Yonglie Cui
G.M.
Email: WNPYN@AOL.COM
Business Description: APC instrumentation;
Variety of testing devices and equipment,

focused on constructions, geological survey, environmental survey, and metal detections.

Wahlco Environmental Systems

3600 West Segerstrom Ave
Santa Ana, CA 92704-6495
Phone: 714-979-7300
Fax: 714-979-2309
Anne Anderson
VP Administration
Email: aanderson@wahlco.com
Business Description: APC equipment manufacturer

Wahlco, Inc.

Website: www.wahlco.com
3600 West Segerstrom Ave.
Santa Ana, CA 92704
Phone: 714-979-7300
Fax: 714-979-0603
Barry J. Southam
Sr. V.P. Sales & Marketing
Email: bsoutham@wahlco.com
Business Description: APC equipment manufacturer; Design & manufactures flue gas conditioning and NOx reduction systems for utility and steel industries.

Wems Inc.

465054 W Rosecrans Ave
Hawthorne, CA 90250
Phone: 310-644-0251
Fax: 310-644-5334
Robert Hood
Business Description: APC equipment manufacturer

Wesco-Willard Environmental Sys. Co.

1250 N. Grove St.
Anaheim, CA 92806-2150
Phone: 714-666-2150
Fax: 714-632-8136
APC Equipment Sales Manager
Business Description: APC equipment manufacturer

West General

Website: www.westgeneral.com
1475 Saratoga Avenue, Suite 120
San Jose, CA 95129
Phone: 408-255-8644
Fax: 408-255-8677
Edward Basanese
President
Email: westgeneral@aol.com
Business Description: APC equipment manufacturer; Acoustical materials, chillers, water recycling, mixers, dewatering systems. noise reduction

Westates Carbon Inc.

2130 Leo Ave.
Los Angeles, CA 90040-1635
Phone: 323-722-7500
Fax: 323-722-8207
Allan Sass
President
Business Description: APC equipment manufacturer

Western Environmental Equip., Corp.

P.O. Box 890
Twin Peaks, CA 92391
Phone: 909-337-2238
Fax: 909-337-2897
Mike Keeney
President
Email: westenve@aol.com
Business Description: APC equipment manufacturer; Design, engineer, install and service flue gas treatment equipment.

Westmark Sales, Inc.

2330 Westwood Blvd. #100
Los Angeles, CA 90064
Phone: 310-474-8211
Fax: 310-470-1277
Joe McCluskey
President
Email: westmksls@aol.com
Business Description: APC instrumentation; Sell instrumentation to environmental field

Whessoe Varec

10800 Valley View Street
Cypress, CA 90630
Phone: 714-761-1300
Fax: 714-952-2701
Jim Groman
Marketing Manager
Business Description: APC equipment manufacturer

White Horse Technologies

Website: WHTINC.AOL.COM
3211 Shannon St.
Santa Ana, CA 92704
Phone: 714-438-9270
Fax: 714-438-9275
Amir Sardari
President & CEO
Business Description: APC equipment manufacturer; Combustion technologies, waste-to-energy systems and monitoring, pollution control technologies

White Horse Technologies Inc.

3211 Shannon Street
Santa Ana, CA 92704
Phone: 714-438-9270
Fax: 714-438-9275
Paul Bay
VP
Business Description: APC equipment manufacturer

Worldwide Environmental Products Inc.

Website: wep-inc.com
430 South Cataract
San Dimas, CA 91773
Phone: 909-559-6431
Fax: 909-599-8253
William Delaney
President
Email: bdelaney@wep-inc.com
Business Description: APC instrumentation; Vehicle emission test equipment

Xontech, Inc.

Website: www.xontech.com
7027 Hayvenhurst Ave.
Van Nuys, CA 91406
Phone: 818-947-3280
Fax: 818-787-8132
Matt Yoong
Manager, Esg
Email: matt_yoong@xontech.com
Business Description: APC instrumentation;
Volatile organic samplers for usepa method to-
14/to-15; carbonyl samplers for usepa method to-
11; automated organic vapor concentrator;
cryogenic refocusing trap; 'summa'
electropolished canisters; canister cleaning
system.

Zap Power Systems

Website: WWW.ZAPBIKES.COM
117 Morris St.
Sebastopol, CA 95472
Phone: 707-824-4150
Fax: 707-824-4159
Gary Starr
Managing Director
Email: ZAP@ZAPBIKES.COM
Business Description: APC equipment
manufacturer; ZAP designs and manufactures
low-power electric vehicles including bicycles,
scooters and mopeds.

Zwick Energy Research

5471 Argosy Drive
Huntington Beach, CA 92649
Phone: 714-891-1640
Business Description: APC equipment
manufacturer

Non-Traditional Sources

A.J. Daw Printing Ink Co.

Website: www.dawink.com
25655 Nickel Place
Hayward, CA 94545
Phone: 510-887-8357
Fax: 510-887-8373
Business Description: Paint & coating

Air Products and Chemicals, Inc.

Website: www.airproducts.com
555 1st Street, Suite 320
Benicia, CA 94510-3280
Phone: 707-748-7595
Fax: 707-748-7585
Business Description: Supplies merchant
hydrogen

Air Products and Chemicals, Inc.

Website: www.airproducts.com
1969 Palomar Oaks Way
Carlsbad, CA 92009-1307
Phone: 760-931-9555
Business Description: Supplies merchant
hydrogen

Air Products and Chemicals, Inc.

Website: www.airproducts.com
23300 S Alameda St
Carson, CA 90810-1921
Phone: 310-847-7300
Business Description: Supplies merchant
hydrogen

Air Products and Chemicals, Inc.

Website: www.airproducts.com
7567 Amador Valley Blvd, Suite 305
Dublin, CA
Business Description: Supplies merchant
hydrogen

Air Products and Chemicals, Inc.

Website: www.airproducts.com
2021 E Rosecrans Ave
El Segundo, CA 90245-4781
Phone: 310-643-8691
Business Description: Supplies merchant hydrogen

Air Products and Chemicals, Inc.

Website: www.airproducts.com
17330 Brookhurst St Ste 260
Fountain Valley, CA 92708-3720
Phone: 714-968-5133
Business Description: Supplies merchant hydrogen

Akzo Nobel Coatings Inc.

Website: www.akzonobel.com
434 West Meats Avenue
Orange, CA 92865
Phone: 714-637-1750
Fax: 714-637-5174
Business Description: Paint & coating (Industrial Finishes)

**Akzo Nobel Coatings Inc.
(International Paint Inc.)**

Website: www.akzonobel.com
Ste. A, 7077 Consolidated Way
San Diego, CA 92121
Phone: 858-547-8810
Fax: 858-547-1885
Business Description: Paint & coating (Marine & Protective Coatings)

Altawood, Inc.

Website: www.altawood.com
420 South Eleventh Avenue
P.O. Box 1150
Upland, CA 91785-1150
Phone: 909-931-1531
Fax: 909-931-1536
Business Description: Paint & coating

Alternative Materials Technology, Inc.

Website: www.polysolutions.com
311 Otterson Drive
Suite 60
Chico, CA 95928
Phone: 530-894-3585
Fax: 530-896-0657
Business Description: Paint & coating

Ameron International Corporation

Website: www.ameroncoatings.com
201 North Berry Street, POB 1020
Brea, CA 92822-1020
Phone: 800-926-3766
Fax: 714-990-0437
Business Description: Paint & coating
(Performance Coatings & Finishes)

**BASF Corporation (NAFTA II Region,
Colton Facility)**

Website: www.basf.com
1231 S. Lincoln Street
Colton, CA 92324
Phone: 909-825-6292
Fax: 909-824-7822
Business Description: Paint & coating

Baytech Corporation

Website: www.baytechcorp.com
P.O. Box 1148
Los Altos, CA 94023
Phone: 650-949-1976
Fax: 650-949-1970
Email: sales@baytechcorp.com
Business Description: Natural gas

Behr Paint Corp. (Sub. of Masco Corporation)

Website: www.behrpaint.com
3400 W. Segerstrom Avenue
Santa Ana, CA 92704
Phone: 714-545-7101
Fax: 714-556-9989
Business Description: Paint & coating

Benjamin Moore & Co.

Website: www.benjaminmoore.com
3325 South Garfield Ave.
Los Angeles, CA 90040-3169
Phone: 323-722-3484
Fax: 323-722-4314
Business Description: Paint & coating

Calpine Corporation

Website: www.calpine.com
50 West San Fernando Street
San Jose, CA 95113
Phone: 408-995-5115
Fax: 408-995-0505
Email: Public-Relations@calpine.com
Business Description: Geothermal energy

ChevronTexaco Corporation

Website: www.chevrontexaco.com
6001 Bollinger Canyon Rd.
San Ramon, CA 94583
Phone: 925-842-1000
Email: comment@chevrontexaco.com
Business Description: Natural gas

Clean Energy (ENRG)

Website: www.cleanenergyfuels.com
3020 Old Ranch Parkway, Suite 200
Seal Beach, CA 90740
Phone: 562-493-2804
Fax: 562-493-4532
Email: brussell@cleanenergyfuels.com
Business Description: Natural gas (vehicular natural gas; CNG and LNG)

Clean Fuel Connection

Website: www.cleanfuelconnection.com
127 La Porte Avenue Unit M
Arcadia, CA 91006
Phone: 626-445-1445
Business Description: Electric cars (Provides charging infrastructure for electric cars)

Colmac Energy, Inc.

62-300 Gene Welmas Drive
Mecca, CA 92254
Phone: 805-386-4343
Business Description: Biomass energy (Urban wood waste and agricultural residue fuels)

Deft, Inc.

Website: www.deftfinishes.com
17451 Von Karman Avenue
Irvine, CA 92614
Phone: 949-474-0400
Fax: 949-474-7269
Business Description: Paint & coating

Delano Energy Company

Website: www.thermo.com
PO Box 1461
31500 Pond Road
Delano, CA 93215
Phone: 805-792-3067
Email: jjensen@thermoecotek.com
Business Description: Biomass energy (Wood wastes, primarily from agricultural sources)

Diamond Walnut Growers, Inc.

1050 So. Diamond Street
Stockton, CA 95201
Phone: 209-467-6296
Business Description: Biomass energy (Walnut shells)

Ellis Paint Company

3150 E. Pico Blvd.
Los Angeles, CA 90023
Phone: 323-261-8114
Fax: 323-261-5491
Business Description: Paint & coating

Fairhaven Power Company

97 Bay Street
Samoa, CA 95564
Business Description: Biomass energy

Fairhaven Power Company

PO Box 280
Eureka, CA 95502
Phone: 707-445-5434
Fax: 707-445-2551
Business Description: Biomass energy (Sawmill wood waste)

Frazee Industries, Inc.

Website: www.professionalpaintinc.com
6625 Miramar Road
San Diego, CA 92121
Phone: 858-626-3600
Fax: 858-626-3650
Business Description: Paint & coating

Gas Technology Institute

Website: www.gastechnology.org
Phone: 415-314-7690
Email: stephen.neal@gastechnology.org
Business Description: Natural gas

GeothermEx, Inc.

Website: www.geothermex.com
5221 Central Ave., Suite 201
Richmond, CA 94804-5829
Phone: 510-527-9876
Fax: 510-527-8164
Email: mw@geothermex.com
Business Description: Geothermal energy consulting; geological and geophysical exploration projects and shallow and deep drilling projects.

Golden Cheese Company of California

Website: ourworld.compuserve.com/homepages/gccc
1138 W. Rincon Street
Corona, CA 92880
Phone: 909-493-4700
Business Description: Ethanol production (Cheese whey)

Harlan Associates, Inc.

Website: www.paintresearchlaboratory.co
Eleven Duboce Avenue
San Francisco, CA 94103
Phone: 415-621-7245
Fax: 415-621-7622
Business Description: Paint & coating

HL Power Company/Operational Energy Corp.

PO Drawer Z
Susanville, CA 96130
Phone: 530-254-6161
Fax: 530-254-6130
Email: hlpower@thegrid.net
Business Description: Biomass energy (Wood Waste Cogeneration Facility)

Honover Compressor Company

3243 Industrial Drive
Yuba City, CA 95991
Phone: 530-751-2997
Fax: 530-751-2953
Business Description: Natural Gas

ICI Paints North America

Website: www.icipaints.com
6100 S. Garfield Avenue
Los Angeles, CA 90040
Phone: 323-888-8888
Fax: 323-888-6842
Business Description: Paint & coating

ICI Paints North America

Website: www.icipaints.com
450 E. Grand Avenue
S. San Francisco, CA 94080
Phone: 650-871-5328
Fax: 650-869-4604
Business Description: Paint & coating

Jackson Valley Energy Partners L.P.

4655 Coal Mine Road
Ione, CA 95640
Phone: 209-274-2411
Fax: 209-274-2846
Business Description: Biomass energy

L.M. Scofield Company

Website: www.scofield.com
6533 Bandini Boulevard
Los Angeles, CA 90040
Phone: 323-720-3000
Fax: 323-720-3030
Business Description: Paint & coating

Mirotone (USA-Inc.)

Website: www.mirotone.com
7710 Balboa Avenue
Suite 227D
San Diego, CA 92111
Phone: 858-502-9829
Fax: 858-502-9831
Business Description: Paint & coating

Modesto Energy

4549 Ingram Creek Road
PO Box 302
Westley, CA 95387-0302
Phone: 510-244-1100
Business Description: Biomass energy; Waste
tire electric generation facility

**North American Power Group, Ltd.
(Runs 4 facilities in California)**

, CA
Phone: 303-773-0461
Business Description: Biomass energy
(Wholesale power marketer)

Parallel Products (U.S. Liquids)

12281 Arrow Route
Rancho Cucamonga, CA 91739
Phone: 909-980-1200
Fax: 909-944-0844

Business Description: Ethanol production
(Beverage waste)

PG&E Corporation

Website: www.pge.com
One Market Spear Tower, Suite 2400
San Francisco, CA 94105
Phone: 415-973-7000
Fax: 415-267-7265
Business Description: Natural gas

Polymer Solutions, Inc.

Website: www.polysolutions.com
312 Otterson Drive
Suite H
Chico, CA 95928
Phone: 530-894-3585
Fax: 530-894-0109
Business Description: Paint & coating

PPG Aerospace

Website: www.ppg.com
5430 San Fernando Road
P.O. Box 1800
Glendale, CA 91209
Phone: 818-240-2060
Business Description: Paint & coating

PureEnergy

30346 Esperanza, Suite B
Rancho Santa Margarita, CA 92688
Phone: 949-888-8560
Fax: 949-888-8562
Business Description: Ethanol production

R.J. McGlennon Co.

Website: www.maclac.com
198 Utah Street
San Francisco, CA 94103
Phone: 415-552-0311
Fax: 415-552-8055
Business Description: Paint & coating

Samuel Cabot, Inc.

Website: www.cabotstain.com
33360 Central Avenue
Union City, CA 94587
Phone: 510-477-8900
Fax: 510-477-9615
Business Description: Paint & coating

San Diego Gas & Electric

Website: www.sdge.com
P.O. Box 129831
San Diego, CA 92112-9831
Phone: 619-696-2000
Business Description: Natural gas

Sierra Pacific Industries

Website: www.sierrapacificinv.com
PO Box 496028
Redding, CA 96049
Phone: 530-378-8179
Fax: 530-378-8109
Email: sierra@c-zone.net
Business Description: Biomass energy (lumber)

Sierra Power Corp.

9000 Road 234
Terra Bella, CA 93270
Phone: 209-535-4893
Fax: 209-535-4515
Business Description: Biomass energy (Wood waste from lumber manufacturers/ pallet manufactures/ agricultural orchardists; currently idle)

Simpson Coatings Group, Inc.

111 S. Maple Ave., P.O. Box 2265
South San Francisco, CA 94080
Phone: 800-877-5997
Fax: 650-873-7441
Business Description: Paint & coating

Southern California Gas Company

Website: www.socalgas.com
P.O. Box 3150
San Dimas, CA 91773
Phone: 800-427-2200
Business Description: Natural gas

Southern California Gas Company

Website: www.socalgas.com
P.O. Box 3150
San Dimas, CA 91773
Phone: 800-427-2200
Business Description: Natural gas

Textured Coatings of America, Inc.

Website: www.texcote.com
5950 S. Avalon Blvd.
Los Angeles, CA 90003-1384
Phone: 323-233-3111
Fax: 323-232-1071
Business Description: Paint & coating

The Henry Co.

Website: www.henry.com
2911 Slauson Ave.
Huntington Park, CA 90255
Phone: 213-583-5000
Fax: 213-582-6429
Business Description: Paint & coating

The Sherwin-Williams Company

Website: www.sherwin-williams.com
1450 Sherwin Avenue
Emeryville, CA 94608
Phone: 510-420-7200
Fax: 510-654-7997
Business Description: Paint & coating

The Sherwin-Williams Company

Website: www.sherwin-williams.com
5526 Ontario Mills Parkway
Ontario, CA 91764-5117
Phone: 909-476-0248
Fax: 909-476-0258
Business Description: Paint & coating

The Sherwin-Williams Company

Website: www.sherwin-williams.com
12401 Industrial Boulevard
Victorville, CA 92392
Business Description: Paint & coating

Thermo Ecotek Corporation

Website: www.thermo.com
735 Sunrise Avenue, Suite 160
Roseville, CA 95661
Phone: 916-773-2940
Business Description: Biomass energy

Tnemec Company, Inc.

Website: www.tnemec.com
417 East Weber Street
Compton, CA 90222-1424
Phone: 310-639-9810
Fax: 310-635-7331
Business Description: Paint & coating

Tnemec Company, Inc.

Website: www.tnemec.com
6420 Goodyear Road
Benicia, CA 94510
Phone: 707-748-7592
Fax: 707-748-7596
Business Description: Paint & coating

U.S. Cellulose Co.

Website: www.polysolutions.com
311 Otterson Drive
Suite 60
Chico, CA 95928
Phone: 530-894-3585
Fax: 530-896-0657
Business Description: Paint & coating

Valspar Industries (USA), Inc.

Website: www.valspar.com
31500 Hayman Street
Hayward, CA 94544
Phone: 510-471-7171
Fax: 510-487-3674
Business Description: Paint & coating

Valspar Industries (USA), Inc.

Website: www.valspar.com
901 East Union Street
Montebello, CA 90640
Phone: 323-722-7511
Fax: 323-725-8746
Business Description: Paint & coating

Valspar Industries (USA), Inc.

Website: www.valspar.com
210 East Alondra Boulevard
Gardena, CA 90248
Phone: 310-352-3087
Fax: 310-327-3041
Business Description: Paint & coating

Valspar--EPS (Engineered Polymer Systems)

Website: www.valspar.com
5501 E. Slauson Avenue
Los Angeles, CA 90040
Phone: 323-726-7272
Fax: 323-724-5179
Business Description: Paint & coating

Wadham Energy

6247 Myers Road
Williams, CA 95987
Phone: 510-244-1100
Fax: Ed Tomeo
Business Description: Biomass energy (Rice hulls)

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Appendix

Compendium of Reviewers Comments

South Coast Air Quality Management District (SCAQMD)

1. Where the survey results are presented, a description of the survey methodology should be provided, how many surveys were sent out; what was the response rate, etc.

[The first three pages of section 1 entitled Study Mission & Methodology provide a more detailed description of the survey process.]

2. Where estimates of the economic impact of specific regulations are provided as point estimates. It would be more appropriate to provide range estimates. Also, there should be a discussion of how these percentages were estimated.

[These estimates are now presented as broad ranges and brief descriptions of the estimates are added.]

3. The report should acknowledge that the air quality regulations in other states may also benefit the California APC industry.

[Interviews with APC executives, trade association representatives and California-based regulators indeed indicate that California APC are active in other states and therefore benefit from those programs. However lacking an exhaustive analysis of other state APC programs, we have elected not to devote a section of the report to other states role in driving revenues and employment of the California APC industry. However, in sections describing the national APC market, mentions of other state or regional programs have been emphasized.]

4. It is unclear how the database was established, modified, or supplemented from year to year. More companies added to the survey? Changes in the percentage impacts of regulations? Or anything else?

[The third and fourth pages of section 1 entitled Study Mission & Methodology provide a more detailed description of the estimation process for this report and EBI's annual APC company survey program which helped make estimates for previous years.]

5. To put their numbers into reality check and increase their credibility, I would suggest that they compare their numbers with the numbers in the Pollution Abatement Costs and Expenditures (an annual publication until the early 1990s).

[The PACE data from U.S. Department of Commerce is referenced in three or four places in the report.]

BP Solar

I would add that the tremendous growth in the California solar market is due to important government initiatives. State electricity deregulation and concern for environmental impacts, at least in part, led to the establishment of the State's incentive programs to deploy solar on homes, commercial roof tops and other structures. As a result of these programs administered by the CEC, PUC and municipal utilities, the solar market in California is growing fast, helping grow power production, offsetting emissions from power production and generating over 4000 California jobs in the manufacture, design, marketing, sale and installation of photovoltaic systems (according to the California Solar Energy Industries Association). As the global market for solar continues to grow rapidly, California is poised to accrue additional economic, environmental, and jobs benefits as an early leader in promoting solar and renewable energy.

[The report includes some discussion of the 'Clean Energy' segment and acknowledges both the role of the California government and companies in making it a vibrant part of the economy. However, as not part of the 'core' APC industry, it is not covered in as much detail as segments more directly impacted by air quality regulations.]

California Air Resources Board (ARB)

1. Certain material in Chapter 2 is repeated in Chapter 3. It should be removed.

[Redundant material has been removed from section 3.]

2. The definition of "Clean Air Products Industry" in Chapter 3 should be expanded to include "The Non-Traditional APC Industry."

[The definition has been modified to include the broader definition.]

3. In Chapter 3 under "Current Trends in Mobile Emission Control Equipment," you provide a discussion of a diesel retrofit initiative for mobile sources. Similar discussion should also be provided for stationary equipment under "Current Trends in Stationary Source Equipment."

[Similar discussion has been added for stationary equipment.]

4. In Chapter 3 under "The Non-Traditional APC Industry," some text should be added to provide a description of the results provided in the tables.

[Description has been added for the Non-Traditional APC Industry.]

5. The impact of APC industry on California's economy in Chapter 4 should be expanded to include a section on future trends for the industry.

[A future trends section has been added.]

California Department of Trade & Commerce

In a 1999 report by EBI, you estimated California export of APC was \$395 million in 1999, accounting for 15.1% of total US exports of APC industry. The contribution of the sector may even be higher because some consulting and engineering services and analytical services should be added to the sector. Please highlight the importance of APC industry exports.

[New statistics on exports of the California APC industry and the broader California environmental industry have been added to section 4.]

California State University, Fullerton

1. The report is well organized and clearly presented.

[No comment.]

2. The title is misleading. Unless I missed something major (and I looked several times), they report the size of the APC industry, not its impact on California's economy. Estimating economic impact would require using some means to model the multiplier effects on industries that are not defined as part of the APC group, and on the economy more broadly. So the results presented in the report do not capture the impact of higher spending in the state economy, of purchases of parts or services from non-APC firms that supply APC firms, etc. As an economist, size vs. impact is a critical distinction and the report should be clear that this is a first effort to pull together information on the size of the industry, not an effort to model the economic impact of it overall. As an effort to provide a lot of information systematically, however, the report is very valuable.

[The title has been changed from 'economic impact' to 'economic contribution' of the APC industry. The authors and sponsors of this report look forward to any work performed on secondary or tangential impacts based on the revenue generation of the companies and segments outlined in this report.]

3. It should be noted that a number of non-traditional control technologies are not included here. I am thinking, for example, of wet dry-cleaning. A paragraph should be added somewhere indicating that

there are other industries that contribute to air pollution reduction, and whose growth depends in part on air quality regulations, but that are also driven by other factors such as worker safety and the Montreal Protocol.

[In crafting the consensus definition of the APC industry, as broad as possible parameters were used to be as inclusive as possible without opening the inclusive definition to suspicions of exaggeration of the size and influence of the APC industry. At the end of section 1 is a list of ‘non-traditional’ sources and segments derived predominantly from ARB’s posted list. However, we acknowledge that not every source may be included.]

4. It would be useful if they explain how large this industry is relative to some other well-known industries in the state. How big is 1/200 of the state's economy relative to, say refining, or metal-plating, or agriculture? This would give some perspective that would help the uninitiated figure out whether this really matters or is too small to worry about.

[Some comparisons for context have been added to section 4 and to the executive summary.]

California Environmental Business Council

The analysis of the size and contribution of the California APC industry is very interesting and useful for making economic arguments concerning the industry. However, we are familiar with statistics that EBI has previously published in state and federal publications which include figures on the California environmental industry. Please provide some more recent estimates of the California environmental industry and how this new analysis of the California APC industry relates to the entire California environmental industry.

[New statistics on the California environmental industry with comparisons to the APC industry have been added to section 4.]

Survey Forms

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ENVIRONMENTAL BUSINESS JOURNAL

Strategic Information for a Changing Industry

2002 Survey of Air Pollution Control Equipment Manufacturers in California

You can complete the survey online!
Visit www.ebiusa.com

Dear Air Pollution Control Executive:

Environmental Business Journal (EBJ), in cooperation with *California Air Resource Board* (CARB), is researching the Air Pollution Control (APC) industry in California. We would like to include your firm in our study and would appreciate your help in completing the survey. Using information from the surveys, we intend to publish an analysis of the APC industry in a CARB publication.

We recognize that some of the information we are asking for might be considered “sensitive,” so it should be understood that only your company’s revenue from air pollution control activities will be listed in our rankings. All other data (including margins, employees and revenue distributions) will be used strictly for analytical purposes and will remain **strictly confidential**.

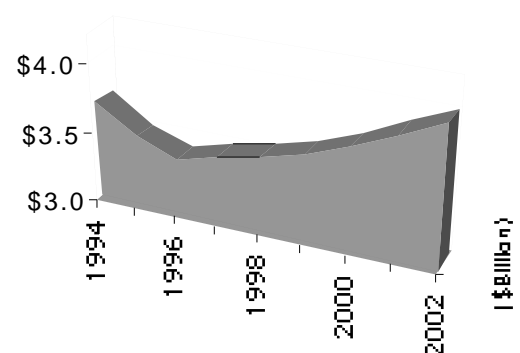
RETURNING THE SURVEY:

Surveys can be returned by fax to **(619) 295-5743**. You can also fill out this survey online at www.ebiusa.com.

THANK YOU!

Please don’t hesitate to call Mariko Killion toll-free at **(619)295-7685 ext. 27** or send e-mail to mkill@ebiusa.com if you have any questions or comments. We thank you in advance for your time and effort, and look forward to sharing the results of our survey with you.

**Air Pollution Control Equipment
Market Size (Stationary Source)**



Environmental Business Journal's 2002 Air Pollution Control Industry Survey

COMPANY INFORMATION

Company Name _____ ☐ Public ☐ Private
 Your Name _____
 Your Title _____
 Address _____
 Phone _____ Fax _____
 E-mail Address _____
 HQ President/CEO _____
 HQ Address _____
 HQ Phone _____ HQ fax _____
 Subsidiary of: _____
 Web Site _____

FINANCIAL INFORMATION (in \$ millions)

	2000	2001	2002 (est.)
Total Gross Revenue (all operations)	\$ _____	\$ _____	\$ _____
Air Pollution Control Equipment Revenue	\$ _____	\$ _____	\$ _____
Backlog of Air Pollution Control Equipment Orders	\$ _____	\$ _____	\$ _____
APC Employees	_____	_____	_____
Non-US Revenues (Exports)	\$ _____	\$ _____	\$ _____
Pre-bonus, pre-tax profit (loss) on APC revenue (check one range for each year)	<input type="checkbox"/> <0% <input type="checkbox"/> 0-2% <input type="checkbox"/> 2-4% <input type="checkbox"/> 4-6% <input type="checkbox"/> 6-8% <input type="checkbox"/> 8-10% <input type="checkbox"/> >10%	<input type="checkbox"/> <0% <input type="checkbox"/> 0-2% <input type="checkbox"/> 2-4% <input type="checkbox"/> 4-6% <input type="checkbox"/> 6-8% <input type="checkbox"/> 8-10% <input type="checkbox"/> >10%	<input type="checkbox"/> <0% <input type="checkbox"/> 0-2% <input type="checkbox"/> 2-4% <input type="checkbox"/> 4-6% <input type="checkbox"/> 6-8% <input type="checkbox"/> 8-10% <input type="checkbox"/> >10%

Please estimate the percentage of 2000 gross NON-US APC equipment revenues within each of the following regions (total=100%):

Canada _____ % Mexico _____ % Latin America _____ % Western Europe _____ % Eastern Europe _____ %
 Japan _____ % Rest of Asia _____ % Australia/NZ _____ % Middle East _____ % Africa _____ %

Of your total Air Pollution Control (APC) revenues, what percent is from the following categories?

Also, please rate the growth potential for each category over the next 3 years – High, Medium or Low (H, M or L)

EQUIPMENT/SERVICE TYPE	Percent of '01 APC Revenue	Growth H M L	MARKET (Client Industries)	Percent of '01 APC Revenue	Growth H M L
FGD/Scrubbers	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Electric Utilities	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Electrostatic Precipitators	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Pulp & Paper Manufacturing	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Fabric Filters/Baghouse Equipment	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Independent Power Producers	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Oxidation Systems	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Incinerators & Waste-to-Energy	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
NOx Control Systems	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Chemical, Pharm. & Plastics	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Carbon Adsorption	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Petroleum Refining	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Delivery Systems (pumps, nozzles, etc.)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Mining	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Consulting & Design/Engineering	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Paint & Coatings/Metal Finishing	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Monitoring Equipment (CEMs etc.)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Stone, Clay, Glass & Cement	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Materials & Supplies	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Primary Metals (Steel, Copper, etc.)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Other (_____)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Landfills	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Total APC Equipment Revenue	100%		Textiles & Leather	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Food Processing	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Wastewater Treatment Plants	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Printing & Publishing	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Electronics & Computers	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Machinery Manufacturing	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Energy Exploration (Coal, Oil & Gas)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Remediation & Env. Cons. Firms	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Other (_____)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Total APC Equipment Revenue	100%	
			New Sources	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Retrofitting Existing Sources	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
			Total APC Equipment Revenue	100%	

APPLICATION

	Percent of '01 APC Revenue	Growth H M L
Particulates	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Sulfur Oxides (SOx)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Volatile Organic Compounds (VOCs)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Air Toxics/HAPs (Hazardous Air Pollutants)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Nitrous Oxides (NOx) & Carbon Monoxide	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Other (_____)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Total APC Equipment Revenue	100%	
Control of Air Emissions (End-of-Line)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Prevention of Air Emissions (in Process)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Total APC Equipment Revenue	100%	

Please rate each of the following in terms of their impact on driving sales of your company's APC equipment

(Scale: 1=No Impact, 2= Small Impact, 3=Moderate Impact, 4= Strong Impact, 5=Very Strong Impact on Sales)

Factor	1	2	3	4	5	Factor	1	2	3	4	5
Clean Air Act Title I - Ambient Air Quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Special Programs (e.g. ReClaim, etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean Air Act Title III - Air Toxics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Emission Trading Programs (SO2 and other credits)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean Air Act Title IV - Acid Rain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Level of Enforcement Activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean Air Act Title V - Operating Permits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Economic Conditions in Customers' Industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean Air Act: Other Provisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Public Pressure/Corporate Environmentalism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MACT Standards for Industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TRI Listings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Risk Management Plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Tax Credits, Grants and other Financial Incentives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
State Air Quality Standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	R&D Expenditures and Programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local/Regional Standards in California Air Districts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Others (_____)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PLEASE RETURN COMPLETED SURVEY TO EBI BY FAX AT (619) 295-5743

ENVIRONMENTAL BUSINESS JOURNAL

Strategic Information for a Changing Industry

2002 Survey of Top Air Pollution Control Equipment Manufacturers

**** Time sensitive, please respond by February 22 ****

**You can complete the survey online!
Visit www.ebiusa.com**

Dear Air Pollution Control Executive:

Environmental Business Journal (EBJ) is researching the Air Pollution Control (APC) industry for 2001 Air Quality Markets issue of EBJ. We would like to include your firm in our study and would appreciate your help in completing the survey.

Using information from the surveys, we intend to publish an analysis of the APC in the upcoming EBJ. This issue will include a ranking of leading air pollution control companies.

We recognize that some of the information we are asking for might be considered "sensitive," so it should be understood that only your company's revenue from air pollution control activities will be listed in our rankings. All other data (including margins, employees and revenue distributions) will be used strictly for analytical purposes and will remain **strictly confidential**.

WHAT'S IN IT FOR YOU?

All respondents will receive a **FREE** copy of the APC issue of *EBJ*, as well as a FREE summary of the results – including the list of the top APC manufacturers and compiled total market breakdowns. If you aren't already familiar with *EBJ*, please visit EBI's website at www.ebiusa.com to request a **FREE SAMPLE** issue.

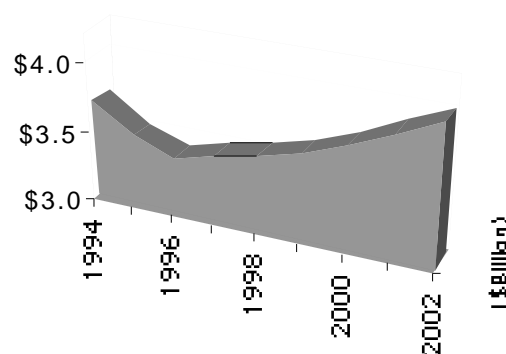
RETURNING THE SURVEY:

Please return your completed survey by the deadline of **Friday, February 22, 2002** to be sure that your firm is included in our list and that you receive our summary of results. Surveys can be returned by fax to **(619) 295-5743**. You can also fill out this survey online at www.ebiusa.com.

THANK YOU!

Please don't hesitate to call Mariko Killion toll-free at **(619)295-7685 ext. 27** or send e-mail to mkill@ebiusa.com if you have any questions or comments. We thank you in advance for your time and effort, and look forward to sharing the results of our survey with you.

**Air Pollution Control Equipment
Market Size (Stationary Source)**



Environmental Business Journal's 2002 Air Pollution Control Industry Survey

COMPANY INFORMATION

Company Name _____ ☐ Public ☐ Private
 Your Name _____
 Your Title _____
 Address _____
 Phone _____ Fax _____
 E-mail Address _____
 HQ President/CEO _____
 HQ Address _____
 HQ Phone _____ HQ fax _____
 Subsidiary of: _____
 Web Site _____

FINANCIAL INFORMATION (in \$ millions)

	2000	2001	2002 (est.)
Total Gross Revenue (all operations)	\$ _____	\$ _____	\$ _____
Air Pollution Control Equipment Revenue	\$ _____	\$ _____	\$ _____
Backlog of Air Pollution Control Equipment Orders	\$ _____	\$ _____	\$ _____
APC Employees	_____	_____	_____
Non-US Revenues (Exports)	\$ _____	\$ _____	\$ _____
Pre-bonus, pre-tax profit (loss) on APC revenue (check one range for each year)	<input type="checkbox"/> <0% <input type="checkbox"/> 0-2% <input type="checkbox"/> 2-4% <input type="checkbox"/> 4-6% <input type="checkbox"/> 6-8% <input type="checkbox"/> 8-10% <input type="checkbox"/> >10%	<input type="checkbox"/> <0% <input type="checkbox"/> 0-2% <input type="checkbox"/> 2-4% <input type="checkbox"/> 4-6% <input type="checkbox"/> 6-8% <input type="checkbox"/> 8-10% <input type="checkbox"/> >10%	<input type="checkbox"/> <0% <input type="checkbox"/> 0-2% <input type="checkbox"/> 2-4% <input type="checkbox"/> 4-6% <input type="checkbox"/> 6-8% <input type="checkbox"/> 8-10% <input type="checkbox"/> >10%

Please estimate the percentage of 2000 gross NON-US APC equipment revenues within each of the following regions (total=100%):

Canada _____ % Mexico _____ % Latin America _____ % Western Europe _____ % Eastern Europe _____ %
 Japan _____ % Rest of Asia _____ % Australia/NZ _____ % Middle East _____ % Africa _____ %

Of your total Air Pollution Control (APC) revenues, what percent is from the following categories?

Also, please rate the growth potential for each category over the next 3 years – High, Medium or Low (H, M or L)

EQUIPMENT/SERVICE TYPE	Percent of '01 APC Revenue	Growth H M L
FGD/Scrubbers	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Electrostatic Precipitators	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Fabric Filters/Baghouse Equipment	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Oxidation Systems	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
NOx Control Systems	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Carbon Adsorption	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Delivery Systems (pumps, nozzles, etc.)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Consulting & Design/Engineering	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Monitoring Equipment (CEMs etc.)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Materials & Supplies	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Other (_____)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Total APC Equipment Revenue	100%	

APPLICATION	Percent of '01 APC Revenue	Growth H M L
Particulates	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Sulfur Oxides (SOx)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Volatile Organic Compounds (VOCs)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Air Toxics/HAPs (Hazardous Air Pollutants)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Nitrous Oxides (NOx) & Carbon Monoxide	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Other (_____)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Total APC Equipment Revenue	100%	
Control of Air Emissions (End-of-Line)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Prevention of Air Emissions (in Process)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Total APC Equipment Revenue	100%	

MARKET (Client Industries)	Percent of '01 APC Revenue	Growth H M L
Electric Utilities	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Pulp & Paper Manufacturing	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Independent Power Producers	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Incinerators & Waste-to-Energy	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Chemical, Pharm. & Plastics	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Petroleum Refining	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Mining	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Paint & Coatings/Metal Finishing	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Stone, Clay, Glass & Cement	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Primary Metals (Steel, Copper, etc.)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Landfills	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Textiles & Leather	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Food Processing	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Wastewater Treatment Plants	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Printing & Publishing	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Electronics & Computers	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Machinery Manufacturing	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Energy Exploration (Coal, Oil & Gas)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Remediation & Env. Cons. Firms	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Other (_____)	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Total APC Equipment Revenue	100%	
New Sources	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Retrofitting Existing Sources	_____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Total APC Equipment Revenue	100%	

Please rate each of the following in terms of their impact on driving sales of your company's APC equipment

(Scale: 1=No Impact, 2= Small Impact, 3=Moderate Impact, 4= Strong Impact, 5=Very Strong Impact on Sales)

Factor	1	2	3	4	5	Factor	1	2	3	4	5
Clean Air Act Title I - Ambient Air Quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Local Air Quality Standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean Air Act Title III - Air Toxics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Level of Enforcement Activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean Air Act Title IV - Acid Rain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Economic Conditions in Customers' Industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean Air Act Title V - Operating Permits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pub. Pressure/Corporate Environmentalism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New MACT Standards for Industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TRI Listings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Risk Management Plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other (_____)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PLEASE RETURN COMPLETED SURVEY BY FEBRUARY 22 TO EBI BY FAX AT (619) 295-5743

ENVIRONMENTAL BUSINESS JOURNAL

Strategic Information for a Changing Industry

2002 Survey of Top Environmental Consulting & Engineering Firms

**** Time sensitive, please respond by May 24 ****

**You can also complete the survey online!
Visit www.ebiusa.com**

Dear C&E Firm Executive:

EBJ is researching the environmental consulting & engineering (C&E) business for our annual *Environmental Industry Overview* and EBJ's ninth annual listing of top C&E firms. We would like to include your firm in our study and would appreciate your help in completing the attached survey.

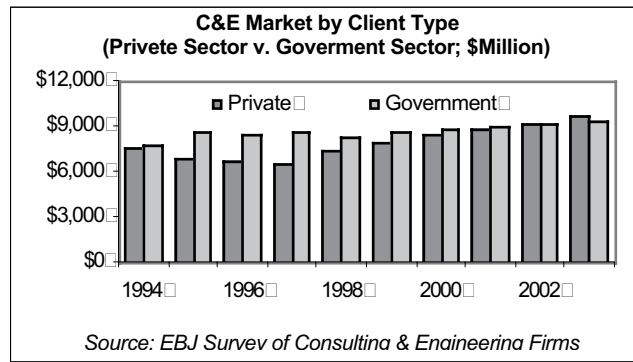
Based on the information collected, we will publish a ranking of top firms according to 2001 gross environmental C&E revenue in the C&E issue of EBJ. Detailed revenue breakdowns on individual companies will not be published without permission, but will be used to analyze the total market and to draw general conclusions about trends in the environmental C&E business.

To ensure that our list is accurate and complete, we need your response to this questionnaire! Approximations are acceptable, but we may ask how numbers were derived or use other sources to estimate or confirm figures.

Please be aware of the difference between C&E and environmental construction revenues. C&E firms rely primarily on "front end" consulting work while engineering/construction firms are more involved in actual construction. You will notice that the questionnaire asks you to report "front end" consulting and "back end" construction revenues (such as remediation construction, construction of wastewater facilities, landfills, etc.) separately.

What's In It For You?

All respondents will receive a **FREE** summary of the results – including the list of the top environmental consulting & engineering firms and compiled total market breakdowns, as well as a **FREE** copy of the C&E issue of EBJ. If you aren't already familiar with EBJ, then call the number below or visit EBI's website at www.ebiusa.com to request a **FREE SAMPLE** issue.



Returning The Survey:

Please return your completed survey by the deadline of **Friday, May 24, 2002** to be sure that your firm is included in our list and that you receive our summary of results. Surveys can be returned by fax to **(619) 295-5743**. You can also fill out this survey online at www.ebiusa.com.

Please call Mariko Killion at **(619) 295-7685 ext. 27** or send e-mail to mkill@ebiusa.com with any questions, comments or concerns. Thank you for your time and effort. We look forward to sharing the results with you.

EBJ's 2002 Survey of Environmental Consulting & Engineering Firms

I. CONTACT INFORMATION

Company Name _____ ☐ Public ☐ Private
Your Name _____
Your Title _____
Address _____
Phone _____ Fax _____
e-mail address: _____
HQ President/CEO _____
HQ Address _____
HQ Phone _____ HQ fax _____
Subsidiary of: _____
Web address: _____

II. FINANCIAL INFORMATION (in \$ millions)

	1999	2000	2001	2002 (est.)
Total Gross Revenue (all operations)	\$ _____	\$ _____	\$ _____	\$ _____
A. Gross Environmental CONSULTING & ENGINEERING Revenue (excluding revenue from remediation construction and other construction)	\$ _____	\$ _____	\$ _____	\$ _____
B. Gross Environmental CONSTRUCTION Revenue (including revenue from remediation construction and other construction)	\$ _____	\$ _____	\$ _____	\$ _____
C. Net Environmental Revenue (A+B less subcontracting)	\$ _____	\$ _____	\$ _____	\$ _____
D. Non-environmental Consulting & Engineering (infra, bldgs, etc)	\$ _____	\$ _____	\$ _____	\$ _____
Total Backlog	\$ _____	\$ _____	\$ _____	\$ _____
Percentage of Gross Environmental Revenue from Outside U.S.	_____ %	_____ %	_____ %	_____ %
Pre-bonus, pre-tax profit (loss) on gross environmental C&E revenue (check one range for each year)	<input type="checkbox"/> <0% <input type="checkbox"/> 0-2% <input type="checkbox"/> 2-4% <input type="checkbox"/> 4-6% <input type="checkbox"/> 6-8% <input type="checkbox"/> 8-10% <input type="checkbox"/> >10%	<input type="checkbox"/> <0% <input type="checkbox"/> 0-2% <input type="checkbox"/> 2-4% <input type="checkbox"/> 4-6% <input type="checkbox"/> 6-8% <input type="checkbox"/> 8-10% <input type="checkbox"/> >10%	<input type="checkbox"/> <0% <input type="checkbox"/> 0-2% <input type="checkbox"/> 2-4% <input type="checkbox"/> 4-6% <input type="checkbox"/> 6-8% <input type="checkbox"/> 8-10% <input type="checkbox"/> >10%	<input type="checkbox"/> <0% <input type="checkbox"/> 0-2% <input type="checkbox"/> 2-4% <input type="checkbox"/> 4-6% <input type="checkbox"/> 6-8% <input type="checkbox"/> 8-10% <input type="checkbox"/> >10%

III. CLIENT INFORMATION

Please estimate the percentage of 2001 gross environmental CONSULTING & ENGINEERING revenue derived from the following end-user client types: **A** + **B** = 100%

Private Sector Clients **A** _____ % expected growth over next three years

Resource & Production Industries	L	M	H
Chemical, Pharmaceutical & Plastic	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Petroleum (Exploration & Refining)	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Primary Metals (steel, copper, etc.)	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Metals Products/Industrial Machines	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Mining	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Electronics/Computers Mfg	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Transp Equip (Auto, Aero, Rail, Ship)	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Textiles & Leather	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Pulp & Paper Processing	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Other	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Distribution, Wholesale, Retail & Service Industries			
Private Water Utilities	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Private Power Utilities	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Private Solid Waste Services	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Gas Stations & Materials Transp Svcs	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Banks, Law, Finance, & Real Estate	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Other	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>

total = **A** _____ % expected growth over next three years

Public Sector Clients **B** _____ % expected growth over next three years

	L	M	H
Federal	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
State	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Local	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>

total = **B** _____ %

IV. MEDIA/SERVICE TYPES

Please estimate the percentage of 2001 gross environmental CONSULTING & ENGINEERING revenue derived from the following media and service types:

Media Types _____ % expected 3-year growth

	L	M	H
Hazardous Waste Management	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Remediation	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Solid Waste Management	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Wastewater Treatment	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Water Purification/Delivery	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Energy Efficiency	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Air Quality	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Natural Resources	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Multi-media	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>

total = 100%

Service Types _____ % expected 3-year growth

	L	M	H
Investigate / Assess / Audit / RI / FS	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Testing / Lab Services	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Permitting / Compliance / Modeling	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Design	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Project Management	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Monitoring	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Operations & Maintenance (O&M)	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Information Management	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Process Engineering / Poll Prev	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Strategic Env. Mgmt Consulting	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>
Other	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>	_____ % <input type="checkbox"/>

total = 100%

Please estimate the percentage of 2001 gross DOMESTIC environmental C&E revenue within each of the USEPA regions (total=100%):

EPA Region 1 _____ % (CT, ME, MA, RI, VT)	EPA Region 3 _____ % (DE, DC, MD, PA, VA, WV)	EPA Region 5 _____ % (IL, IN, MI, MN, OH, WI)	EPA Region 7 _____ % (IA, KS, MO, NE)	EPA Region 9 _____ % (AZ, CA, HI, NV)
EPA Region 2 _____ % (NJ, NY)	EPA Region 4 _____ % (AL, FL, GA, KY, MS, NC, SC, TN)	EPA Region 6 _____ % (AR, LA, NM, OK, TX)	EPA Region 8 _____ % (CO, MT, ND, SD, UT, WY)	EPA Region 10 _____ % (AK, ID, OR, WA))

Please estimate the percentage of 2001 gross INTERNATIONAL environmental C&E revenue within each of the following int'l regions (total=100%):

Canada _____ %	Mexico _____ %	Latin America _____ %	Western Europe _____ %	Eastern Europe _____ %
Japan _____ %	Rest of Asia _____ %	Australia/NZ _____ %	Middle East _____ %	Africa _____ %

PLEASE RETURN COMPLETED SURVEY BY MAY 24 TO EBI BY FAX AT (619) 295-5743

ENVIRONMENTAL BUSINESS JOURNAL

Strategic Information for a Changing Industry

2002 Survey of The Top Environmental Testing Lab Firms

- Please respond by May 31 -

You can complete this survey **ONLINE!**
Visit www.ebiusa.com

Dear Environmental Executive:

Environmental Business International, publisher of Environmental Business Journal (EBJ), is conducting a survey of business conditions in the environmental laboratory and analytical services industry. We would like to include your firm in our study and would appreciate your help in completing the attached survey.

Who We Are...

EBJ is widely recognized as the leading source of strategic business information for the environmental industry. Our research has been cited regularly in trade journals such as Pollution Engineering, Environmental Solutions and Environment Protection, and in business publications such as The Wall Street Journal, The Economist, Fortune and Business Week. Our subscribers include many senior executives from some of the most respected firms in the environmental industry, governmental agencies and the investment and regulated communities.

Using information derived from these surveys, we intend to analyze the environmental testing market and develop a ranking of the top firms according to environmental testing revenues. EBJ will not publish any other data on individual companies without permission. That information will be used for analytical purposes and to draw general conclusions about trends in the lab business.

What's In It For You?

All respondents will receive a **FREE** summary of the results – including the list of the top environmental testing labs – as published in an upcoming issue of EBJ. If you aren't already familiar with EBJ, please visit www.ebiusa.com to request a complimentary sample issue.

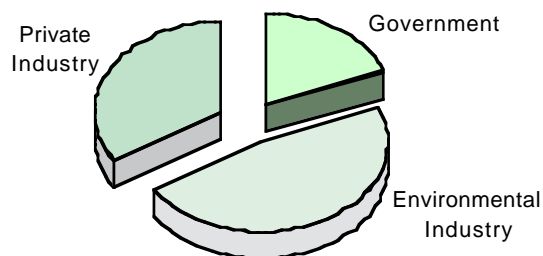
For less than 20 minutes of your time, you will receive valuable market intelligence with which to shape your business plan and take advantage of opportunities you may have overlooked.

Returning The Survey:

Please return your completed survey no later than **Friday, May 31, 2002** to be sure that your firm is included in our list. You can fill out the survey online at www.ebiusa.com or return the complete survey by FAX to (619) 295-5743.

Please call **Mariko Killion** at (619) 295-7685 x27 or send email to mkill@ebiusa.com with any questions or comments about EBJ or the survey. We thank you for your time and effort and look forward to sharing the results of this important and timely survey with you.

Environmental Testing Market:
a Snapshot



EBJ's 2002 Survey of the Top Environmental Testing Lab Firms

I. CONTACT INFORMATION

Company Name _____ ☐ Public ☐ Private
 Your Name _____ Subsidiary of _____
 Your Title _____ HQ President/CEO _____
 Address _____ HQ Address _____
 Phone _____ Fax _____ HQ Phone _____ HQ Fax _____
 Email _____ Web Site _____ HQ Email _____
 # of U.S. Lab Locations _____ # Outside U.S. _____ Last Fiscal Year Ended ____ / ____ / ____

II. FINANCIAL & GEOGRAPHIC INFORMATION (\$ Millions)

	FY2000	FY2001	FY2002 (est.)
Total Gross Revenues (all operations)	\$ _____	\$ _____	\$ _____
Environmental Lab Services Revenue	\$ _____	\$ _____	\$ _____
Operating Income (Confidential)	\$ _____	\$ _____	\$ _____
Total Number of Lab Employees	_____	_____	_____
Non-U.S. Revenues	\$ _____	\$ _____	\$ _____

Distribution of 2001 Non-U.S. Revenue by Region (Total = 100%):

Canada _____ % Mexico _____ % W. Europe _____ % E. Europe _____ % Japan _____ %
 Rest of Asia _____ % Aus/NZ _____ % Mid East _____ % Latin America _____ % Africa _____ %

Revenue by EPA Region (total = 100% of 2001 Domestic Environmental Lab Services Revenue):

Region 1 _____ % Region 2 _____ % Region 3 _____ % Region 4 _____ % Region 5 _____ %
 (CT, ME, MA, RI, VT) (NJ, NY) (DE, DC, MD, PA, VA, WV) (AL, FL, GA, KY, MS, NC, SC, TN) (IL, IN, MI, MN, OH, WI)
 Region 6 _____ % Region 7 _____ % Region 8 _____ % Region 9 _____ % Region 10 _____ %
 (AR, LA, NM, OK, TX) (IA, KS, MO, NE) (CO, MT, ND, SD, UT, WY) (AZ, CA, HI, NV) (AK, ID, OR, WA)

III. SAMPLE TYPE & SERVICE TYPE INFORMATION

Please estimate the % of 2001 environmental lab revenues from each area.

Service Type	Expected % growth over next three years	Sample Type				Expected % growth over next three years
		<5	-5-0	0-3	3+	
Sampling _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Hazardous Waste _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Monitoring _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Remediation _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Testing _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Solid Waste _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Consulting _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Water/Wastewater _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Other Service _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Air Compliance _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Total 100 %		Other Sample _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
		Total 100 %				

IV. CLIENT INFORMATION

Please estimate the % of 2001 environmental lab revenues from each market .

Government Clients	Expected % growth over next three years	Private Industrial Clients				Expected % growth over next three years
		<-5	-5-0	0-3	3+	
Federal Government _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Chemical & Plastics Manufacturing _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
State Government _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Pharmaceuticals Manufacturing _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Local Government _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Petroleum Exploration/Refining _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Total Government A _____ %		Metals Manufacturing _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Environmental Industry Clients	Expected % growth over next three years	Mining _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Solid Waste Mgmt Firms _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Electronics/Computer Manuf. _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Haz Waste Mgmt Firms _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Transportation Equip. Manuf. _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Remediation/Industrial Svs Firms _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Agriculture _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Engineering & Consulting Firms _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Pulp & Paper _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Other Environmental _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Gas Stations _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Total Environmental B _____ %		Utilities _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
		Financial & Real Estate Svs _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
		Other (Specify) _____ %	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
		Total Industrial C _____ %				

Note: A + B + C = 100

V. WEB SITE INFORMATION

How would you describe the use of your web site (check all that apply):

☐ Provides product/service information ☐ Permits customer interaction ☐ Takes online orders
☐ Reports work progress to customers ☐ Provides online payment option ☐ Permits creation of 1:1 customer relationships
☐ Other _____

☐ Check here if you would like to be interviewed for an upcoming issue of EBJ on the Environmental Testing Sector

PLEASE RETURN COMPLETED SURVEY BY 5/31/02 TO EBI BY MAIL OR FAX AT (619) 295-5743

ENVIRONMENTAL BUSINESS JOURNAL

Strategic Information for a Changing Industry

2002 Survey of Top Environmental Instrument Manufacturers

Dear Sir/Madam:

Environmental Business Journal is researching environmental instrument companies, markets and technologies for our listing of top environmental instrument manufacturers. We would like to include your firm in our study and would appreciate your help in completing the enclosed survey.

Based on the information collected, we will publish a ranking of top firms according to 2000 gross environmental instrument revenue. Detailed revenue breakdowns on individual companies will not be published without permission but will be used to analyze the total market and to draw general conclusions about trends in the environmental instrument business.

To ensure that your company is included in our industry review and considered for *EBJ's* list of Top Environmental Instrument Manufacturers, we need your response to this questionnaire. Approximations are acceptable, but we may use other sources to estimate or confirm figures.

Who We Are...

EBJ is widely recognized as the leading source of strategic business information for the environmental industry. We have been defining environmental markets and tracking the evolution of the industry since 1987. Our research has been cited regularly in leading trade journals such as *Environment Today* and *Pollution Engineering* and business publications such as *The Economist*, *Fortune* and *The Wall Street Journal*.

What's In It For You?

All respondents will receive a **FREE** summary of the results – including market segmentation, a competitive analysis, and the list of top environmental instrument manufacturers. If you aren't already familiar with *EBJ*, please call us or return the enclosed information form by fax for a **FREE SAMPLE** issue.

Returning The Survey:

Please return your completed survey no later than **Friday, April 25** to be sure that your firm is included in our list. Surveys can be returned either by fax to **(619) 295-5743**, or by mail in the enclosed postage-paid envelope.

Please call Mariko Killion at **(619)295-7685 x27** with any questions, comments or concerns. Thank you for your time and effort. We look forward to sharing the results with you.

EBJ's 2002 Survey of Top Environmental Instrument Manufacturers

I. CONTACT INFORMATION

Company Name _____ ☐ Public ☐ Private
 Your Name _____ Subsidiary of _____
 Your Title _____ HQ President/CEO _____
 Address _____ HQ Address _____
 Phone _____ Fax _____ HQ Phone _____ HQ Fax _____

II. FINANCIAL INFORMATION (\$ Millions)

	FY1999	FY2000	FY2001	FY2002 (est.)
Total Gross INSTRUMENT Revenue (all operations)	\$ _____	\$ _____	\$ _____	\$ _____
Gross ENVIRONMENTAL INSTRUMENT Revenue	\$ _____	\$ _____	\$ _____	\$ _____
Pre-tax profit (loss) on Gross Environmental Instrument Revenue	_____ %	_____ %	_____ %	_____ %
Total Number of Employees	_____	_____	_____	_____
Technical	_____	_____	_____	_____
Sales	_____	_____	_____	_____
% of Gross Environmental Instrument Revenue from Outside U.S.	_____ %	_____ %	_____ %	_____ %

Distribution of Gross 2001 Environmental Instrument Revenue by Region:
 Asia/Pacific _____ % Canada _____ % Mex/LatAm _____ % Europe _____ % MidEast _____ % Other _____ %

III. PRODUCT INFORMATION

Please check ☒ instruments and corresponding application and estimate the percentage of gross ENVIRONMENTAL INSTRUMENT revenue derived from each of the three applications.

Application	Instrument Type															expected % growth over next three years				
	Atomic Absorption	Electrochemical	ICP	ICPMS	HPLC	GC	GCMS	IR	Gas Analyzers	SOx, NOx Monitors	Scintillation Equipment	Flow Meters	Field Water Kits	Wastewater Sampler	Support Software		Other (please specify)			
In-Lab Analytical	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Portable/Field Analytical	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In-Line/Process Control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total																	100 %			

IV. OTHER INFORMATION

Please estimate percentage of environmental instrument revenue by:

Media				End Client					
		expected % growth over next three years				expected % growth over next three years			
		0-5	6-10	10+		0-5	6-10	10+	
Air	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Commercial Labs	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Consultant-owned Labs	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Groundwater	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Government Labs	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wastewater	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Captive Industry Labs	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Solid Waste (non-haz)	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Chemical	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Solid Hazardous Waste (non-rad)	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Petroleum	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radioactive Waste	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Mining	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					Power Utility	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					Transportation	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					Pharmaceutical	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					Other	_____ %	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total	100 %				Total	100 %			

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