CHAPTER 5

A SURVEY OF PURCHASERS OF AIR POLLUTION CONTROL EQUIPMENT

The primary focus of this study was the firms that supply goods and services to other firms to assist them in complying with air pollution control regulations. The data collected by the methods described in Chapter 3 and discussed in Chapter 4 identify the major firms in California that comprise the APCI, but the following questions remain unanswered:

- What portion of the control equipment for California firms is purchased outside of California?
- Are signifcant "in-house" expenditures made by regulated firms?

Answers to these questions must be obtained from the regulated firms rather than the APCI.

A complete survey of regulated firms was beyond the scope of this study, but it was possible to survey a group of firms known to have made major purchases of air pollution control equipment during the past five years. The results of this survey are described in this chapter.

5.1 -- SURVEY METHODOLOGY

The list of firms was obtained from the California Pollution Control Financing Authority, an agency that arranges low-cost financing for air and water pollution control projects and for

resource conservation projects. A project must exceed $50,000 to qualify for assistance. The records were examined for the years 1978 to the present. A group of 59 firms were identified as having secured loans for air pollution control projects, and an additional 21 firms had applied and were still negotiating for financing for water pollution and resource recovery, as well as air pollution control projects. The loan applications were examined, the air pollution portions of the expenditures were identified, and the types of control devices were listed. The information is summarized in Table 5.1.

These firms range from small businesses with less than 20 employees to large utility companies with more than 20,000 employees and include representatives of all the industry/process categories listed in Table 2.3. Since 1978 the Authority has arranged for $422,698,000 in air pollution control financing and has requests in-house for another $242,000,000.

The Pollution Control Financing Authority provided a listing of the individuals at each firm who were the principal contacts for loan arrangements. These individuals were contacted by telephone and asked whether the funds were spent: (1) outside California, (2) within California but outside their own firm, or (3) within their own firm. They were also asked if they incurred additional expenses that were not covered by the loan. No attempt was made to determine the names of suppliers or the exact description of the equipment that was purchased. (See Appendix D for a sample of the questionnaire used for the survey).

Table 5.1

FINANCING THROUGH CALIFORNIA POLLUTION CONTROL FINANCING AUTHORITY FOR AIR POLLUTION CONTROL

Company Name and Location	SIC or Business	No. of Calif. Employees	Dollar Amount	Device	Proposed Project Duration
FUNDS AWARDED IN 1982					
Kernridge Oil Kern County	1311	459	$43,000,000	99 sulfur oxides and particulate devices and 70 NO_x controls for oil-field steam generators	12/80-12/86
Martin Marietta Union Pacific Wilmington	Green coke calciner (joint venture) 3334	1,234 2,077	3,450,000 3,450,000	Baghouse, pyroscrubber, low NO_x burner, wet scrubber	2/81-10/82
Decor-Ative Specialities Irwindale	NA	NA	1,320,000	NA	NA
FUNDS AWARDED IN 1981					
Lakewood Oil Company Santa Fe Springs	5096	NA	4,500,000	Vapor recovery	NA
So. Cal. Edison Huntington Beach	4911	12,963	8,300,000	Catalytic $DeNO_x$ demonstration system	10/80-9/81
Namolco Inc. Long Beach	5190	17	392,000	Install floating roofs on tanks	9/80-12/80
Kaiser Cement Lucerne Valley	3241	1,138	13,400,000	Particulate collectors, ducts, conveyors	4/80-3/82
Hexel Corporation Livermore	2295	522	1,000,000	VOC incinerator	1/81-12/82
Tri-Valley Growers Modesto	2033	1,675	50,000	Multiclone for biomass boiler	11/79-6/80

Table 5.1 (Cont'd)

Company Name and Location	SIC or Business	No. of Calif. Employees	Dollar Amount	Device	Proposed Project Duration
Powerine Oil Company Santa Fe Springs	2911	738	23,000,000	Refinery modernization	11/80-10/82
Vernon Leather/ Beggs & Cobb Los Angeles	3198	217	140,000	Wet scrubber for H_2S	2/81-8/81
Lone Star Industries Santa Cruz	3241	666	7,600,000	Particulate control for cement plant	4/79-3/81
Xidex Sunnyvale	3861	295	1,000,000	VOC incinerator	11/80-3/81
Superior Farming Company Bakersfield	farming	1,000	350,000	Baghouse for biomass boiler	5/81-11/82
Symtron Mt. View	3671	NA	300,000	Particulate scrubber	NA
Jeffries Bros. Wasco	5171	20	575,000	Gasoline vapor recovery system	NA
Anaheim Foundry Co. Anaheim	3430	350	145,000	Baghouse	NA
Stauffer Chemical Co. Martinez	2819	1,904	4,500,000	Wet scrubber for SO_2	8/80-5/81
Champlin Petroleum Co. Wilmington	2911	2,077	10,500,000	Refinery modernizing	NA
PG&E Geysers	4931	24,583	60,000,000	H_2S abatement and sulfur recovery at geothermal well	9/79-7/82
Shell Oil Company Carson	2911	3,461	59,000,000	Refinery modernizing	10/79-7/81

Table 5.1 (Cont'd)

Company Name and Location	SIC or Business	No. of Calif. Employees	Dollar Amount	Device	Proposed Project Duration
Mar Kee Cleaners Los Angeles	2200	14	440,000	Vapor recovery (actually financed purchase of 2 complete dry cleaning machines that recycle perchlorethylene)	2/81-7/81
		FUNDS AWARDED IN 1980			
Amer. Metal Decorating Freemont	3479	132	390,000	Flame fume incerator	NA
Pacific Steel Casting Berkeley	3325	30	2,285,000	Particulate collectors	NA
Solvent Coating Corp. Torrance	2641	19	365,000	Carbon bed for VOC control	NA
Pennington Manufacturing Oxnard	4723, 4753, 1798	125	775,000	Abrasive blasting and painting booths	9/80-12/80
Signetics Corporation Santa Clara	3670	4,272	995,000	Scrubbers, dust collectors, consulting	NA
Brockway Glass Co. Pomona	3221	730 at Oakland 375 at Pomona	1,550,000	Particulate collectors (from United McGill, Columbus, OH)	6/80-10/80
A&S Glass Fabrics Los Angeles	2241	NA	145,000	Fume incinerator	NA
New Fashion Cleaners Los Angeles	2200	NA	390,000	Carbon adsorbers	NA
Shell Oil Company Martinez	2911	3,461	63,000,000	H_2S abatement and sulfur recovery units, VOC recovery	11/79-5/81

Table 5.1 (Cont'd)

Company Name and Location	SIC or Business	No. of Calif. Employees	Dollar Amount	Device	Proposed Prosed Duration
Union Oil Bakersfield	1311, 2911	6,700	7,500,000	Vapor recovery at service stations, scrubbers for oilfield stream generators	NA
Exxon Benecia	2911	9,000	14,400,000	Tail gas clean-up units	10/79-8/81
Simonsen Lumber Arcata	2421	NA	50,000	Wet scrubbers (Bumstead-Woolford) for particulates	NA
Certain-Teed Corp. Chowchilla	2221	774	3,595,000	Pollution control at new plant--wet scrubbers, ESP	1/78-12/78
Detergents Inc. Santa Fe Springs	2841	NA	995,000	Sulfur burning unit	NA
		FUNDS AWARDED IN 1979			
Alloy Metals Company Los Angeles	3370	27	110,000	Baghouse	NA
Certified Alloy Products Long Beach	3325	415	310,000	Baghouse	NA
Orrell-Keefe Inc. Richmond	0033	75	985,000	Baghouse for blasting unit	NA
Vernon Paving Co. Cerritos	1611	NA	260,000	Fabric filter	NA
Amcord Inc. Oro Grande	3421	NA	1,000,000	Baghouse	NA
Kaiser Steel Fontana	0033	9,838	7,000,000	Baghouses for coke ovens	9/78-1/80
Calif. Portland Cement Mojave	3241	1,050	8,800,000	Baghouse, ducting, cyclones	NA

Table 5.1 (Cont'd)

Company Name and Location	SIC or Business	No. of Calif. Employees	Dollar Amount	Device	Proposed Project Duration
U.S. Borax Boron	2819, 2841, 2879	1,890	1,000,000	7 fabric filters, 1 wet scrubber	3/79-12-79
Flintkote Redding	3241	1,577	7,975,000	Dust collectors for plant expansion	NA
Jim Walter Corp. (U.S. Pipe and Foundry) Union City	3272, 3317	988	700,000	Baghouse and ducting sprays	NA
Fletcher Oil Wilmington	2911	107	10,260,000	Refinery modernization and expansion	8/78-2/80
Panamint Marketing Kern County	1499	75	520,000	Particulate control	6/77-1/78
		FUNDS AWARDED IN 1978			
Guardian Industries Kingsburg	3211	72	1,780,000	Controls for new glass plant ESP (United McGill)	NA
Gatx Tank Storage Carson	4226	30	995,000	Incinerators for VOC control on fixed roof tank	NA
Pauley Petroleum Newhall	2911	165	5,000,000	Tail gas clean-up unit	5/78-11/79
Mohawk Petroleum Bakersfield	2911	466	7,100,000	Tail gas clean-up unit	7/77-9/79
Orrell-Keefe Inc. Richmond	0033	75	540,000	Wet scrubber, paint arrestors	NA
Anderson Lumber Redding	2661	32	80,000	Cyclones for wood waste boiler	NA
Arlon Products Santa Ana	3070	180	206,000	VOC incinerator	NA

Table 5.1 (Cont'd)

Company Name and Location	SIC or Business	No. of Calif. Employees	Dollar Amount	Device	Proposed Project Duration
Good-West Rubber Co. Cucamonga	3069	65	190,000	Filter for particulates	NA
Keysor-Century Saugus	2821	104	1,500,000	Vinyl chloride adsorption system	NA
SAG Plating Los Angeles	2468	35	130,000	Fume scrubbers	NA
Kaiser Steel Corp. Fontana	0033	9,838	23,000,000	Coke oven stack emission control	NA

FUNDING APPLICATIONS STILL BEING PROCESSED (as of 4/6/82)

Company Name	Location	SIC or Business	Amount Requested	Device
Southdown, Inc.	Victorville	NA	$24,870,000	
Tosco Corporation	Martinez	NA	44,121,000	
Occidental Geothermal	Lake County	Oil & gas production	17,400,000	
Trend West	Carson	Furniture manufacturing	470,000	
Penn. Lithographics	Cerritos	Printing	163,000	
Allied Corporation	Visalia	Auto battery mfg.	1,350,000	
Standard Oil	various locations	2911	70,000,000	
Homestake Mining	Napa	Mining	<94,850,000	(much of this is for water and solid waste)
PPG Industries	Fresno	Glass manufacturing	2,000,000	
Chevron USA	Richmond	2911	60,000,000	

Table 5.1 (Cont'd)

Company Name	Location	SIC or Business	Amount Requested	Device
Valley Metal Works	El Cajon	Pipe manufacturing	< 430,000	(also water)
Vista Paint Corp.	Stanton	Paint manufacturing	1,125,000	
Union Oil Company	Kern County	Oil production	250,000	
Castaic Brick	Castaic	Brick manufacturing	6,000,000	
Monolith Cement	Monolith	Cement manufacturing	10,281,000	
Hobart Wholesale Dry Cleaning	Los Angeles	Industrial laundry	250,000	
Oakland Bean Cleaning	Knights Landing	Wholesale seeds	350,000	
Proctor and Gamble	Long Beach	Laundry products mfg.	<35,000,000	(mostly water)
Kingsford Company	Elk Grove	Charcoal manufacturing	2,391,000	Vapor recovery system
United Whitehouse Cleaners	San Francisco	Wholesale cleaners	180,000	Vapor recovery system
Allied Media Tech.	Sunnyvale	Magnetic tape mfg.	800,000	

5.2 -- SURVEY RESULTS

Four of the original 59 firms were no longer in business or had no one on staff who was familiar with the loans; therefore, a total of 55 purchasing firms were surveyed. The loans were granted over a five-year period beginning in 1978. Over 80 percent of these loans were received between 1979 and 1981. The loan amounts ranged from the minimum $50,000 to $60 million. The mean loan value was $5.9 million, while the median value was $1 million. Table 5.2 contains the frequency distribution of firms for different loan amount categories. The majority of firms borrowed amounts of less than $3 million.

The survey responses indicated that 64 percent of the loan funds were spent in California but outside the firm, 28 percent were spent outside California, and 5 percent were spent "in-house."* (Since these figures represent mean values, the three means will not necessarily sum to 100 percent.) The distribution of firms by percent loan funds spent in each of these three categories is shown in Tables 5.3, 5.4, and 5.5

Only 40 of the 55 survey firms responded to the loan distribution question in sufficient detail to characterize the spending patterns. These 40 firms received loans totaling $184 million compared to a total of $324 million loaned to all survey firms. The spending patterns by year are shown for these firms in Table 5.6. The patterns vary from year to year, but the "in-house" expenditures are typically very small, and expenditures inside California exceed the expenditures outside California.

*The term "in-house" denotes goods and services that are provided by the regulated firm itself rather than being purchased from outside suppliers.

Table 5.2

DISTRIBUTION OF FIRMS
BY LOAN AMOUNT CATEGORIES

Loan Amount Category (Thousands of $)	Number of Firms
0 - 250	10
250 - 500	9
500 - 1,000	7
1,000 - 3,000	9
3,000 - 6,000	4
6,000 - 10,000	8
10,000 - 20,000	4
20,000 +	4
Mean	$5.8 million
Median	$1.0 million

Source: CIC Research, Inc., "APCI Purchaser Survey," 1982.

Table 5.3

DISTRIBUTION OF FIRMS BY PERCENT OF LOAN FUNDS SPENT OUTSIDE OF CALIFORNIA

Percent Grouping	Number of Firms
1 - 10%	18
10 - 25	3
25 - 35	6
35 - 50	5
50 - 75	6
75 - 100	2
Mean	28 percent

Source: CIC Research, Inc., "APCI Purchaser Survey," 1982.

Table 5.4

DISTRIBUTION OF FIRMS BY PERCENT OF LOAN FUNDS SPENT IN CALIFORNIA BUT OUTSIDE FIRM

Percent Grouping	Number of Firms
0 - 25%	9
25 - 50	3
50 - 75	12
75 - 100	16
Mean	64 percent

Source: CIC Research, Inc., "APCI Purchaser Survey," 1982.

Table 5.6

DISTRIBUTION OF LOAN AMOUNTS BY WHERE SPENT AND YEAR*
(Thousands)

Year	Loan Amount (All Firms)	Loan Amount (Firms Responding to Survey)	Amount Spent Outside of California	Amount Spent Inside of California	
				Outside Firm	Within Firm
1978	$ 17,000	$ 3,900	$ 2,200	$ 1,400	$ 300
1979	71,300	48,700	22,000	26,500	200
1980	33,400	31,860	8,200	23,600	60
1981	195,200	92,800	17,400	73,700	1,700
1982	6,900	6,900	0	5,500	1,400
Total	$323,800	$184,160	$49,800	$130,700	$3,660

*Since only 40 firms responded to the loan distribution questions, the sum of columns 3 through 5 will not equal column one.

Source: CIC Research, Inc., "APCI Purchaser Survey," 1982.

CHAPTER 6

AN ASSESSMENT OF THE AIR POLLUTION CONTROL INDUSTRY

In this chapter, the air pollution control industry in California is assessed in light of the descriptive economic information found in Chapter 4 and the discussion of the purchasers of APCI goods and services in Chapter 5. Specifically, attention is given to the multiproduct nature of the industry, relative industry size, the implications of an export industry, selected behavior of APC purchasers, and the economic impact of the APCI. In short, this chapter summarizes the economic findings of the study.

6.1 -- APCI: A MULTIPRODUCT, CAPITAL GOODS INDUSTRY

The California APCI can be characterized as a multiproduct, capital goods industry. The industry supplies more than 20 different major products or services. Since almost half of the products or services are provided by both the manufacturing and service sectors, cross-over between sectors appears to be commonplace. On the average, three major products and/or services are provided by a single APCI firm in California.

As a capital goods industry, California APCI firms produce goods which are used to produce other goods over an extended time period. As the data in Chapter 4 indicate, the types of equipment produced have average lives in the eight- to 20-year range.

In addition, the APCI service sector is heavily involved in the capital goods industry through design efforts, planning, and engineering. Thus, the products of the California APCI tend to exhibit extended life cycles.

6.2 -- RELATIVE SIZE OF THE CALIFORNIA APCI

The relative size of the California APCI can be determined by comparing key economic variables within the APCI with the corresponding State variables. Table 6.1 compares APCI sales and employment with the State's manufacturing and service data. As the table indicates, APCI sales account for less than one percent of the total sales in the manufacturing and service sectors for the State of California. APCI employment represents 0.1 percent of the total California employment in manufacturing and services.

6.3 -- THE CALIFORNIA APCI: AN EXPORT INDUSTRY

The multiproduct, capital goods APCI is primarily an export industry. Almost 90 percent of California's APCI manufactured goods were sold in out-of-state markets (refer to Table 4.9). Similarly, 75 percent of APCI services were provided to customers in other states (refer to Table 4.9). In this sense, the APCI has become a basic industry to the State's economic system.

A basic or export industry occurs when the market for a firm's product is outside the region, i.e., state. Hence, other things being the same, the growth, development, and general economic activity of a region tends to increase when the number of outside (export) markets which this industry can profitably serve increases. This is the position of the APCI industry today.

Table 6.1

COMPARISON OF APCI AND
CALIFORNIA ECONOMY IN 1980

	Sales (Millions)	Employment (Thousands)
APCI	$ 903	5.6
California (Manufacturing and service sectors only)	$130,500*	4,300
APCI as a percent of California	0.7%	0.1%

*California sales figure is for 1977, no adjustment made.

Source: Employment Development Department, Division of Employment Data and Research; Economic Analysis Group, State of California, 1981.
U.S. Department of Commerce, Bureau of the Census, 1977 Census of Service Industries and 1977 Census of Manufacturing Industries.
CIC Research, Inc., "A Survey of APCI Firms," 1982.

The export status of the industry underscores another idea. As long as air quality standards are established throughout the United States, California APCI firms will be able to play a vital role in supplying air pollution control equipment and services. While the impetus for developing an APCI may have been the result of California's leadership in establishing air quality standards, the continued health of the industry is much more dependent on the needs of the rest of the nation.

6.4 -- APCI PURCHASERS

While the primary study findings focus on suppliers of APC equipment and services, a selected survey of APCI purchasers provides further economic impact. First, in reviewing funds borrowed for APCI expenditures in California (see Table 5.2), the mean amount borrowed appears to be less than $6 million per project with a much lower median expenditure at $1 million. Second, APCI purchasing firms indicated that only 28 percent of the funds borrowed were spent outside California. Third, the percentage of borrowed funds spent within the borrowing firm was estimated to be 5 percent. Fourth, in addition to the borrowed funds, firm outlays required to support the air pollution control projects are estimated to be less than $200,000 per project. In conclusion, the survey of APCI purchasers indicates that the bulk of the borrowed funds are spent in California, that only a small percentage of the borrowed funds are spent in-house, and that the borrowing firms modestly support their air pollution control projects with in-house funds.

6.5 -- ECONOMIC IMPACT OF APCI

The information presented in the previous chapters lends itself to a discussion of the economic impact of the APCI. For the sake of the following discussion, the economic impact of the APCI will be viewed primarily in terms of the business activity within the industry. However, a discussion of indirect impacts is also provided. Complete economic welfare considerations are believed to be well out of the scope of this present study.

6.5.1 -- Direct Economic Impacts

The California APCI has direct effects on the State's economy. Table 6.2 measures these direct effects in terms of employment and sales volume. Simply stated, the California APCI as defined in this study produced $903 million in sales and employed 5,600 full-time workers in 1980. As indicated previously, the APCI is a relatively small industry when compared to the State's manufacturing and service sectors.

As Table 6.2 indicates, the level of activity directed to California firms amounts to $143 million in sales and 1,050 full-time workers for 1980. In addition, it was found that the bulk of California air pollution equipment and service purchases occurred from vendors within the State. If this level of activity is viewed as resources withdrawn from non-air pollution business activity (which assumes full employment), a crude measure of opportunity costs for controlling air pollution in California might be made from the point of view of society. Relative to

Table 6.2

DIRECT EFFECTS ASSOCIATED WITH APCI ACTIVITY

Sector/Industry	Sales (Millions)	Employment
Manufacturing	$703	3,100
California firms only	$90	400
Service	200	2,500
California firms only	53	650
APCI	903	5,600
California firms only	143	1,050

Source: CIC Research, Inc., "A Survey of APCI Firms," 1982.

the State's manufacturing and service sectors, the withdrawn resources for air quality control represent one-tenth of one percent in sales and an almost imperceptible percentage of employment in 1980. Even when in-house outlays to support air pollution control are added, the total amount of withdrawn resources to control air pollution appears to be very, very small.

6.5.2 -- Indirect Economic Impacts

The capital goods characteristic and the export nature of the APCI effects the California economy in ways not captured in the analysis of direct effects. The capital goods characteristic indicates that the products of the APCI have an extended life cycle. This means that the air pollution control device has value over the life of the equipment and is, therefore, not entirely a current production expense. That is, even though it is produced in the current period, it is not (all) a current cost to the regulated firms, and, therefore, would not be counted in their current production expense. Also, because, California's APCI is largely an export industry, sales and employment impacts extend beyond what is needed to control air pollution within the State. The capital good and export characteristics lead to the treatment of the APCI sales as "sales to final demand" with impacts on the California economy beyond the direct impact analysis.

Although beyond the scope of the present study, the survey information lends itself to the analysis of the direct and indirect impacts of the APCI. By indirect we refer to the employment requirements at earlier stages of production that are

intermediate inputs to the APCI, e.g., if it takes $4 million of purchased special components to manufacture $10 million of APCI equipment, then the employment required to manufacture the $4 million is not counted directly in the APCI employment figure, but is indirectly attributable to the manufacture of the $10 million of APCI equipment and should, therefore, be counted in the total employment estimate. An estimate of the indirect employment can be accomplished through the use of an input-output (I-O) model.

The ARB has an I-O model for California. By incorporating the information collected in this survey with the I-O model, the ARB could estimate the direct and indirect (and induced) effects on employment, as well as income and sales. For example, the survey information can be used to define unique sectors representing the APCI. These sectors, then, can be made compatible with the existing ARB I-O model. The total direct and indirect effects could then be measured using this model. The discussion in Appendix G describes the technical requirements in detail. A first approximation* of APCI indirect effects could be obtained by estimating multipliers for the I-O sectors that include the APCI. This is done by aggregating those manufacturing activities in the California I-O transactions table that include APCI

*The reason that this is a first approximation is that the multipliers are derived from sectors in which the APCI is a very minor element. A more refined approximation would require subtracting the APCI from the aggregated sectors and including the APCI in the I-O model as separate sectors (refer to Appendix G for further discussion).

manufacturing into a single sector; and also aggregating those service activities in the I-O model that include APCI services into a single sector. These two sectors, in conjunction with the remaining sectors of the California I-O model can be used to obtain approximate multipliers for APCI manufacturing and APCI services.

There are two types of multipliers which can be computed for output, employment, or income. These multipliers are called Type 1 and Type 2 multipliers. Essentially, the difference between the two is that the Type 2 multiplier incorporates household activity into the I-O model while the Type 1 does not consider such activity (refer to Appendix G for further discussions). Typically, multipliers for the manufacturing and service sector range from 1.3 to 4.0 depending upon how the multiplier is defined.* Generally multipliers for the service sector are smaller than for the manufacturing sector. In addition, Type 2 multipliers are larger than Type 1 multipliers because they add the effects of household income and expenditures.

By including multipliers into the analysis one is able to obtain a better estimate of the total impact that the APCI has on the California economy. For example, assuming a manufacturing APCI Type 2 employment multiplier of 4.0, the direct APCI manufacturing employment of 3,100 measured in the present study could be expanded to 12,400 workers, i.e., 4.0 X 3,100.

*Numerical values for these multipliers may not reflect the range of APCI multipliers and should only be viewed in an illustrative manner.

Further, assuming a smaller APCI service Type 2 multiplier of 2.6, the direct service sector employment of 2,500 could be expanded to 6,500 workers, i.e., 2.6 x 2,500. In essence, the total employment impact of the California APCI could be substantially larger than the direct impacts measured in this study. A similar argument could be made for APCI sales, and income effects.

6.6 -- FUTURE CARB REGULATIONS AND THE APCI

Since the APCI is an export industry that primarily serves customers outside of California, the industry will not be impacted in a major way by the enactment of new control regulations in California. The impact will be increased if the rest of the nation follows California and enacts similar regulations, but it is difficult to predict the extent of this phenomenon. Nonetheless, it may be instructive to examine the regulations that are proposed for the future in California and make a qualitative estimate of the control device requirements. Since this study does not include mobile sources, only stationary source regulations will be considered.

Although California enacted air pollution control regulations many years ago and has led the nation in controlling

pollutants, the most heavily populated areas of the state still exceed some of the National Ambient Air Quality Standards. Therefore, the State is still engaged in an active program to identify uncontrolled sources of pollution and develop control strategies for them. Some of these activities merely involve the extension of well established control technologies to geographic areas that were previously uncontrolled. Other activities involve the development of new control strategies for sources that have never been controlled.

Proposed regulations are described in the 1979 State Implementation Plan Amendments that sets forth plans for meeting the National Ambient Air Quality Standards in accordance with the requirements of the Clean Air Act Amendments of 1977. The CARB's proposed schedule for adoption of rules is shown in Table 6.3. The schedule requires that the rules be adopted by December 31, 1981, but compliance dates are substantially later in some air basins. To predict the future requirements for stationary control devices in California, the following sequence of activities must be accomplished:

1. Examine the final version of the Implementation Plan and list the new control regulations and compliance dates in each planning area or county.

2. Identify those regulations that are likely to require purchases of stationary source control devices.

3. Examine the emissions inventory for each planning area or county and determine the number and size of sources that would be required to comply.

4. Estimate the expenditures for the required control devices and determine whether they would be purchased from California vendors.

5. If possible, estimate indirect impacts of these purchases using an I/O model.

This exercise could be accomplished as a separate project with a moderate expenditure of time and effort, but it is clearly beyond the scope of the present study.

However, some qualitative generalizations about future control requirements may be made by examining the proposed rules listed in Table 6.3. Many of the proposed rules deal with controls for organic solvent emissions. Rules to control these emissions have been in force for several years in the larger air basins, so there will be very few industries that are uncontrolled at present that will be required to comply in the future. Organic emissions from refineries have been under control in California for many years but similar controls have not been required at oil production fields until very recently. Therefore, floating roof tanks, well-head vapor recovery and low-leakage valves and flanges, etc. will be required at oil production facilities until all operations are brought under control. In addition, controls have been adopted, but not completely implemented, for NO_x and SO_x from oil field steam generators. Vapor recovery controls for some gasoline marketing operations are to be implemented in the future in certain air basins, but many controls are already in place. For the first time, nitrogen oxide controls are proposed for certain boilers and gas turbines. These are not likely to be required statewide but they will be required in the heavily industrialized air basins that have the most severe air pollution problems.

In addition to the rules listed in Table 6.3, existing rules must be implemented for all new sources that are constructed. If an ambient air quality standard is adopted for fine particles, the implementation plans for meeting this standard may require the installation of additional particulate control devices.

In summary, the demand for air pollution control goods and services can be expected to continue in future years. The specific product demands will continue to change in the future as they have in the past, so the APCI will have to adjust to these changes. Some existing companies may go out of business rather than switch to new products, but there seems to be sufficient demand to support the somewhat optimistic future expectations that were expressed by the firms that responded to the survey.

Table 6.3

State of California
AIR RESOURCES BOARD

PROPOSED SCHEDULE
FOR ADOPTION OF RULES

This schedule applies to all metropolitan nonattainment areas. For all other areas, the schedule will be determined on a case-by-case basis.

CATEGORY I - To be adopted by local air pollution control district or by ARB for district before 6/30/79, if necessary.

GENERAL

- New source review

ORGANIC COMPOUNDS

- Architectural coatings[c/]
- Automotive assemblyline coatings[c/]
- Dry cleaning (petroleum)[d/]
- Fixed roof tanks at refineries, terminals, and other facilities except for production fields[c/]
- Floating roof tanks at refineries, terminals, and other facilities except for production fields[c/]
- Gasoline vapor recovery[c/]
- Marine lightering operations[c/]
- Valves and flanges at oil refineries[c/]
- Can and coil coatings[b/]
- Cutback asphalt[a/]
- Degreasing[b/]
- Manufactured metal parts and products coatings[b/]
- Paper and fabric coatings[b/]
- Refinery vacuum producing equipment
- Oil/water gravity separation devices
- Process turnarounds at refineries and other facilities

OXIDES OF NITROGEN

- Gas-fired, fan type central furnaces[c/]
- Oil field steam generators[b/]
- Electric utility boilers[b/] (SCAQMD, Ventura only)

OXIDES OF SULFUR

- Coke calcining[c/] (SCAQMD only)
- Marine lightering operations[c/]
- Sulfuric acid plants[d/] (SCAQMD only)
- Oil field steam generators[b/]

PARTICULATE MATTER

- Coke ovens[c/]

[a/] Model rule not yet developed.
[b/] Model rules delegated to E.O. for revisions and final approval.
[c/] Model rules approved by the Board prior to 10/78.
[d/] Rule approved by E.O.

(Cont'd)

PROPOSED SCHEDULE
FOR ADOPTION OF RULES

CATEGORY II - To be adopted by local air pollution control district before 12/31/79, or by ARB for district before 6/30/80, if necessary.

OXIDES OF NITROGEN

- Internal combustion engines (stationary only)

CATEGORY III - To be adopted by local air pollution control district before 6/30/80, or by ARB for district before 12/31/80, if necessary.

ORGANIC COMPOUNDS

- Marine coatings
- Graphic arts
- Vegetable oils
- Pharmaceutical
- Rubber
- Dry cleaning (perchloroethylene)

OXIDES OF NITROGEN

- Refinery boilers and heaters and FCC units (SCAQMD, Ventura only)
- Glass melting furnaces
- Electric utility gas turbines (Santa Barbara, Ventura, San Diego, SCAQMD only)

OXIDES OF SULFUR

- Electric utility boilers (SCAQMD, Ventura only)
- Sulfuric acid plants (Fresno, San Joaquin, Kern only)

(Cont'd)

PROPOSED SCHEDULE
FOR ADOPTION OF RULES

CATEGORY IV - To be adopted by local air pollution control district before 12/31/80, or by ARB for district before 6/30/81, if necessary.

ORGANIC COMPOUNDS

- Waste solvent disposal
- Automobile refinishing
- Wood furniture
- Marine vessel operations
- Valves and flanges at oil production fields
- Oil production well vents under steam stimulation

OXIDES OF NITROGEN

- Electric utility boilers (San Diego only)
- Industrial boilers
- Cement plants

OXIDES OF SULFUR

- Coke calcining (Kern only)
- Sulfur recovery plants (SCAQMD only)
- Electric utility gas turbines (SCAQMD, Ventura only)
- Electric utility combined cycles (SCAQMD, Ventura only)
- Marine vessels
- Sulfur in fuel (SCAQMD, Ventura only)
- Cement plants

PARTICULATE MATTER

- Electric utility boilers (SCAQMD, Ventura only)

(Cont'd)

PROPOSED SCHEDULE
FOR ADOPTION OF RULES

CATEGORY V - To be adopted by local air pollution control district before 6/30/81, or by ARB for district before 12/31/81, if necessary.

ORGANIC COMPOUNDS

- Storage tanks at oil production fields
- Secondary oil/water separation operations at oil refineries

OXIDES OF NITROGEN

- Refinery boilers, heaters, CO boilers (Kings, Santa Barbara, Kern only)
- Electric utility combined cycles (San Diego, SCAQMD only)
- Water heaters
- Secondary metal furnaces

OXIDES OF SULFUR

- Electric utility boilers (San Diego only)
- Fluid catalytic cracking units (Kern only)
- Sulfur in fuel (San Diego only)

PARTICULATE MATTER

- Electric utility boilers (San Diego only)

CATEGORY VI - To be adopted by local air pollution control district before 12/31/81, or by ARB for district before 6/30/82, if necessary.

ORGANIC COMPOUNDS

- Flat woodstock
- Pesticides
- Chemical manufacturing

OXIDES OF SULFUR

- Electric utility boilers (Kern, Monterey, San Luis Obispo only)
- Sulfur in fuel (Kern, Kings, Santa Barbara, Monterey, San Luis Obispo only)
- Fluid cokers (Kern only)
- H_2S flares (SCAQMD, Santa Barbara only)
- Catalytic cracking units (Kern only)
- Sulfur recovery units (Santa Barbara only)
- Sulfur in fuel

OXIDES OF NITROGEN

- Electric utility boilers (Kern, Monterey, San Luis Obispo only)

PARTICULATE MATTER

- Electric utility boilers (Kern, Monterey, San Luis Obispo only)

-a.

BIBLIOGRAPHY

Air Pollution Control Association, "Consultants Guide/1981," Journal of the Air Pollution Control Association 30, No. 12 (1980): 1377-1397.

Lists names, addresses and telephone numbers of air pollution control consultants and indicates the type of services they provide.

Air Pollution Control Association, Directory and Resource Book, 1980-1981 (Pittsburgh, PA:APCA, 1980).

Includes addresses of manufacturers of emission control equipment and air pollution instrumentation arranged into 78 categories.

Air Pollution Control Association, Directory and Resource Book, 1981-1982 (Pittsburgh, PA:APCA, 1981).

Includes addresses of manufacturers of emission control equipment and air pollution instrumentation arranged into 78 categories.

Analytical Chemistry, 1981-1982 Lab Guide (Washington, D.C.: American Chemical Society, August 1981).

Includes addresses and telephone numbers of companies that sell instruments, equipment and supplies for all types of chemical analysis. There is a section for air sampling and analysis equipment.

Arthur D. Little, Inc., "The Economic Effects of Environmental Regulations on the Pollution Control Industry," Report to the Environmental Protection Agency, September 1978. (EPA Contract No. 68-01-4660).

Provides a national estimate of the size of the air pollution control industry under a very restrictive definition. The study also measures other forms of pollution control activity.

McIlvaine, Robert W.,"The Ever-Changing Air Pollution Control Market," Journal of the Air Pollution Control Association 32, No. 3 (1982): 304-309.

A study which considers the difficulties associated with a market definition of the air pollution control industry. Provides comparisons of estimated vs. actual market conditions for precipitor and fabric filter orders.

McIlvaine, Robert W., "Market Trends for Air Pollution Control Equipment," Journal of the Air Pollution Control Association 33, No. 3 (1983): 250-255.

Based on Industrial Gas Cleaning Institute Data, the study provides particulate control equipment orders from 1971-1981. These data include mechanical and wet scrubber orders, and are national in scope.

D. Minicucci, M. Herther, L. Babb and W. Kuby, "Assessment of Control Technology for Stationary Sources," Report prepared by Accurex for California Air Resources Board, July 1979 (Contract No. A7-170-30).

Classifies stationary sources located in California and describes applicable control techniques for each type of source.

National Academy of Sciences, National Research Council, Manpower for Environmental Pollution Control, (Washington, D.C.: NAS, 1977).

Provides a national estimate of 677,900 individuals employed in pollution control activities in 1974.

Pollution Engineering, 1980 Environmental Yearbook and Product Reference Guide (New York, NY: Technical Publishing, December, 1979).

Lists names, addresses, telephone numbers and product lines (51 categories) for manufacturers of industrial air pollution control equipment and accessories.

State of California, California Statistical Abstract, 1980 (Sacramento, CA: State of California, California Department of Finance, Financial Research Section, 1981).

Provides basic economic data pertaining to the State of California. Of special interest,wages and salaries by major industries and total employment in these industries.

Thomas Publishing Company, Thomas Register of American Manufacturers, 72nd Edition (New York, NY: Thomas Publishing Company, 1982).

Lists names, addresses, product lines and financial information for manufacturing firms.

U.S. Department of Commerce Bureau of the Census 1977 Census of Manufacturing Industries (Washington, D.C.: U.S. Government Printing Office, 1980).

Provides basic, periodic data on the manufacturing sector of the economy.

U.S. Department of Commerce, Bureau of the Census, 1977 Census of Service Industries (Washington, D.C.: U.S. Government Printing Office, 1980).

Provides basic, periodic data on the service sector of the economy.

U.S. Department of Commerce, Bureau of the Census, Selected Industrial Air Pollution Equipment, 1980. (OMB No. 41-R2676).

Provides periodic national estimates of the air pollution control equipment industry based on survey data. The equipment categories are very specific, i.e., 7-digit SIC codes.

Appendix A

BUREAU OF CENSUS SURVEY QUESTIONNAIRE

DUE DATE: 30 DAYS AFTER RECEIPT OF FORM

Form Approved: O.M.B. No. 41-R2676

FORM MA-35J
(7-7-80)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

SELECTED INDUSTRIAL AIR POLLUTION CONTROL EQUIPMENT – 1980

RETURN TO
Bureau of the Census
1201 East Tenth Street
Jeffersonville, Indiana 47132

EMPLOYER IDENTIFICATION NUMBER
Identification Number used for this establishment on Employer's Quarterly Federal Tax Return (U.S. Treasury Department Form 941).

EI No. | | | – | | | | | | | |

NOTICE – Response to this inquiry is required by law (title 13, U.S. Code, sections 131, 182, 224, and 225). By section 9 of the same law, your report to the Census Bureau is confidential. It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

(Please correct any error in name and address including ZIP code)

YOUR FILE COPY

NOTE – The industry totals compiled from data on this form will be published by the Bureau of the Census in the Current Industrial Reports Series MA-35J, Selected Industrial Air Pollution Control Equipment, as soon as possible after all reports are received. Copies are available upon request to the Bureau of the Census, ATTN: Industry Division, Washington, D.C. 20233.

GENERAL INSTRUCTIONS

Scope of survey

This survey is confined to equipment used in the separation, removal, or collection of particulate and gaseous emissions.

Not included in this survey is any equipment used to remove particulate matter from air for the comfort and protection of people (air conditioning) or the protection of scientific instruments (clean rooms) or any other allied or similar application. As such, electrostatic collectors, air washers, air filters, and other similar equipment used in air conditioning or clean room applications are excluded from this survey.

Filing your report

One copy of this report should be returned in the enclosed preaddressed envelope within 30 days after receipt. A separate report is to be filed for each plant producing any of the items covered on this form.

If you do not manufacture any of the items included in this survey, please note this fact under "Remarks" together with a brief description of the principal products manufactured at this establishment and RETURN THE REPORT.

Correspondence about your report

In any correspondence with the Bureau of the Census about your report, please include the title of the survey and the 11-digit file number shown in the address box of your report form.

Reporting period

Report data for the calendar year. However, if your fiscal year includes at least 10 months of the calendar year (ends between October 31 and February 28), fiscal year figures will be acceptable. If book figures are not available, except at considerable cost, reasonable estimates will be acceptable.

If there was a change in ownership during the year, or the establishment operated part of the year only, the data should apply to the period of operation by your company only.

Comparability

If you also report in the Annual Survey of Manufactures (Form MA-100), the sum of values for item codes shown in column (a) should correspond to the dollar value reported under product class codes indicated in column (b) below:

Current Industrial Reports (Form MA-35J) (Column d) Item codes (a)	Annual Survey of Manufactures (Form MA-100) Product class codes (b)
4299	35646

Name of person to contact regarding this report	Address *(Number, street, city, State, and ZIP code)*	Telephone *(Area code, number, and extension)*

CERTIFICATION – This report is substantially accurate and has been prepared in accordance with instructions.

Name of company	Address *(Number, street, city, State, and ZIP code)*	
Signature of authorized official	Title	Date

Part C – DEFINITIONS AND SPECIAL INSTRUCTIONS

Value of Shipments – The value of shipments figures should represent the net sales price f.o.b. plant, after discounts and allowances and exclusive of freight charges and excise taxes. The figures should include only the "flange-to-flange" value of the specified industrial air pollution control equipment and all directly related items involved in the normal functioning and operation of the unit; they should exclude the value of such items as: auxiliary equipment used primarily for production purposes; electrical wiring; labor costs of installation; etc.

New orders (Bookings) – Report orders received during the year minus all cancellations received during the same year.

PARTICULATE EMISSIONS COLLECTORS

Item code 4251 – **Electrostatic precipitator** – A device which separates aerosol particulate matter (solid or liquid) from industrial gases by imparting an electric charge to the particles and removing them from the gas stream with the force created by an electric field.

Item code 4254 – **Fabric filter** – A device in which the dust-bearing gas is passed through a fabric in such a manner that the dust particles are retained on the up stream or "dirty" gas side of the fabric, while the cleaned gas passes through the fabric to the down stream or clean gas side, where it is removed by natural and/or mechanical means. The fabric may be of any fibrous material either natural or manmade.

Item code 4255 – **Mechanical collector** – A device for the separation in a dry state of entrained particulate material from a gas stream by the application of one or a combination of the following forces: centrifugal, inertial, and gravitational.

Item code 4258 – **Wet scrubber** – A device for the removal of particulate contaminants from a gas stream by means of intimate contact with the scrubbing liquid. (If water is added in any form, consider it a scrubber, except wetted wall electronic precipitators and those devices which are primarily mechanical collectors.)

GASEOUS EMISSIONS CONTROL DEVICES

Item code 4263 – **Catalytic oxidation system (including heat recovery systems which are an integral part of the system)** – A device for the removal of combustible air contaminants in which the contaminant-laden stream is preheated by a suitable heating mechanism, then passed through a catalyst bed that initiates and promotes oxidation of the combustible contaminants to carbon dioxide, water vapor, and other compounds less noxious than those originally in the gas stream.

Item code 4265 – **Thermal and direct oxidation systems**

A **thermal oxidation system** is a device for the correction of combustible air contaminants in which the contaminant-laden gas stream is passed over a burner or other suitable preheat device to a thermal residence chamber where the contaminant materials are oxidized to carbon dioxide, water vapor, and other materials less noxious than those originally in the gas stream.

A **direct oxidation system** is a device for the destruction of concentrated combustible or oxidant streams in which the air contaminant is reacted directly with a fuel or with oxidizing air in a burner flame and the products of combustion exhausted into the atmosphere directly or through a suitable incineration chamber and stack.

Item code 4264 – **Scrubber (gas absorber non-FGD)** – A device for the removal of soluble or reactive gaseous material from gas streams by contacting the stream with water, aqueous chemical solutions, or other scrubbing liquids. This involves a chemical reaction.

Item code 4266 – **Flue gas desulfurization systems (FGD)** are chemical process plants designed primarily for the removal of sulfur oxides from gaseous products of combustion emitted to the atmosphere from the use of fossil fuels in boilers or other combustion devices operated for the generation of thermal or electric energy. The system extends from gas inlet to gas discharge, including all required auxiliaries and controls.

Item code 4269 – **Gas adsorber** – A device for the removal of air contaminants by adsorption on a surface-active solid, such as activated carbon or molecular sieves. Depending on the application, the adsorbent is either discarded or regenerated.

Section I – NEW ORDERS, SHIPMENTS, AND BACKLOG OF ORDERS FOR SELECTED INDUSTRIAL AIR POLLUTION CONTROL EQUIPMENT

Product code	Product	Item code	New orders – Bookings 1980		Shipments 1980		Backlog of orders Dec. 31, 1980	
			Number (Units) (a)	Value ($1,000) (b)	Number (Units) (c)	Value ($1,000) (d)	Number (Units) (e)	Value ($1,000) (f)
	Particulate emissions collectors							
3564651	Electrostatic precipitators	4251						
3564654	Fabric filters	4254						
3564655	Mechanical collectors	4255						
3564658	Wet scrubbers	4258						
	Gaseous emissions control devices							
3564662	Catalytic oxidation systems	4263						
3564664	Thermal and direct oxidation systems	4265						
3564665	Scrubber (gas absorber non-FGD)	4264						
3564666	Flue gas desulfurization systems	4266						
3564667	Gas adsorbers	4269						
3564668	Other types of industrial air pollution control equipment – Specify	4271						
3564668		4271						
3564600	Total industrial air pollution control equipment (Sum of item codes 4251–4271). Corresponds to value of shipments reported in product class 35646 on the Annual Survey of Manufactures	4299						

Remarks

Section II – SHIPMENTS BY END-USE

(Report in thousands of dollars)

End use	Item code	Particulate emissions collectors				Item code	Gaseous emissions collectors					Other types of industrial air pollution control equipment (Item code 4271)
		Electrostatic precipitator (Item code 4251)	Fabric filter (Item code 4254)	Mechanical collector (Item code 4255)	Wet scrubber (Item code 4258)		Catalytic oxidation systems (Item code 4263)	Thermal and direct oxidation systems (Item code 4265)	Scrubber (gas absorber non-FGD) (Item code 4264)	Flue gas desulfurization systems (Item code 4266)	Gas adsorber (Item code 4269)	
Steam power plants Electric utility	5002					5006						
Industrial	5003					5007						
Coal mining and cleaning	5010					5015						
Petroleum refining	5020					5025						
Foundries	5031					5032						
Iron and steel mills	5033					5034						
Primary nonferrous metal smelting plants	5040					5045						
Chemical and fertilizer production	5050					5055						
Cement manufacturing	5060					5065						
Grain milling and handling	5080					5085						
Pulp and papermill operations	6010					6015						
Other end-uses, as specified below:	6020					6025						
	6020					6025						
Total of various types of industrial air pollution control equipment (corresponds to value of shipments reported in section I)	6029					6039						

Appendix B

ARB CONTROL EQUIPMENT IDENTIFICATION CODES

CONTROL EQUIPMENT IDENTIFICATION CODES

Identification Number	Control Device/Method
000	No Equipment
001	Wet Scrubber - High Efficiency
002	Wet Scrubber - Medium Efficiency
003	Wet Scrubber - Low Efficiency
004	Gravity Collector - High Efficiency
005	Gravity Collector - Medium Efficiency
006	Gravity Collector - Low Efficiency
007	Centrifugal Collector - High Efficiency
008	Centrifugal Collector - Medium Efficiency
009	Centrifugal Collector - Low Efficiency
010	Electrostatic Precipitator - High Efficiency
011	Electrostatic Precipitator - Medium Efficiency
012	Electrostatic Precipitator - Low Efficiency
013	Gas Scrubber (general, not classified)
014	Mist Eliminator - High Velocity
015	Mist Eliminator - Low Velocity
016	Fabric Filter - High Temperature
017	Fabric Filter - Medium Temperature
018	Fabric Filter - Low Temperature
019	Catalytic Afterburner
020	Catalytic Afterburner with Heat Exchanger
021	Direct Flame Afterburner
022	Direct Flame Afterburner with Heat Exchanger
023	Flaring
039	Catalytic Oxidation - Flue Gas Desulfurization
040	Alkalized Alumina
041	Dry Limestone Injection
042	Wet Limestone Injection
043	Sulfuric Acid Plant - Contact Process
044	Sulfuric Acid Plant - Double Contact Process
045	Sulfur Plant
046	Process Change
047	Vapor Recovery System (including condensers, hooding, and other enclosures)
048	Activated Carbon Absorption
049	Liquid Filtration System
050	Packed-Gas Absorption Column
051	Tray-Type Gas Absorption Column
052	Spray Tower
053	Venturi Scrubber
054	Process Enclosed
059	Metal Fabric Filter Screen (Cotton Gins)
060	Process Gas Recovery
061	Dust Suppression by Water Sprays
062	Dust Suppression by Chemical Stabilizers or Wetting Agents
063	Gravel Bed Filter
064	Annular Ring Filter
065	Catalytic Reduction
066	Molecular Sieve
071	Fluid Bed Dry Scrubber

For the particulate control devices (wet scrubbers, gravity collectors, centrifugal collectors, and electrostatic precipitators), the efficiency ranges correspond to the following percentages:

High: 95 - 99 +
Medium: 80 - 95
Low: < 80

Appendix C

LIST OF CONTACTED FIRMS

Part 1.

FIRMS IN AIR POLLUTION CONTROL INDUSTRY WHICH RESPONDED EITHER FULLY OR PARTIALLY TO SURVEY

PART 1

CALIFORNIA

Accurex Corp. - Aerotherm Division, 485 Clyde Avenue, Mountain View, CA 94042 -- 415/964-3200

AeroComp, Inc., 3303 Harbor Blvd., Suite F-4, Costa Mesa, CA 92626 -- 714/957-6596

AeroVironment, Inc., 145 Vista Avenue, Pasadena, CA 91107 -- 213/449-4392

Air Chem Systems, 15222 Connector Lane, Huntington Beach, CA 92649 -- 714/897-1017

Alert Blower and Pipe Company, 430 Weber Avenue, Compton, CA 90222 -- 213-636-3100

Allen Engineering and Research, 7435 Mountjoy Drive, Huntington Beach, CA 92648 -- 714/842-6228

Alternative Energy and Environmental Engineering, 12 N. Ash Street, Ventura, CA 93001 -- 805/653-1722

Andros Analyzers, 2332 Fourth Street, Berkeley, CA 94710 -- 415/849-1377

Atlas Tank, Inc., P.O. Box 254, Paramount, CA 90723 -- 213/634-0956

Automobile Club of Southern California, Automobile Engineering Dept., 2601 S. Figueroa Street, Los Angeles, CA 90007 -- 213/741-4500

Automotive Environmental Systems, Inc., 7300 Bolsa Avenue, Westminster, CA 92683 -- 714/897-0333

Babcock-Hitachi, 2100 E. Katella, Suite 210, Anaheim, CA 92806 -- 714/978-3272

Bayco Industries of California, 2108 Davis Street, San Leandro, CA 94577 -- 415/562-6700

Bechtel Corporation, Environmental Services Dept., P.O. Box 3965, San Francisco, CA 94119 -- 415/768-1944

Berkeley Controls, Inc., P.O. Box 277, Laguna Beach, CA 92652 -- 714/494-9401

Beverly Pacific Corp., Industrial Systems Division, 140 W. Providencia Avenue, Burbank, CA 91502 -- 213/841-1400

Part 1 (Cont'd)

Braun, C.F. and Company, 1000 S. Fremont Avenue, Alhambra, CA 91801 -- 213/570-1000

Bright, Donald and Associates, 1200 N. Jefferson, Unit B, Anaheim, CA 92807 -- 714/632-8521

BTC Laboratories, 1775 Callens Road, Ventura, CA 93003 -- 805/644-1095

California Blow Pipe Mfg. Company, 1921 E. 67th Street, Los Angeles, CA 90001 -- 213/634-9340

California Carbon, 1520 W. 16th Street, Long Beach, CA 90813 -- 213/775-6678

California Clean Air, Inc., 3031 Tisch Way, Suite 3032, San Jose, CA 95128 -- 408/249-9064

California Environmental Technology, P.O. Box 7, Richmond, CA 94807 -- 415/233-6300

Carter Engineers, 10200 Willow Creek Road, San Diego, CA 92131 -- 714/578-6410

Caspino Company, P.O. Box 4382, Burbank, CA 91503 -- 213/845-7818

C-B Equipment, Inc., 10851 Drury Lane, Lynwood, CA 90262 -- 213/636-9947

CB Process Equipment Corporation, 918 Washington, San Carlos, CA 94070 -- 415/592-4545

C-E Power Systems, 2102 Business Center Drive, Suite 206, Irvine, CA 92715 -- 714/955-1711

Charlton Technology, 7313 Carroll Road, San Diego, CA 92121 -- 714/578-5040

Chemark Company, P.O. Box 2281, West Covina, CA 91793 -- 213/445-4076

Chemecology Corporation, 690 Garcia Avenue, Pittsburg, CA 94565 -- 415/439-5766

Chicago Bridge and Iron, 301 E. Colorado Blvd., Suite 614, Pasadena, CA 91101 -- 213/684-0840

Climet Instruments, P.O. Box 151, Redlands, CA 92373 -- 714/793-2788

Part 1 (Cont'd)

Coen Company, 1510 Rollins Road, Burlingame, CA 94010 -- 415/697-0440

Combustion Power Company, Inc., 1346 Willow Road, Menlo Park, CA 94025 -- 415/324-4744

Custom Engineering, 500 Stuart Street, Redlands, CA 92373 -- 714/793-2967

Dasibi Environmental Corp., 616 E. Colorado Street, Glendale, CA 91205 -- 213/247-7601

Earth Metrics, Inc., 859 Cowan Road, Burlingame, CA 94010-- 415/697-7103

Ecolaire Environmental, 380 Civic Drive, Pleasant Hill, CA 94523 -- 415/676-6315

Electric Power Research Institute, P.O. Box 10412, Palo Alto, CA 94303 -- 415/855-2000

EMS Laboratories, 12563 Crenshaw Blvd., Hawthorne, CA 90250 -- 213/973-6694

Energy and Environmental Research Corporation, 18 Mason, Irvine, CA 92714 -- 714/859-8851

Energy Resources Company, 3344 N. Torrey Pines Court, La Jolla, CA 92037 -- 714/455-7170

Engelhard Minerals and Chemicals Corp., 428 McCormick, San Leandro, CA 94577 -- 415/638-6663

Engineering Science, Inc., 125 W. Huntington Drive, Arcadia, CA 91006 -- 213/445-7560

Environics, Inc., 3601 W. Moore Avenue, Santa Ana, CA 92704 -- 714/957-6916

Environmental Measurements, Inc., 215 Leidesdorff Street, San Francisco, CA 94111 -- 415/398-7664

Environmental Monitoring Company, Inc., 1012 Pacific Street, San Luis Obispo, CA 93401 -- 805/544-2037

Environmental Research and Technology, 2325 Townsgate Road, Suite 360, Westlake Village, CA 91361 -- 213/889-5313

Environmental Research Group, 1400 53rd, Emeryville, CA 94608 -- 415/652-2300

Part 1 (Cont'd)

Envirosphere Company, 130 Newport Center Drive, Newport Beach, CA 92660 -- 714/759-7700

Fallon Engineering Company, 8040 San Fernando Road, Sun Valley, CA 91362 -- 213/768-3900

Farr Company, P.O. Box 92187, Airport Station, Los Angeles, 90009 -- 213/772-5221

Fischer and Porter Company, 11050 Artesia Blvd., Suite C, Cerritos, CA 90701 -- 213/865-6993

Flex-Liner Corp., 44 S. Raymond, Pasadena, CA 91105 -- 213/796-3177

Foxboro Analytical, 9420 Telstar Avenue, Suite 100, El Monte, CA 91731 -- 213/443-4191

Frederiksen Engineering Company, Inc., 1755 Broadway, Oakland, CA 94612 -- 415/465-0644

Gerber Industries, 3176 Pullman Street, Suite 108, Costa Mesa, CA 92626 -- 714/966-1144

Graver Tank and Manufacturing Co., Div. of Aerojet General, 10300 N. Torrey Pines Rd., La Jolla, CA 92037 -- 714/455-8500

Green, Del and Associates, 1155-C Chess Dr., Suite A. Foster City, CA 94404 -- 415/574-4737

Harrington Plastics, 168 E. Freedom Ave., Anaheim, CA 92801 -- 714/879-9030

Hasstech, Inc., 11575 Sorrento Road, #219, San Diego, CA 92121 -- 714/452-1921

Heater Technology Inc., 106 Norris Rd., Bakersfield, CA 93308 -- 805/399-4492

Hirt Combustion Engineers, 931 S. Maple Ave., Montebello, CA 90640 -- 213/728-9164

Hariba Instruments, Inc., 1021 Duryea Avenue, Irvine, CA 92714 -- 714/540-7874

Infrared Industries, Inc., P.O. Box 989, Santa Barbara, CA 93102 -- 805/684-4181

Interscan Corp., P.O. Box 2496, Chatsworth, CA 91311 -- 213/882-2331

Part 1 (Cont'd)

Joy Manufacturing Company, Western Precipitation Division, P.O. Box 2744, Terminal Annex, Los Angeles CA 90051 -- 213/240-2300

King-Knight Company, Emission Control Systems Division, 831 Vallejo Ave., Novato, CA 94947 -- 415/892-8861

Kleensteel, Inc., 919 S. Fremont Ave., Alhambra, CA 91803 -- 213/283-0701

Kurz Instruments, Inc., P.O. Box 849, Carmel Valley, CA 93924 -- 408/659-3421

KVB Inc., 18006 Sky Park Blvd., Irvine, CA 92714 -- 714/641-6200

Lear Siegler, Executive Offices, P.O. Box 2158, Santa Monica, CA 90406 -- 213/391-7211

LFE Environmental Analysis Laboratories, 2030 Wright Avenue, Richmond, CA 94804 -- 415/235-2633

Little, Arthur D., Inc., 4 Embarcadero, Suite 600, San Francisco, CA 94111 -- 415/981-2500

Lodge-Cottrell, P.O. Box 5608, Walnut Creek, CA 94596 -- 415/937-6010

Membrana Inc., 7070 Commerce Circle, Industrial Park, Pleasanton, CA 94566 -- 415/846-8270

Metal Masters Fabricators, 5631 E. Leeds, South Gate, CA 90280 -- 213/869-1086

Meteorology Research, Inc., 464 W. Woodbury Road, Altadena, CA 91001 -- 213/791-1901

Metro Monitoring Services, 436 N. Barranca Ave., Covina, CA 91723 -- 213/332-8411

Monitor Labs, Inc., 10180 Scripps Ranch Blvd., San Diego, CA 92131 -- 714/578-5060

Multiple Chamber Incinerator Company, P.O. Box 647, Los Angeles, CA 90028 -- 714/831-2294 (answering service)

Murphy-Rodgers, Inc., 2301 Belgrave Ave., Huntington Park, CA 90255 -- 213/587-4118

National Tank and Manufacturing Company, 8201 S. Santa Fe Ave., Huntington Park, CA 90255 -- 213/583-1841

North American Mfg. Company, 2421 Haley Street, Suite 7, Bakersfield, CA 93305 -- 805/871-5191

OSA Steel Fabrication, 11540 Hart, North Hollywood, CA 91605 -- 213/875-1483

Pacific Environmental Laboratory, 657 Howard, San Francisco, CA 94105 -- 415/495-6627

Pacific Environmental Services, Inc., 1930 14th St., Santa Monica, CA 90404 -- 213/450-1800

Pacific Erectors Corp., 10847 S. Painter Ave., Santa Fe Springs, CA 90670 -- 213/944-8816

Pacific Pneumatics, Inc., 17051 Green Drive, City of Industry, CA 91745 -- 213/965-1931

Paramount Plastics, 13215 Laureldale Avenue, Downey, CA 90242 -- 213/636-1039

Parsons, Ralph M. Company, 100 W. Walnut Street, Pasadena, CA 91124 -- 213/440-2096

Phillips, J. E. Company, Inc., 6027 Venice Blvd., Los Angeles, CA 90034 -- 213/931-1429

Photomation, Inc., P.O. Box 460, Mountain View, CA 94040 -- 415/967-8992

Process Equipment Company, 55 New Montgomery, San Francisco, CA 94105 -- 415/397-1496

PTS Industries, 1280 N. Sunshine Way, Anaheim, CA 92806 -- 213/865-0877

Quixote, 2851 White Star Avenue, Suite B, Anaheim, CA 92806 -- 714/630-6700

Radian, 3401 La Grande Blvd., Sacramento, CA 95823 -- 916/421-8700

Red Jacket, A Marley Company, 16632 Milliken Avenue, Irvine, CA 92714 -- 714/641-8033

Reliance Fabricators, 2713 S. Bonnie Beach Place, Los Angles, CA 90023 -- 213/268-1304

Richter Engineering Company, 2941 E. 11th Avenue, Los Angeles, CA 90023 -- 213/269-9431

Rockwell International, Environmental Monitoring and Services Center, 2421 W. Hillcrest Drive, Newbury Park, CA 91320 -- 805/498-6771

Rosswood Industries, Inc., 126 Pioneer Place, Pomona, CA 91768 -- 714/594-7561

Schoellerman, W.W. Company, 5619 West 77th Ave., Los Angeles, CA 90045 -- 213/641-7278

Scott-Marrin, Inc., 2001 Third Street, Unit H, Riverside, CA 92507 -- 714/784-1240

SCS Engineers, 4014 Long Beach Blvd., Long Beach, CA 90807 -- 213/426-9544

Shamrock Engineering Co., 845 Malcolm Road, Burlingame, CA 94010 -- 415/697-3326

Sierra Environmental Products, 1825 E. Shore Highway, Berkeley, CA 94710 -- 451/843-1282

Sierra Instruments, P.O. Box 909, Carmel Valley, CA 93924 -- 408/659-3177

Sierra Research, 1009 14th Street, Sacramento, CA 95814 -- 916/444-6666

Smith Environmental Corp., P.O. Box 295, Duarte, CA 91010 -- 213/357-1186

Smog-Hog Air Clean System Company, 22337 Meekland Avenue, Hayward, CA 94541 -- 415/538-3545

Spectrex Corp., 3594 Haven Ave., Redwood City, CA 94063 -- 415/365-6567

Spencer Boiler & Engineering, Inc., 12106 Center, Southgate, CA 90280 -- 213/636-0216

SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025 -- 415/326-6200

Sur-Lite Corp., 8124 Allport Ave., Santa Fe Springs, CA 90670 -- 213/693-0796

Systems Applications, Inc., 101 Lucas Valley Road, San Rafael, CA 94903 -- 415/472-4011

Part 1 (Cont'd)

Systems, Science, & Software, P.O. Box 1620, La Jolla, CA 92038 -- 714/453-0060

Tank Service, Inc., 707 E. Rosecrans, Los Angeles, CA 90059 -- 213/538-4280

Technical Heaters, Inc., 710 Jessie, San Fernando, CA 91340 -- 213/361-7185

Teledyne Analytical Instruments, P.O. Box 1580, City of Industry, CA 91749 -- 213/961-9221

Tepco, 6274 E. Peachtree Street, City of Commerce, CA 90040 -- 213/724-0861

TERA Corporation, 2150 Shattuck Ave., Berkeley, CA 94704 -- 415/845-5200

Tetra Tech, Inc., 630 N. Rosemead, Pasadena, CA 91107 -- 213/449-6400

Thermotics, Inc., 6804 Fishback Avenue, Bakersfield, CA 93308 -- 805/327-7001

Theta Sensors, 17635 E. Rowland A, City of Industry, CA 91748 -- 213/965-1539

Thorpe, J.T. and Son, Inc., 1351 Ocean Avenue, Emeryville, CA 94662 -- 415/547-2400

Troy Sheet Metal Works, 1026 S. Vail Ave., Montebello, CA 90640 -- 213/723-9638

Truesdail Labs, Inc., 4101 N. Figueroa Street, Los Angeles, CA 90065 -- 213/225-1564

TRW, Environmental Engineering Division, One Space Park, Redondo Beach, CA 90278 -- 213/535-0721

Ultra Chem Corporation, 1150 Civic Drive, Walnut Creek, CA 94596 -- 415/935-3115

Ultrasystems, Inc., 2400 Michelson Drive, Irvine, CA 92715 -- 714/752-7500

URS Corporation, 155 Bovet Road, San Mateo, CA 94402 -- 415/574-5000

Vacu-Blast Corp., P.O. Drawer 885, Belmont, CA 94002 -- 415/592-2121

VICI Metronics, 2991 Corvin Drive, Santa Clara, CA 95051 -- 408/737-0552

Wahlco, Inc., 3600 W. Segerstrom, Santa Ana, CA 92704 -- 714/979-7300

Westates Carbon Company, 1919-T Raymond Ave., Los Angeles, CA 90007 -- 213/737-2631

West Coast Technical Services, 17605 Fabrica Way, Suite D, Cerritos, CA 90701 -- 213/921-9831

Westec Services, Inc., 3211 5th Ave., San Diego, CA 92103 -- 714/294-9770

Western Combustion Engineering, Inc., 640 Realty, Carson, CA 90745 -- 213/834-9389

Winzler and Kelly, P.O. Box 1345, Eureka, CA 95501 -- 717/443-8323

Xonics, Inc., 6862 Hayvenhurst Ave., Van Nuys, CA 91406 -- 213/787-7380

Zink, John Company, P.O. Box 7653, Long Beach, CA 90807 -- 213/428-4646

OUT-OF-STATE FIRMS THAT SELL TO CALIFORNIA

American Air Filter Co., 215 Central Ave., Louisville, KY 40208 -- 502/637-0011

Anderson 2000 , Inc.,P.O. Box 20769, Atlanta, GA 30320 -- 404/997-2000

CH2M - Hill, P.O. Box 428, Corvallis, OR 97339 -- 503/752-4271

DCE Vokes, Inc., 11301 Electron Drive, Jeffersontown, KY 40299 -- 502/267-0707

Dover Corp./OPW Division, P.O. Box 40240, Cincinnati, OH 45240 -- 513/870-3100

Duall Industries, Inc., 700 S. McMillan St., Owosso, MI 48867 -- 517/725-8184

Emco Wheaton, Inc., P.O. Box 688, Conneaut, OH 44030 -- 216/599-8151

Part 1 (Concluded)

Foster Wheeler Energy Corp., 110 S. Orange Ave., Livingston, NJ 07039 -- 201/533-1100

GATX Tank Erection Corp., 120 S. Riverside Plaza, Chicago, IL 60606 -- 312/621-6451

Koppers Co., Inc., Environmental Elements Div., 1900 Koppers Bldg., Pittsburgh, PA 15219 -- 412/227-2592

Research Cottrell, P.O. Box 1500, Somerville, NJ 08876 -- 201/685-4280

TRC Environmental Consultants, 800 Connecticut Blvd., East Hartford, CT 06108 -- 203/289-8631

Tri-Mer Corp., 1400 Monroe St., Owasso, MI 48867 -- 517/723-7838

Part 2.

FIRMS WHICH RESPONDED
THAT THEY DID NOT PROVIDE
AIR POLLUTION GOODS OR SERVICES

CALIFORNIA

Aerospace Corp., P.O. Box 92957, Los Angeles, CA 90009 -- 213/648-5000

Ameron Protective Linings Div., 595 W. Lambert Road, Brea, CA 92621 -- 714/529-5291

Applied Equipment Corp., 5900 Canoga, Woodland Hills, CA 91367 213/992-1111

Bolt Beranek and Newman, Inc., 21120 Vanowen, Canoga Park, CA 91305 -- 213/347-8360

Brown and Caldwell, 150 S. Arroyo Parkway, Pasadena, CA 91109 -- 213/577-1020

Buehler Tank and Welding Works, 321 W. Katella Ave., Orange, CA 92668--714/538-8805

Carle Instruments, Inc., 1200 Knollwood Circle, Anaheim, CA 92801 -- 714/761-9000

Century Fiberglass Products, Inc., 1210 N. Tustin Ave., Anaheim, CA 92807 -- 714/630-0012

Circle Seal Controls, P.O. Box 3666, Anaheim, CA 92803. -- 714/774-6110

Clayton Manufacturing Company, P.O. Box 5530, El Monte, CA 91734 213/443-9381

Cleasby Manufacturing Co., Inc., 1414 Bancroft Ave., San Francisco, CA 94124 -- 415/822-6565

Coast Constractors, Inc., 3636 Westminster Blvd., Santa Ana, CA 92703 -- 213/426-4406

Daniel, Mann, Johnson & Mendenhall, 3250 Wilshire Blvd., Los Angeles, CA 90010 -- 213/381-3663

Delphi Inernational, 9514 Rush St., S. El Monte, CA 91733 -- 213/350-5177

Duke Standards, P.O. Box 11666, Palo Alto, CA 94306 -- 415/328-2400

Environmental Resources Group, 6380 Wilshire Blvd., Los Angeles CA 90048 -- 213/653-1086

Part 2 (Cont'd)

Envirotech Corp., 3000 San Hill Rd., Menlo Park, CA 94025 -- 415/854-2000

Eureka Laboratories, 216 27th St., Sacramento, CA 95816 -- 916/443-3932

Finnegan Corp., 355 River Oaks Parkway, San Jose, CA 95134 -- 408/946-4848

Ford Aerospace and Communications Corp., Ford Road, Newport Beach, CA 92663 -- 714/759-5500

General Monitors, Inc., 3019 Enterprise St., Costa Mesa, CA 92626 714/540-4895

Hewlett-Packard Co., 1601 California Ave., Palo Alto, CA 94304 415/857-6199

Hexcel Corp., Trevarno Division, 11711 Dublin Blvd., Dublin, CA 94566 -- 415/828-4200

Krebs Engineers, 1205 Chrysler Drive, Menlo Park, CA 94025 -- 415/325-0751

Lazarri Fuel Co., Inc., P.O. Box 34051, San Francisco, CA 94134 -- 415/467-2970

Lindberg International Corp., 1052 Dwight Way, Berkeley, CA 94710 415/848-2869

Los Angeles Boiler Works, P.O. Box 3037, Terminal Annex, Los Angeles, CA 90012 -- 213/221-1186

McCaron Steel Fabrication, P.O. Box 518, Baldwin Park, CA 91706 -- 213/337-1275

Metal Bellows Corp., 20960 Knapp Street, Chatsworth, CA 91311 -- 213/341-4900

Milner, Bob and Assoc. Co., 21822 Sherman Way, Canoga Park, CA 91303 -- 213/348-4296

Montedoro-Whitney Corp., 2741-E McMillon Rd., San Luis Obispo, CA 93401 -- 805/543-1233

Montgomery, James E., Consulting Engineers, Inc., 555 E. Walnut St., Pasadena, CA 91101 -- 213/796-9141

North American Weather Consultants, 600 Norman Firestone Rd., Goleta, CA 93117 -- 805/967-1246

Part 2 (Cont'd)

Nuclepore Corp., 7035 Commerce Circle, Pleasanton, CA 94566 -- 415/462-2230

Pacific Scientific, 1350 S. State College Blvd., Anaheim, CA 92803 -- 714/535-8141

Parker Hannifin, 10567 Jefferson Blvd., Culver City, CA 90230 -- 213/204-3000

PJB Laboratories, Jacobs Engineering, 251 S. Lake Ave., Pasadena, CA 91101 -- 213/449-2171

Pollution Equipment News, 701 High St., Auburn, CA 95603 -- 916/823-8160

Process Products, Inc., 20604-T Belshaw Ave., Carson, CA 90746 213/638-7707

Prosser Industries, P.O. Box 3818, Anaheim, CA 92803 -- 714/774-8600

Purad, Inc., 724 Kilbourne Drive, Upland, CA 91786 -- 714/985-2012

Purcell & Noppe and Associates, Inc., P.O. Box 1028, Chatsworth, CA 91311 -- 213/882-7820

Rand Corp., 1700 Main St., Santa Monica, CA 90406-- 213/393-0411

R W Manufacturing Co., 9835 Kale, S. El Monte, CA 91733 -- 213/283-0111

SAI Technology Company, 1200 Prospect, La Jolla, CA 92037 -- 714/454-3811

Santa Fe Energy Co., 10737 Shoemaker Ave., Santa Fe Springs, CA 90670 -- 213/944-0311

S and T Western, 1400 N. Bristol, Suite 150, Newport Beach, CA 92660 -- 714/955-2732

Solar Turbines International, P.O. Box 80966, San Diego, CA 92138 -- 714/238-5500

Sowers Steam Service, 325 Panorama Drive, Bakersfield, CA 93305 -- 805/322-6478

Stanton Oil Recycle, P.O. Box 187, McKittric, CA 93251 -- 805/762-7318

Stinson Research Assoc., P.O. Box 15148, Long Beach, CA 90815 -- 213/430-1428

Part 2 (Concluded)

Teknekron, Inc., 2118 Milvia St., Berkeley, CA 94704 -- 415/548-4100

Thermal Equipment Corp., 1301 W. 228th, Torrance, CA 90501 -- 213/775-6745

Trico Superior, Inc., 8420 S. Atlantic Blvd., Cudahy, CA 90201 -- 213/773-8611

Weathermeasure Corp., 3213 Orange Grove Ave., North Highlands, CA 95660 -- 916/481-7565

Wethertronics, Inc., P.O. Box 1437, West Sacramento, CA 95691 -- 916/371-2660

Woodward-Clyde Consultants, Environmental Systems Div., Three Embarcadero Center, Suite 700, San Francisco, CA 94111 -- 415/956-7070

OUT-OF-STATE

Energy and Environmental Analyses, 1111 N. 19th St., Arlington, VA 22209 -- 703/528-1900

Universal Oil Products Co., Process Development, Process Div., 20 UOP Plaza, Algonquin and Mt. Prospect Rd., Des Plaines, IL 60016 -- 312/391-2000

Part 3.

FIRMS NOT RESPONDING TO SURVEY AT ALL

Part 3

Note: Some of these may not consider themselves to be part of the APCI.

CALIFORNIA

Air Pollution Technology, Inc. (also Calvert Environmental Equipment Co.), 4901 Morena Blvd., Suite 402, San Diego, CA 92117 -- 714/272-0050

Analytical Research Labs, Inc., P.O. Box 2360, Monrovia, CA 92634 -- 213/357-3247

Beckman Instruments, Inc., 2500 Harbor Blvd., Fullerton, CA 714/871-4848

California Measurements, Inc., 150 E. Montecito Ave., Sierra Madre, CA 91024 -- 213/355-3361

Campbell, H.W. & Associates, 10666 Chapman Ave., Garden Grove, CA 92640 -- 714/638-7901

Dames & Moore, 445 S. Figueroa St., Suite 3500, Los Angeles CA 90071 -- 213/683-1560

Fluor Engineers & Constructors, 3333 Michelson Drive, Irvine, CA 92715 -- 714/975-5265

Form & Substance, Inc., 756 Lakefield Rd., Suite B, Westlake Village, CA 91361 -- 213/889-0514

Grayd-A-Metal Fabricators, 13233 E. Florence Ave., Santa Fe Springs CA 90670 -- 213/944-8951

Guy, Mel E., Industrial Sheet Metal, 2766 St. Louis Ave., Long Beach, CA 90806 -- 213/426-6363

HMT, Inc., 14013 Marquardt Ave., Santa Fe Springs, CA 90670-- 213/802-2446

Jamac Industries, Inc., 13344 Cambridge, Santa Fe Springs, CA 90670 -- 213/802-1961

Melrose Metal Products, 44533 Grimmer, Fremont, CA 94538 -- 415/657-8771

Mendardi - Southern, 1201 W. Francisco St., Torrance, CA 90502 -- 213/321-8910

Pitter Metal Products, Inc., 3570 Fruitland Ave., Maywood, CA 90270 -- 213/587-5161

Procon, Inc., 9650 Flair Drive, El Monte, CA 91731 -- 213/350-0000

Resinwood Manufacturing Company, P.O. Box 2783, Fullerton, CA 92633 -- 714/526-1512

Scott Environmental Technology, Inc., 2600 Cajon Blvd., San Bernardino, CA 92411 -- 714/887-2571

Thermo Electron Corp., 1930 S. Brea Canyon Rd., Diamond Bar, CA 91765 -- 714/598-2711 (headquarters at 108 S. Street, Hopkinton MA 01748 -- 617/435-5321)

Torit Corp., Donaldson Industrial Group, 312 N. Gaffey, Suite 201, San Pedro, CA 90731 -- 213/548-3981 (headquarters at P.O. Box 1299, Minneapolis, MN 55440 -- 612/698-0391)

Turner Designs, 2247 Old Middlefield Way, Mountain View, CA 94043 -- 415/965-9800

U.S. Steel-American Bridge Division, P.O. Box 2826, Terminal Annex, Los Angeles, CA 90051 -- 213/588-0111

VTN Consolidated, Inc., 2301 Campus Drive, Irvine, CA 92713 -- 714/851-5200

Weissenbach, Joseph & Assoc., Thetachron Division, 373 S. Hoover St., Suite 301, Los Angeles, CA 90020 -- 213/384-9507

Western Technology Assoc., 2897 E. La Cresta, Anaheim, CA 92806 714/632-8740

Wheelaborator-Frye, Inc., 1650 S. Amphlett, San Mateo, CA 94402 415/349-3381 (Creswell Div. at P.O. Box 4104, Riverside, CA 92504 -- 714/786-0880)

Wire Technology Corp., 9527 Laurel St., Los Angeles, CA 90002 -- 213/564-6894

OUT-OF-STATE

Aget Manufacturing Co., 1408 E. Church St., Adrian, MI 49211 -- 517/263-5781

Andersen Samplers, Inc., 4215 C Wendell Drive, Atlanta, GA 30336 404/691-1910

Part 3 (Concluded)

Bendix Corp., Process Instruments Div., P.O. Drawer 831, Lewisburg, WV 24901 -- 304/647-4358

CEA Carter-Day Co., 500 73d Ave., NE, Minneapolis, MN 55432 -- 612/571-1000

Ceilcote Co., 140 Sheldon Rd., Berea, OH 44017 -- 216/243-0700

C-E Natco, Combustion Engineering,Inc., P.O. Box 1710, Tulsa, OK 74101 -- 918/663-9100

Fisher-Klosterman, Inc., P.O. Box 11045, Louisville, KY 40211 -- 502/776-1505

Flex-Kleen Corp., 222 S. Riverside Plaza, Chicago, IL 60606 -- 312/648-5343

General Metal Works, Inc., 8368 Bridgeton Rd., Cleves, OH 45002 -- 513/941-2229

Koch Engineering Co., 161 E. 42nd Street, New York, NY 10017 -- 212/682-5755 (CA office at 6880 Orangethorpe Ave., Unit C, Buena Park, CA 90620 -- 714/739-8853)

McCrone, Walter & Associates, Inc., 2820 S. Michigan Ave., Chicago, IL 60616 -- 312/842-7100

McIlvane Co., 2970 Maria Ave., Northbrook, IL 60062 -- 312/272-0010

Mikropul Corp., U.S. Filter Corp., 10 Chatham Rd., Summit, NJ 07901 -- 201/273-6360

Neptune AirPol, Inc., 145 Cedar Lane, Englewood, NJ 07631 -- 201/871-3855

Appendix D

SURVEY QUESTIONNAIRES AND COVER LETTERS

(Mail Survey Questionnaire)

A SURVEY OF THE CALIFORNIA AIR POLLUTION CONTROL INDUSTRY

GENERAL INSTRUCTIONS

Scope of Survey

This survey is confined to manufacturing and services provided by or to California firms to assist them in complying with air pollution control regulations. Sales and services to households are not included. Also not included in this survey is any economic activity associated with water pollution, air conditioning for comfort, or protection of scientific instruments (i.e., clean rooms).

Reporting Period

The data requested should reflect your economic activity for calendar year 1980. If your firm's fiscal year differs from the calendar year, please make 1980 estimates.

Q1. Do you provide air pollution control equipment, component parts, or services to firms within the State of California?

Yes_____ No_____

Q1a. Do you provide these services to firms outside of the State of California?

Yes_____ No_____

IF YOU HAVE ANSWERED "NO" TO Q1 AND Q1a, YOU NEED NOT ANSWER THE REMAINING QUESTIONS. PLEASE RETURN YOUR QUESTIONNAIRE EVEN THOUGH YOU DO NOT ANSWER Q2 - Q14. THANK YOU FOR YOUR COOPERATION.

Q2. What is your firm's primary and secondary four-digit SIC (Standard Industrial Classification) code?

Primary SIC Code_____ Secondary SIC Code_____

Q3. Please describe the major types of air pollution control equipment, component parts, or services that your firm provides. Where possible, indicate the expected useful life of equipment.

Equipment or Service	Useful Life of Equipment (years)

Q4. In 1980, how many persons were employed by your firm?

Full-Time ___ Part-Time _____

Q4a. Please estimate the full-time work equivalency of these part-time employees (e.g., 20 part-time employees equal approximately 5 full-time employees).

_____Full-Time Equivalent

Q4b. What percentage of your employees are based in California?

_____Percent

Q5. Which of the following groups includes your company's gross sales for 1980?

____ Less than $100,000
____ $100,000 - $250,000
____ $250,000 - $500,000
____ $500,000 - $750,000
____ $750,000 - $1 million
____ $1 - $2.5 million
____ $2.5 - $5 million
____ $5 - $10 million
____ $10 - $25 million
____ $25 - $50 million
____ $50 - $75 million
____ $75 - $100 million
____ more than $100 million

Q6. What percentage of your company's gross sales may be associated with air pollution control equipment, component parts, or services?

_____ Percent

Q7. What percentage of your firm's air pollution control activity may be associated with California end users?

_____ Percent

Q7a. Approximately what dollar volume do these California sales represent

$_____ dollars

Q8. Please identify your major customers for air pollution goods and services by their product line and indicate whether each customer is located in California or elsewhere. If possible, distribute your air pollution sales among these customers such that the total equals 100 percent. Use the following as a guide for specifying product lines: chemicals, coatings, crude oil, food products, gasoline, metal products, minerals, solvents, wood products, other (please specify)

Customer's Product Line	Customer Location CA	Customer Location Elsewhere	Percent of Air Pollution Sales
			%
			%
			%
			%
			%
			%
			%

Total = 100%

Q9. Please distribute your major purchases by major industry such that the total equals 100 percent. For each purchase, please note the percentage that came from California. Use the following as a guide for specifying industries: chemicals, consulting services, electrical equipment and supplies, insturments, machinery, metal and fabricated metal parts, rubber and plastic products, paper goods, printing, other (please specify).

Industry	Percent Total Purchases	Percent Purchased from California Firms
	%	%
	%	%
	%	%
	%	%
	%	%
	%	%

Total = 100%

Q10. What percentage of your company's total purchases is associated with your sales of air pollution control equipment or services?

_____ Percent

Q11. How long has your firm been in business? _____ Years

Q11a. How long have you provided air pollution control equipment and services?

_____ Years

Q12. From your point of view, please name your three major <u>competitors</u> in providing air pollution control equipment, component parts, or services to California customers.

	Name	City and State
1)		
2)		
3)		

Q13. Over the last three years, what percentage of your capital expenditures would you say was made to enhance your sales of air pollution control equipment or services?

1980_____% 1979_____% 1978_____%

Q14. From your firm's point of view, which outlook best describes the profitability of your air pollution control activity over the next five years?

_____Will be very profitable
_____Will be somewhat profitable
_____Will break even
_____Will result in modest losses
_____Will result in significant losses
_____Will result in termination of these activities

Thank you very much for your cooperation. Please return your completed questionnaire in the envelope provided to:

CIC Research, Inc.
1215 Cushman Avenue
San Diego, CA 92101

(Mail Survey Cover Letter #1 - General Form)

CIC RESEARCH, INC.

Economic Research • Marketing Research • Environmental Research • Survey Research

As a result of a recent telephone call, CIC Research understands that you are the individual that can best describe the level of economic activity associated with your firm's air pollution control products and services. As part of a study that we are conducting for the California Air Resources Board, we are attempting to characterize those firms in California that provide goods and services to other firms to help them comply with air pollution regulation. We call these firms the "air pollution control industry."

As a member of the air pollution control industry, your help is important to help us determine the level of economic activity. Please complete the enclosed questionnaire and return it to CIC Research in the enclosed envelope. Although your participation in the survey is voluntary, we need your cooperation if the study is going to be meaningful and accurate. All information provided will be kept strictly confidential and will be used only in an aggregate form. The questionnaire will not be labeled with your company name, and your responses will be combined with responses from many other companies to give an overall picture of the relative importance of the air pollution control industry in the total economy of California.

Should you have any questions regarding the study or the questionnaire itself, please feel free to call me at (714) 296-8844. Dr. Malcom Dole is the Air Resources Board research contract manager and may be reached at (916) 323-1532.

Thank you for you time and assistance.

Sincerely,

Gordon H. Kubota

Gordon H. Kubota, Ph.D.
Project Director

1215 CUSHMAN AVENUE • SAN DIEGO, CALIFORNIA 92110
TELEPHONE (714) 296-8844

(Mail Survey Cover Letter #2 - Manufacturers of Auxiliary Equipment)

CIC RESEARCH, INC.

Economic Research • Marketing Research • Environmental Research • Survey Research

As a result of a recent telephone call, CIC Research understands that you are the individual that can best describe the level of economic activity associated with your firm's air pollution control products and services. As part of a study that we are conducting for the California Air Resources Board, we are attempting to characterize those firms in California that provide goods and services to other firms to help them comply with air pollution regulation. We call these firms the "air pollution control industry."

As a member of the air pollution control industry, your help is important to help us determine the level of economic activity. Please complete the enclosed questionnaire and return it to CIC Research in the enclosed envelope. Although your participation in the survey is voluntary, we need your cooperation if the study is going to be meaningful and accurate. All information provided will be kept strictly confidential and will be used only in an aggregate form. The questionnaire will not be labeled with your company name, and your responses will be combined with responses from many other companies to give an overall picture of the relative importance of the air pollution control industry in the total economy of California.

We realize that your firm manufactures component parts or auxiliary equipment and you may not know their end uses. We will appreciate having your best guess based on whatever information you may have about your customers' applications.

Should you have any questions regarding the study or the questionnaire itself, please feel free to call me at (714) 296-8844. Dr. Malcom Dole is the Air Resources Board research contract manager and may be reached at (916) 323-1532.

Thank you for you time and assistance.

Sincerely,

Gordon H. Kubota

Gordon H. Kubota, Ph.D.
Project Director

1215 CUSHMAN AVENUE • SAN DIEGO, CALIFORNIA 92110
TELEPHONE (714) 296-8844

(Mail Survey Cover Letter #3 - Consultants with Equipment Sidelines)

CIC RESEARCH, INC.

Economic Research • Marketing Research • Environmental Research • Survey Research

As a result of a recent telephone call, CIC Research understands that you are the individual that can best describe the level of economic activity associated with your firm's air pollution control products and services. As part of a study that we are conducting for the California Air Resources Board, we are attempting to characterize those firms in California that provide goods and services to other firms to help them comply with air pollution regulation. We call these firms the "air pollution control industry."

As a member of the air pollution control industry, your help is important to help us determine the level of economic activity. Please complete the enclosed questionnaire and return it to CIC Research in the enclosed envelope. Although your participation in the survey is voluntary, we need your cooperation if the study is going to be meaningful and accurate. All information provided will be kept strictly confidential and will be used only in an aggregate form. The questionnaire will not be labeled with your company name, and your responses will be combined with responses from many other companies to give an overall picture of the relative importance of the air pollution control industry in the total economy of California.

We realize that your firm provides consulting services and also manufactures hardware. You may fill out separate questionnaires for each of these activities if it is more convenient than combining them on one questionnaire.

Should you have any questions regarding the study or the questionnaire itself, please feel free to call me at (714) 296-8844. Dr. Malcom Dole is the Air Resources Board research contract manager and may be reached at (916) 323-1532.

Thank you for you time and assistance.

Sincerely,

Gordon H. Kubota

Gordon H. Kubota, Ph.D.
Project Director

1215 CUSHMAN AVENUE • SAN DIEGO, CALIFORNIA 92110
TELEPHONE (714) 296-8844

(Mail Survey Cover Letter #4 - A & E Firms)

CIC RESEARCH, INC.

Economic Research • Marketing Research • Environmental Research • Survey Research

As a result of a recent telephone call, CIC Research understands that you are the individual that can best describe the level of economic activity associated with your firm's air pollution control products and services. As part of a study that we are conducting for the California Air Resources Board, we are attempting to characterize those firms in California that provide goods and services to other firms to help them comply with air pollution regulation. We call these firms the "air pollution control industry."

As a member of the air pollution control industry, your help is important to help us determine the level of economic activity. Please complete the enclosed questionnaire and return it to CIC Research in the enclosed envelope. Although your participation in the survey is voluntary, we need your cooperation if the study is going to be meaningful and accurate. All information provided will be kept strictly confidential and will be used only in an aggregate form. The questionnaire will not be labeled with your company name, and your responses will be combined with responses from many other companies to give an overall picture of the relative importance of the air pollution control industry in the total economy of California.

We realize that your firm has many divisions and diversified activities. Please feel free to modify the questionnaire in any way that will facilitate your providing information on the air pollution control part of your business.

Should you have any questions regarding the study or the questionnaire itself, please feel free to call me at (714) 296-8844. Dr. Malcom Dole is the Air Resources Board research contract manager and may be reached at (916) 323-1532.

Thank you for you time and assistance.

Sincerely,

Gordon H. Kubota

Gordon H. Kubota, Ph.D.
Project Director

1215 CUSHMAN AVENUE • SAN DIEGO, CALIFORNIA 92110
TELEPHONE (714) 296-8844

(Mail Survey Follow-Up Letter)

CIC RESEARCH, INC.

Economic Research • Marketing Research • Environmental Research • Survey Research

Several weeks ago a questionnaire was mailed to you by CIC Research as part of a study for the California Air Resources Board. The questionnaire dealt with the kinds of air pollution control products or services that your firm provides and the associated level of economic activity. According to our records the questionnaire has not been returned; therefore, we are enclosing another copy for your convenience.

Although a substantial number of California air pollution control firms have already responded to our survey, we need your input to permit us to determine the overall level of economic activity for the industry. All information provided will be kept strictly confidential and will be reported only in an aggregate form. By completing the questionnaire, you will be assisting us in identifying the relative importance of the air pollution control industry in the California economy. Please feel free to modify the questionnaire in any way that will facilitate describing your firm's air pollution control activity within the State of California. We realize that there are many diversified activities included in the air pollution control industry and a single questionnaire may not fit some situations.

Should you have any questions regarding the study or the questionnaire itself, please feel free to call me at (714) 296-8844. Dr. Malcom Dole is the Air Resources Board research contract manager and may be reached at (916) 323-1532.

Thank you for your time and assistance.

Sincerely,

Gordon H. Kubota

Gordon H. Kubota, Ph.D.
President

GHK/shm

1215 CUSHMAN AVENUE • SAN DIEGO, CALIFORNIA 92110
TELEPHONE (714) 296-8844

(Telephone Survey Questionnaire)

NON-RESPONSE SET SURVEY: APCI

NAME:_____

TITLE:_____

ADDRESS:_____

TELEPHONE:_____

	ATTEMPT #1	ATTEMPT #2	ATTEMPT #3
DATE	_____	_____	_____
TIME	_____	_____	_____
DISPOSITION	_____	_____	_____
CALL BACK	_____	_____	_____

Hello. I'm calling back from CIC Research in San Diego regarding the study we're conducting for the California Air Resources Board. We realize that you may have been too busy to return the questionnaire we sent you, but I would appreciate your taking about two minutes to provide the answers to the most important questions in an abbreviated form of the questionnaire.

Q1. May I confirm that your company provides air pollution control equipment or services, including consulting services, to firms within the State of California?

Yes 1 No 2 DK -1 RF -2

Q2. Does your firm provide these products or services outside the State of California?

Yes 1 No 2 DK -1 RF -2

(If "No" to Q1 and Q2, thank the respondent and terminate)

Q3. In 1980, approximately how many full-time workers were employed by your firm?

_____ 1980 full-time RF -2

-1 DK

Q4. How long has your firm been in business?

_____ Years RF -2

-1 DK

Q5. We'd like to know the approximate value of your gross sales in 1980. Please stop me when I reach the appropriate level:

Less than $100,000	1	$2.5 - $5 million	7
$100,000 - $250,000	2	$5 - $10 million	8
$250,000 - $500,000	3	$10 - $25 million	9
$500,000 - $750,000	4	$25 - $50 million	10
$750,000 - $1 million	5	$50 - $75 million	11
$1 - $2.5 million	6	$75 - $100 million	12
		More than $100 million	13

DK -1

RF -2

Q6. Do you expect next year's air pollution control activity to be....

1 Very profitable?

2 Somewhat profitable?

3 Break even?

4 To incur modest losses?

5 To incur significant losses?

6 Or to be discontinued?

DK -1 RF -2

Thank you very much for your cooperation.

(Purchaser Telephone Questionnaire)

APCI PURCHASER SURVEY

LOAN DATE _____ A1_____

NAME _____ LOAN AMOUNT $_____ A2_____

TITLE _____ EQUIP CODE _____ A3_____

COMPANY _____ SIC Code _____ A4_____

TELEPHONE _____ NO. OF EMP. _____ A5_____

	Attempt #1	Attempt #2	Attempt #3
Date			
Time			
Disposition			
Callback			

Hello. I'm calling from CIC Research in San Diego for a study we're conducting for the California Air Resources Board. They want to find out whether California companies purchase air pollution control equipment from California vendors or whether they buy it out-of-state. The Pollution Control Finance Authority tells us that your company received a loan to purchase air pollution control equipment during the past 5 years. I would appreciate your taking a minute of your time to answer 2 brief questions about these purchases.

Q1. We would like to know whether the air pollution loan funds were spent outside of California, in California but outside your own firm, or within your own firm. Could you tell me what percentage of the funds were spent...

. . . outside California? _____% -1 DK/Ref. A6_____

(IF ANY, ASK:) Which state(s)? _____ 9 DK/Ref. A7_____

. . . inside California but outside your firm? _____% -1 DK/Ref. A8_____

. . . within your firm? _____ % -1 DK/Ref. A9_____

Q2. Did you have additional in-house costs that weren't covered by the loan?

* Yes 0 No -1 DK/Refused A10_____

(IF YES, ASK:) What was the approximate amount? $_____ -2 DK/Ref.

Thank you very much for your time and cooperation!

APPENDIX E

NUMBER OF RESPONSES BY QUESTION

(Mail Survey Questionnaire)

Number of Responses by Question

A SURVEY OF THE CALIFORNIA AIR POLLUTION CONTROL INDUSTRY

General Instructions

Scope of Survey

This survey is confined to manufacturing and services provided by or to California firms to assist them in complying with air pollution control regulations. Sales and services to households are not included. Also not included in this survey is any economic activity associated with water pollution, air conditioning for comfort, or protection of scientific instruments (i.e., clean rooms).

Reporting Period

The data requested should reflect your economic activity for calendar year 1980. If your firm's fiscal year differs from the calendar year, please make 1980 estimates.

Q1. Do you provide air pollution control equipment, component parts, or services to firms within the State of California?

Yes (97) No (59)

Q1a. Do you provide these services to firms outside of the State of California?

Yes (86) No (9)

IF YOU HAVE ANSWERED "NO" TO Q1 AND Q1a, YOU NEED NOT ANSWER THE REMAINING QUESTIONS. PLEASE RETURN YOUR QUESTIONNAIRE EVEN THOUGH YOU DO NOT ANSWER Q2 - Q14. THANK YOU FOR YOUR COOPERATION.

Q2. What is your firm's primary and secondary four-digit SIC (Standard Industrial Classification) code?

Primary SIC Code (97) Secondary SIC Code (N/A)

Q3. Please describe the major types of air pollution control equipment, component parts, or services that your firm provides. Where possible, indicate the expected useful life of equipment.

Equipment or Service	Useful Life of Equipment (years)
(96)	

Q4. In 1980, how many persons were employed by your firm?

Full-Time 91 Part-Time 54

Q4a. Please estimate the full-time work equivalency of these part-time employees (e.g., 20 part-time employees equal approximately 5 full-time employees).

N/A Full-Time Equivalent

Q4b. What percentage of your employees are based in California?

94 Percent

Q5. Which of the following groups includes your company's gross sales for 1980?

2	Less than $100,000	13	$2.5 - $5 million
10	$100,000 - $250,000	5	$5 - $10 million
6	$250,000 - $500,000	7	$10 - $25 million
7	$500,000 - $750,000	7	$25 - $50 million
7	$750,000 - $1 million	3	$50 - $75 million
20	$1 - $2.5 million	7	$75 - $100 million
		3	more than $100 million

Q6. What percentage of your company's gross sales may be associated with air pollution control equipment, component parts, or services?

95 Percent

Q7. What percentage of your firm's air pollution control activity may be associated with California end users?

92 Percent

Q7a. Approximately what dollar volume do these California sales represent

$ 83 dollars

Q8. Please identify your major customers for air pollution goods and services by their product line and indicate whether each customer is located in California or elsewhere. If possible, distribute your air pollution sales among these customers such that the total equals 100 percent. Use the following as a guide for specifying product lines: chemicals, coatings, crude oil, food products, gasoline, metal products, minerals, solvents, wood products, other (please specify)

Customer's Product Line	Customer Location CA	Customer Location Elsewhere	Percent of Air Pollution Sales
N/A	—		%
	—		%
	—		%
	—		%
	—		%
	—		%
	—		%

Total = 100%

Q9. Please distribute your major purchases by major industry such that the total equals 100 percent. For each purchase, please note the percentage that came from California. Use the following as a guide for specifying industries: chemicals, consulting services, electrical equipment and supplies, insturments, machinery, metal and fabricated metal parts, rubber and plastic products, paper goods, printing, other (please specify).

Industry	Percent Total Purchases	Percent Purchased from California Firms
N/A	%	%
	%	%
	%	%
	%	%
	%	%
	%	%

Total = 100%

Q10. What percentage of your company's total purchases is associated with your sales of air pollution control equipment or services?

83 Percent

Q11. How long has your firm been in business? 97 Years

Q11a. How long have you provided air pollution control equipment and services? 96 Years

Q12. From your point of view, please name your three major competitors in providing air pollution control equipment, component parts, or services to California customers.

	Name	City and State
1)	69	
2)		
3)		

Q13. Over the last three years, what percentage of your capital expenditures would you say was made to enhance your sales of air pollution control equipment or services?

1980 68 % 1979 65 % 1978 66 %

Q14. From your firm's point of view, which outlook best describes the profitability of your air pollution control activity over the next five years?

11 Will be very profitable
62 Will be somewhat profitable
13 Will break even
3 Will result in modest losses
1 Will result in significant losses
2 Will result in termination of these activities

Thank you very much for your cooperation. Please return your completed questionnaire in the envelope provided to:

CIC Research, Inc.
1215 Cushman Avenue
San Diego, CA 92101

Telephone Survey Questionnaire
Number of Responses by Question
NON-RESPONSE SET SURVEY: APCI

NAME:_____

TITLE:_____

ADDRESS:_____

TELEPHONE:_____

	ATTEMPT #1	ATTEMPT #2	ATTEMPT #3
DATE			
TIME			
DISPOSITION			
CALL BACK			

Hello. I'm calling back from CIC Research in San Diego regarding the study we're conducting for the California Air Resources Board. We realize that you may have been too busy to return the questionnaire we sent you, but I would appreciate your taking about two minutes to provide the answers to the most important questions in an abbreviated form of the questionnaire.

Q1. May I confirm that your company provides air pollution control equipment or services, including consulting services, to firms within the State of California?

Yes 1 (65) No 2 DK -1 RF -2

Q2. Does your firm provide these products or services outside the State of California?

Yes 1 No 2 DK -1 RF -2

(If "No" to Q1 and Q2, thank the respondent and terminate)

(59) /

Q3. In 1980, approximately how many full-time workers were employed by your firm?

(511) _____ 1980 full-time RF -2

-1 DK

Q4. How long has your firm been in business?

(60) _____ Years RF -2

-1 DK

Q5. We'd like to know the approximate value of your gross sales in 1980. Please stop me when I reach the appropriate level:

Less than $100,000	1	$2.5 - $5 million	7	10
$100,000 - $250,000	2	$5 - $10 million	8	5
$250,000 - $500,000	3	$10 - $25 million	9	4
$500,000 - $750,000	4	$25 - $50 million	10	3
$750,000 - $1 million	5	$50 - $75 million	11	0
$1 - $2.5 million	6	$75 - $100 million	12	1
		More than $100 million	13	0

DK -1

RF -2

Q6. Do you expect next year's air pollution control activity to be....

1 Very profitable?

2 Somewhat profitable?

3 Break even?

4 To incur modest losses?

5 To incur significant losses?

6 Or to be discontinued?

DK -1 RF -2

Thank you very much for your cooperation.

(Purchaser Telephone Questionnaire)
Number of Responses by Question
APCI Purchaser Survey

LOAN DATE _____ A1____

NAME _____ LOAN AMOUNT $ _____ A2____

TITLE _____ EQUIP CODE _____ A3____

COMPANY _____ SIC Code _____ A4____

TELEPHONE _____ NO. OF EMP. _____ A5____

	Attempt #1	Attempt #2	Attempt #3
Date			
Time			
Disposition			
Callback			

Hello. I'm calling from CIC Research in San Diego for a study we're conducting for the California Air Resources Board. They want to find out whether California companies purchase air pollution control equipment from California vendors or whether they buy it out-of-state. The Pollution Control Finance Authority tells us that your company received a loan to purchase air pollution control equipment during the past 5 years. I would appreciate your taking a minute of your time to answer 2 brief questions about these purchases.

Q1. We would like to know whether the air pollution loan funds were spent outside of California, in California but outside your own firm, or within your own firm. Could you tell me what percentage of the funds were spent...

. . . outside California? (40) % -1 DK/Ref. A6____

(IF ANY, ASK:) Which state(s)? N/A 9 DK/Ref. A7____

. . . inside California but outside your firm? (40) % -1 DK/Ref. A8____

. . . within your firm? (41) % -1 DK/Ref. A9____

Q2. Did you have additional in-house costs that weren't covered by the loan?

(20) Yes 0 No -1 DK/Refused A10____

(IF YES, ASK:) What was the approximate amount? $ _____ -2 DK/Ref.

Thank you very much for your time and cooperation!

Appendix F

ANALYSIS OF NON-RESPONSE SET

ANALYSIS OF NON-RESPONSE SET

REVIEW OF NON-RESPONSE SURVEY

An underlying element of probability sampling theory is that all errors of estimation arise solely from random sampling variation. Thus, observations made on sample units represent the correct value for that unit. However, in actuality, non-sampling errors occur during the administration of a survey. A major non-sampling error is called non-response error. This error refers to the failure to measure some of the units in the selected sample. In order not to introduce unwanted bias into the survey results, the existence of non-response error must be addressed explicitly.*

The non-response set for the APCI mail survey consisted of 101 firms that had not responded to the initial survey. A telephone survey of these firms was conducted to determine if the responses between these firms and the mail survey respondents differed, in a statistical sense. The questionnaire used for the telephone survey (see page D-12) contained key points from the original questionnaire and the questions were identically worded except for Question 6. In essence, the questionnaire was an abbreviated version of the mail questionnaire and basically asked for readily available information. An attempt was made to contact all of the 101 firms by telephone, and, where

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* For a complete discussion, see William G. Cochran, Sampling Techniques (New York: John Wiley & Sons, 1963), Chapter 13.

possible, a questionnaire was completed. A total of 60 APCI firms completed the questionnaire, and these firms formed the non-response data set.

ANALYSIS OF NON-RESPONSE SURVEY RESULTS

In comparing the firms' characteristics in the response and non-response sets, a total of seven different factors were assessed. These characteristics are as follows:

- SIC codes
- Participation in APCI
- Provision of services outside California
- Full-time workers
- Years in business
- Gross sales
- Future expectations

The analysis looked at the total industry, manufacturing sector, and the service sector separately. Table F.1 shows the breakdown of firms in each group.

Table F.1

NUMBER OF FIRMS IN EACH SET
BY ANALYSIS CATEGORY

	Number of Firms	
	Response Set	Non-Response Set
Manufacturing Sector	56	47
Service Sector	41	13
Total Industry	97	60

Statistical tests were performed to determine if significant differences existed between the response and non-response sets for each of the above characteristics. Basically, two types of tests were employed during the analysis: central tendency and distributional tests. For those characteristics which could be stated in terms of a mean or proportion, standard two-sample tests were computed. The remainder of the characteristics entailed a distribution (categories) of responses for each question. A Chi-Square test was primarily utilized for these distributional characteristics. Other association statistical tests were also computed and reviewed.

Table F.2 presents the findings of the statistical analysis between the response and non-response sets for the total industry. In all but two areas, the two data sets were compatible. Compatibility of the data set implies that non-response error is insignificant. First, it appeared that the non-response set was comprised of a larger proportion of manufacturing firms and a smaller proportion of service firms. Second, the gross

sales distributions between the two sets differed. The non-response survey exposed a greater proportion of firms in the $1 million to $25 million sales group. Part of this sales difference can be attributed to the additional manufacturing firms surveyed. Adjustment factors for these two characteristics were compiled (see Table F.5) to correct for the introduction of non-response error.

Table F.3 summarizes the results from the analysis of the manufacturing sector response and non-response sets. Except for the gross sales variable, the two data sets do not show any significant differences. Again, the gross sales difference appears to lie in the type of manufacturing firms surveyed during the non-response survey -- those having a $1 million to $5 million sales range. An adjustment must be made for this result (see Table F.5). The difference between the years in business distributions seems to occur because the non-response set is less dispersed, i.e., smaller variance.

Table F.4 shows the comparison of the two data sets for the service sector. Of all the groups, the service sector appears to be the most compatible between the response and non-response sets. However, this result may be due to the small sample size of the non-response set.

Based on the above analysis the conclusion was reached that no significant differences exist between the two groups. However, differences in gross sales distribution and SIC codes distribution were identified. Adjustment factors were computed and used to correct any known bias in the data set.

These factors are shown in Table F.5. A sample calculation is appended to the table to explain the methodology. The purpose of the adjustment factors was to allow the new information, uncovered by the non-response survey, to be meaningfully incorporated into the study data base. In essence, the factors correct for the non-response error introduced from the outcome of the initial survey. By multiplying together the appropriate adjustment factor and the response survey estimate for a particular characteristic, the non-response error is mitigated.

Table F.2

COMPARISON OF SELECTED FIRM CHARACTERISTICS
FOR APCI RESPONSE AND NON-RESPONSE SETS:
TOTAL INDUSTRY

Firm Characteristic	Response Set (97)	Non-Response Set (60)
1) Standard industrial classification code*		
30's	57.7%	78.3%
70's	32.0	16.7
80's	10.3	5.0
2) Firms in APCI	100.0%	100.0%
3) Firm provides products or services outside California	90.5%	90.0%
4) Average number of full-time workers - mean, (std.dev.)	251 (810)	331 (1,246)
No. of full-time workers:		
0 to 10	27.5%	18.5%
11 to 25	20.9	20.4
26 to 50	11.0	13.0
51 to 100	14.3	16.7
101 to 250	9.9	16.7
251 to 500	6.6	3.7
501 to 1,000	5.5	7.4
1,000 +	4.4	3.7
5) Average years in business: mean, (std.dev.)	24 (23)	24 (20)
Years in business by categories:		
0 to 3	4.1%	3.3%
4 to 6	11.3	6.7
7 to 10	21.6	11.7
11 to 15	18.6	25.0
16 to 25	13.4	21.7
26 to 50	17.5	23.3
51 to 75	9.3	3.3
76 to 100	3.1	5.0
100 +	1.0	--

TABLE F.2 (CONT'D.)

Firm Characteristic	Response Set (97)	Non-Response Set (60)
6) Gross sales by categories*		
<$500,000	19.1%	9.5%
$500,000 to $1 million	14.9	4.8
$1 million to $2.5 million	21.3	31.0
$2.5 million to $5 million	13.8	23.8
$5 million to $25 million	12.8	21.4
$25 million +	18.1	9.5
Average Gross Sales from categorical groupings**	$7.5M	$7.1M
7) Expectation of future activity***		
Profitable	81. %	72.7%
Breakeven	14.4	21.8
Non-profitable	4.4	5.5

*Statistically significant distributional differences at $\alpha = .1$

**No statistical test performed

***Responses between two data sets not strictly comparable

Table F.3

COMPARISON OF SELECTED FIRM CHARACTERISTICS
FOR APCI RESPONSE AND NON RESPONSE SETS:

MANUFACTURING SECTOR

Firm Characteristic	Response Set (56)	Non-Response Set (47)
1) Standard industrial classification code		
34 (metal products)	19.6%	38.3%
35 (machinery)	57.2	38.3
37 (transportation)	1.8	--
38 (instruments)	21.4	23.4
2) Firm in APCI	100.0%	97.9%
3) Firm provides products or services outside California	87.3%	89.4%
4) Average number of full-time workers - mean, (std.dev.)	117 (267)	331 (1,370)
No. of full-time workers		
0 to 10	34.0	14.0
11 to 25	26.4	25.6
26 to 50	13.2	16.3
51 to 100	7.5	18.6
101 to 250	3.8	11.6
251 to 500	9.4	4.7
501 to 1,000	3.8	7.0
1,000 +	1.9	2.3
5) Average years in business - mean, (std.dev.)	24 (24.1)	27 (21.1)
Years in business by categories*		
0 to 3	5.4%	2.1%
4 to 6	14.3	6.4
7 to 10	19.6	6.4
11 to 15	17.9	25.5
16 to 25	12.5	21.3
26 to 50	16.1	27.7
51 to 75	12.5	4.3
76 to 100	--	6.4
100 +	1.8	--

TABLE F.3 (CONT'D.)

Firm Characteristic	Response Set (56)	Non-Response Set (47)
6) Gross sales by categories*		
<$500,000	20.8%	9.1%
$500,000 to $1 million	18.9	3.0
$1 million to $2.5 million	24.5	36.4
$2.5 million to $5 million	11.3	27.3
$5 million to $25 million	7.5	12.1
$25 million +	17.0	12.1
Average gross sales from categorical groupings**	$6.4m	$6.5m
7) Expectations of future activity***		
Profitable	83.0%	75.0%
Breakeven	13.2	20.5
Non-profitable	3.8	4.5

*Statistically significant distributional differences at $\alpha = .1$

**No statistical test performed

***Responses between two data sets not strictly comparable

Table F.4

COMPARISON OF SELECTED FIRM CHARACTERISTICS
FOR APCI RESPONSE AND NON-RESPONSE SETS:
SERVICE SECTOR

Firm Characteristic	Response Set (41)	Non-Response Set (13)
1) Standard industrial classification code		
73 (misc. services)	75.6%	76.9%
89 (design engineering)	24.4	23.1
2) Firms in APCI	100.0%	100.0%
3) Firm provides products or services outside California	95%	92.3%
4) Average number of full-time workers - mean, (std.dev.)	439 (1197)	331 (581)
No. of full-time workers		
0 to 10	18.4%	36.4%
11 to 25	13.2	--
26 to 50	7.9	--
51 to 100	23.7	9.1
101 to 250	18.4	36.4
251 to 500	2.6	--
501 to 1,000	7.9	9.1
1,000 +	7.9	9.1
5) Average years in business* - mean, (std.dev.)	24 (22.3)	14 (9)
Years in business by categories		
0 to 3	2.4%	7.7%
4 to 6	7.3	7.7
7 to 10	24.4	30.8
11 to 15	19.5	23.1
16 to 25	14.6	23.1
26 to 50	19.5	7.7
51 to 75	4.9	--
76 to 100	7.3	--
100 +	--	--

TABLE F.4 (CONT'D.)

Firm Characteristic	Response Set (41)	Non-Response Set (13)
6) Gross sales by categories		
$500,000	17.1%	11.1%
$500,000 to $1 million	9.8	11.1
$1 million to $2.5 million	17.1	11.1
$2.5 million to $5 million	17.1	11.1
$ 5 million to $25 million	19.5	55.6
$25 million	19.5	--
Average gross sales from categorical groupings**	$8.9m	$9.1m
7) Expectation of future activity***		
Profitable	78.4	63.6
Break even	16.2	27.3
non-profitable	5.4	9.1

*Statistically significant at $\alpha = .1$

**No statistical test performed

***Responses between two data sets not strictly comparable

Table F-5

ADJUSTMENT FACTORS FOR REQUIRED APCI CHARACTERISTICS*

	APCI Characteristic	Industry	Adjustment Factor: Manufacturing Sector	Adjustment Factor: Service Sector
1)	SIC Code			
	Two Digit			
	34	1.86	1.48	
	35	.97	.84	
	37	-	-	
	38	1.21	1.03	
	73	.75		
	89	.77		
	One Digit			
	3	1.18		
	7	.75		
	8	.77		
2)	Employment **	1.12	1.82	.94
3)	Gross Sales	.98	1.03	
	<500 K	.73	.72	
	500 K to 1 M	.67	.58	
	1 to 2.5	1.22	1.22	
	2.5 to 5	1.38	1.68	
	5 to 25	1.33	1.33	
	25>	.77	.88	

*Sample calculation for computing adjustment factor for single digit SIC code characteristic. In general, the adjustment factor (AF) is defined as follows:

$$AF_i = \frac{\overline{E_i}}{RSE_i}$$

where AF_i = adjustment factor for i^{th} characteristic

$\overline{E_i}$ = mean estimate of i^{th} characteristic

and $$\overline{E}_i = \frac{RSE_i + NSE_i}{2}$$

where RSE_i = response survey estimate of i^{th} characteristic

NSE_i = non-response survey estimate of i^{th} characteristic

Example:

from Table F.2 we know that

$57.7 = RSE_i$

$78.3 = NSE_i$

hence, $\overline{E} = 68 = \frac{57.7 + 78.3}{2}$

therefore,

$$AF = 1.18 = \frac{68}{57.7}$$

Similar calculations were made for the other adjustment factors in Table F.5.

** $\overline{E_i}$ based on weighted average of RSE_i and NSE_i although differences were not statistically different at $\alpha = .1$

Appendix G

RELATIONSHIP OF DATA TO I-O MODELING

RELATIONSHIP OF DATA TO I-O MODELING

In Chapter 6 the direct effects of the APCI were presented. However, the total economic impact of the industry was not determined because it was beyond the scope of the study. This appendix discusses some techniques which can be used, along with the data from the study, to estimate the indirect impacts of the APCI. The derivation of the indirect impacts presumes the existence of a model of the economy and the position of the APCI in that model. Since the ARB possesses an input-output model of California, CIC Research sought to obtain data that would facilitate use of the I-O model. This discussion will therefore be oriented towards this application.

The organization of the discussion is as follows: 1) a description of the elements of the input-output model, 2) a discussion of the applications of these elements to the data obtained in this study, and 3) an evaluation of the appropriateness of those data to the applications.

ELEMENTS OF THE STATIC-OPEN INPUT-OUTPUT MODEL

The I-O model is derived from the basic balance equations:

(1) $X-AX = FD$

Where X is a vector of outputs by the producing sectors; A is a matrix of technical coefficients, a_{ij}, where a_{ij} = sales from industry i to industry j, divided by the total value of output of industry j, and FD is a vector of final demand. Final demand is the purchases of goods and services that are <u>finished</u> from

the point of view of the production sector of the economy as distinguished from X_{ij} which are purchases of raw materials from sector i by industry j to be used up in the production process of industry j. Equation (1) is solved for X for a given level of final demand.

(2) $(I-A)^{-1}FD = X.$

With the assumption of linear and homogenous production relationships (a_{ij}'s) the model can derive the relationship $\frac{dX}{dFD}$ representing change in output by sector associated with a unit change in final demand by sector as the elements, r_{ij}, of the n by n matrix $(I-A)^{-1}$*

Sector specific output multipliers, M_j, are obtained by

$$M_j = \sum_{i=1}^{n} r_{ij} \quad \text{for } j = 1,2,\ldots n.$$

Employment and/or income multipliers must be arrived at by first converting the elements, r_{ij}, to labor or income coefficients, ℓ_{ij}, and Y_{ij}, respectively. These are derived from equation (2).

(2a) $\frac{\ell}{X}(I-A)^{-1}FD = \frac{\ell}{X}X = \ell$ or $\frac{Y}{X}(I-A)^{-1}FD = \frac{Y}{X}X = Y$

where $\frac{\ell}{X}$ is a vector of elements $\frac{\ell_j}{X_j}$ which are direct labor units per dollar of output by sector j for j = 1,2,...n; and $\frac{Y}{X}$ is a vector of elements $\frac{Y_j}{X_j}$ which are direct income payments by sector j per dollar of output by sector j.

The elements of the matrix obtained by the operation $\frac{\ell}{X}(I-A)^{-1}$ are direct and indirect labor coefficients ℓ_{ij}, and the elements of the matrix obtained by the operation $\frac{Y}{X}(I-A)^{-1}$ are (direct and indirect) income coefficients. The sector specific employment (ME_j) and income (MY_j) multipliers are then determined by the operations shown at the top of the following page.

*These r_{ij} elements are defined as the direct and indirect requirements per dollar of delivery to final demand.

$$ME_j = \sum_{i=1}^{n} \ell_{ij} \div \frac{\ell_j}{X_j} \text{ for } j = 1,2,\ldots n; \text{ and } MY_j = \sum_{i=1}^{n} Y_{ij} \div \frac{Y_j}{X_j}$$

APPLICATIONS OF I-O ELEMENTS TO APCI DATA

The first crude, but simple, estimation of the total impact of the APCI in California is to use the j^{th} multipliers from the set M_j, ME_j, and MY_j from the California I-O model. The direct sales, employment, and income estimates, respectively, for the two APCI sectors (i.e., j represents manufacturing and services). This is complicated by the fact that the California I-O model contains several manufacturing and several service sectors. One way around this is to go back to the transactions matrix from the California I-O model and aggregate all manufacturing and all services into two sectors (manufacturing and services). This is probably the only feasible approach since the detailed APCI SIC codes crossed several sectors and disaggregation would not be feasible.

A more sophisticated approach to determining the total impacts of the APCI would be to attempt to derive multipliers specifically for the two APCI sectors. This would require building each sector into the California model as two additional industries.

One piece of information gathered by the survey tends to make this a fairly simple procedure. Because virtually all sales by APCI are to final demand sectors -- either exports or private capital formation -- the interindustry transactions (sales) figures of the two sectors are all zeros. The problem will be

in estimating the appropriate production (input) function of the two APCI sectors. These data were obtained in the survey and are shown in Tables G.1, G.2, G.3 and G.4. Responses to the purchase questions for manufacturing and service APCI firms were grouped by industry. This industry grouping was further separated into purchases from all firms as a whole, and from those firms located in California.

There are two problems with the data. First, there was a high non-response to the relevant questions. Second, the data were obtained as percentages of an unknown base. Little can be done about the first problem. However, the second problem might be skirted by estimating the relationship of total sales to total purchases. In computing the purchase information, the assumption was made that total sales equated total purchases. The specific purchase data was calculated on a firm-by-firm basis. While this assumption may distort the dollar value, it should not significantly affect the relative (percent) relationship between the industries.

The second step in the procedure to compute the APCI multipliers would be to subtract the APCI elements from the sectors from which they are taken. Once again, the problem is that there are several manufacturing sectors and several service sectors in the California model that would require adjustment. Fortunately, the amounts which would be subtracted from these sectors represent such a tiny fraction of these sector's transactions that simply ignoring this step would probably not add significantly to the error associated with the procedure.

The final step would be to derive APCI multipliers by using the California I-O model augmented for the two APCI sectors using the procedure described in the previous Section. Multiplying the APCI sector specific multipliers times the direct sales, employment and income estimates presented in the text would yield the approximate total direct and indirect impacts of the APCI on the California economy. These impacts could also be disaggregated by sector by using the matrix forms instead of the multiplier forms of the augmented California Model (i.e., instead of using the j^{th} multiplier from M_{rj}, ME_j, and MY_j, one would use the j^{th} column of elements r_{ij}, ℓ_{ij}, and Y_{ij} for j = APCI manufacturing and j = APCI services, respectively.

ADDITIONAL APCI IMPACTS

The procedure described above defines only what are called Type 1 multipliers and impacts. There is also a Type 2 multiplier which estimates the total effects, including payments of income to households and consumption expenditures attributable to the APCI. In order to develop the Type 2 multipliers, the initial model must be augmented by a household row (income) and a household column (consumption expenditures). The augmented matrix and two APCI sectors are then taken through the procedure described in the first two Sections, and the result is an estimate of the total direct, indirect, and induced impacts of the APCI on the California economy.

One additional important effect of the APCI on the California economy is the accelerator effect. This is the effect

attributable to APCI purchases of capital goods and services. These effects could be very significant, since the APCI requires relatively large amounts of capital goods. Unfortunately, the survey only disclosed the proportion of total capital investment of the firms associated with APC, and insufficient data were obtained to estimate accelerator effects.

Data were collected concerning sales distribution by APCI firms. While this information would not enter into the inter-industry transactions, per se, this type of sales information is of interest. Tables G.5 and G.6 show the distribution of sales by APCI manufacturing and service sectors, respectively. As was the case with the purchasing information, the response rate was low.

Table G.1

ESTIMATED DOLLAR VALUE OF MAJOR PURCHASES
BY APCI'S MANUFACTURING SECTOR FROM ALL INDUSTRIES

Industry Purchased From	SIC	Number of Responses	Total Purchases			
			Amount	Percent	Mean	Standard Deviation
Construction	16	1	17,438	9.4%	--	--
Textile	22	1	350	0.2	--	--
Lumber	24	1	42	-0-	--	--
Paper	26	7	6,946	3.7	992.3	2,322.0
Printing	27	1	88	-0-		
Chemicals	28	5	1,703	0.9	340.6	527.1
Petroleum	29	1	3,125	1.7	--	--
Rubber/plastics	30	14	9,178	4.9	655.6	1,158.2
Concrete	32	4	4,985	2.7	1,246.3	2,270.3
Fabricated Metals	34	27	63,316	34.0	2,345.0	6,074.5
Machinery	35	10	2,065	1.1	206.5	236.4
Electrical Equipment	36	16	8,778	4.7	548.6	1,425.6
Measuring Instruments	38	9	1,495	0.8	166.1	103.6
Air Transportation	45	1	50,000	26.9	--	--
Misc. Services	39	2	105	0.1	52.5	56.7
Non-Classifiable	99	7	16,572	8.9	2,367.4	5,381.0
Total		107	186,186	100.0		

Source: CIC Research, Inc., "A Survey of APCI Firms," 1982.

Table G.2

ESTIMATED DOLLAR VALUE OF MAJOR PURCHASES
BY APCI'S MANUFACTURING SECTOR
FROM IN-CALIFORNIA INDUSTRIES

Industry Purchased From	SIC	Number of Responses	In-California Purchases			
			Amount	Percent	Mean	Standard Deviation
Construction	16	1	3,488	10.3 %	--	--
Textile	22	1	350	1.0	--	--
Lumber	24	0	--	-0-	--	--
Paper	26	7	536	1.6	76.6	135.5
Printing	27	1	88	0.3	--	--
Chemicals	28	5	382	1.1	76.4	153.2
Petroleum	29	1	1	-0-	--	--
Rubber/Plastics	30	13	2,606	7.7	200.5	289.9
Concrete	32	4	1,119	3.3	279.8	435.8
Fabricated Metals	34	25	8,883	26.2	355.3	601.7
Machinery	35	10	1,410	4.2	141.0	224.9
Electrical Equipment	36	15	3,127	9.2	208.5	300.3
Measuring Instruments	38	9	776	2.2	86.2	130.4
Air Transportation	45	1	1,000	3.0	--	--
Misc. Services	89	2	58	0.2	29.0	25.5
Non-Classifiable	99	7	10,073	29.7	1,439.0	3,595.8
Total		102	33,897	100.0		

Source: CIC Research, Inc., "A Survey of APCI Firms," 1982.

Table G.3

ESTIMATED DOLLAR VALUE OF MAJOR PURCHASES
BY APCI'S SERVICE SECTOR FROM ALL INDUSTRIES

Industry Purchased From	SIC	Number of Responses	Total Purchases			
			Amount (Thousands)	Percent	Mean (Thousands)	Standard Deviation
Paper	26	4	$ 2,375	2.2%	$ 593.8	810.7
Printing	27	4	387	0.4	96.75	172.9
Chemicals	28	3	2,419	2.2	806.3	730.4
Rubber/Plastics	30	1	190	0.2	--	--
Concrete	32	1	28	0	--	--
Fabricated Metals	34	5	3,720	3.4	744.0	788.3
Machinery	35	2	3,006	2.8	1,503.0	1,834.0
Electrical Equipment	36	10	8,425	7.8	842.5	890.8
Transportation	37	2	288	0.3	144.0	48.1
Measuring Instruments	38	13	68,777	63.6	5,290.5	13,629.9
Air Transportation	45	2	6,075	5.6	3,037.5	3,128.9
Business Services	73	6	4,768	4.4	794.7	1,103.9
Miscellaneous Services	89	4	180	0.2	45.0	49.2
Nonclassifiable	99	8	7,484	6.9	935.5	1,710.1
Total		65	$108,122	100.0%		

Source: CIC Research, Inc., "A Survey of APCI Firms," 1982.

Table G.4

ESTIMATED DOLLAR VALUE OF MAJOR PURCHASES BY APCI'S SERVICE SECTOR FROM IN-CALIFORNIA INDUSTRIES

Industry Purchased From	SIC	Number of Responses	In-California Purchases: Amount (Thousands)	Percent	Mean (Thousands)	Standard Deviation
Paper	26	4	$ 2,266	4.9%	$ 566.5	$ 823.6
Printing	27	3	42	0.1	14.0	5.0
Chemicals	28	3	775	1.7	258.3	344.7
Rubber/Plastics	30	1	30	0.1	--	--
Concrete	32	1	11	0	--	--
Fabricated Metals	34	5	1,923	4.1	384.6	508.0
Machinery	35	2	1,306	2.8	653.0	660.4
Electrical Equipment	36	10	4,208	9.1	420.8	442.1
Transportation	37	2	136	0.3	68.0	28.3
Measuring Instruments	38	13	32,017	69.1	2,462.8	6,873.3
Air Transportation	45	2	674	1.4	337.0	106.1
Business Services	73	6	729	1.6	121.5	107.7
Miscellaneous Services	89	4	150	0.3	37.5	49.2
Nonclassifiable	99	8	2,087	4.5	260.9	386.0
Total		64	$46,354	100.0%		

Source: CIC Research, Inc., "A Survey of APCI Firms," 1982.

Table G.5

ESTIMATED DOLLAR VALUE OF SALES BY APCI'S MANUFACTURING SECTOR

Industry Sold to	SIC	Total Number or Response	Total Sales		In-California Sales				Out of California Sales			
			Amount (Thousands)	Percent	Amount (Thousands)	Percent	Mean	Standard Deviation	Amount (Thousands)	Percent	Mean (Thousands)	Standard Deviation
Oil and Gas	13	15	$ 39,936	18.8	$ 6,547	16.6%	$ 467.6	$ 664.6	$ 33,389	19.4%	$ 2,568.4	$ 7,305.9
Mining	14	2	704	0.3	6	0	--	--	698	0.4	349.0	328.1
Construction	16	3	1,820	0.9	545	1.4	181.7	125.7	1,275	0.7	--	--
Food	20	6	1,293	0.6	894	2.3	149.0	199.4	399	0.2	133.0	165.7
Textile	22	2	63	0	63	0.2	31.5	4.9	--	0	--	--
Lumber	24	7	3,007	1.4	822	2.1	117.4	102.9	2,185	1.3	437.0	520.2
Paper	26	3	6,331	3.0	4	0	--	--	6,327	3.7	2,109.0	3,586.3
Printing	27	1	175	0.1	--	0	--	--	175	0.1	--	--
Chemicals	28	19	6,417	3.0	2,722	6.9	181.5	282.9	3,695	2.1	369.5	490.5
Petroleum	29	6	16,462	7.8	16,436	41.6	2,739.3	6,374.5	26	0	--	--
Rubber/Plastic	30	1	14	0	14	0	--	--	--	0	--	--
Concrete	32	3	377	0.2	289	0.7	144.5	167.6	88	0.1	--	--
Fabricated Metals	34	31	7,842	3.7	2,769	7.0	110.8	138.1	5,073	2.9	267.0	313.5
Machinery	35	7	3,142	1.5	907	2.3	129.6	131.5	2,235	1.3	558.8	665.5
Electrical Equipment	36	4	1,114	0.5	762	1.9	190.5	210.4	352	0.2	--	--
Utilities	49	11	111,951	52.8	3,110	7.9	518.3	974.5	108,841	63.2	12,093.4	22,025.1
Health Services	80	1	175	0.1	175	0.4	--	--	--	0	--	--
Miscellaneous Services	89	2	105	0.1	24	0	12	15.6	81	0	40.5	43.1
Public Administration	90	10	5,975	2.8	2,485	6.3	414.2	899.8	3,490	2.0	498.6	804.8
Nonclassifiable	99	17	4,971	2.4	972	2.4	74.8	72.5	3,999	2.4	363.5	501.6
Total		151	$211,874	100.0	$39,546	100.0			$172,328	100.0%		

Source: CIC Research, Inc., "A Survey of APCI Firms," 1982.

Table G.6

ESTIMATED DOLLAR VALUE OF SALES BY APCI'S SERVICE SECTOR

Industry Sold To	SIC	Total Number or Response	Total Sales		In-California Sales				Out-of-California Sales			
			Amount (Thousands)	Percent	Amount (Thousands)	Percent	Mean (Thousands)	Standard Deviation	Amount (Thousands)	Percent	Mean (Thousands)	Standard Deviation
Oil and Gas	13	10	$ 19,907	9.1%	$ 5,517	13.6%	$ 613	$ 569.5	$ 14,390	8.0%	$ 2,398.3	$ 2,952.9
Food	20	5	1,586	0.7	216	0.5	43.2	62.1	1,370	0.8	685.0	940.5
Lumber	24	3	43	0	13	0	--	--	30	0	15.0	15.6
Paper	26	1	280	0.1	--	0	--	--	280	0.2	--	--
Chemicals	28	5	29,585	13.5	1,365	3.4	341.3	485.4	28,220	15.8	7,055.0	13,299.7
Petroleum	29	4	9,703	4.4	1,603	4.0	400.8	468.2	8,100	4.5	--	--
Rubber/Plastics	30	1	4	0	4	0	--	--	--	0	--	--
Concrete	32	5	271	0.1	84	0.2	21.0	13.6	187	0.1	93.5	115.3
Fabricated Metals	34	5	102	0	56	0.1	14.0	6.3	46	0	23.0	21.2
Machinery	35	4	7,859	3.6	1,441	3.5	481.7	676.5	6,418	3.6	2,139.3	2,597.6
Electrical Equipment	36	3	745	0.3	534	1.3	178.0	216.9	211	0.1	70.3	61.2
Transportation Equipment	37	2	21	0	2	0	--	--	19	0	9.5	10.6
Measuring Instruments	38	2	438	0.2	44	0.1	22.0	18.4	394	0.2	197.0	166.9
Utilities	49	9	17,705	8.1	8,818	21.7	1,259.7	2,589.5	8,887	5.0	1,777.4	1,935.3
Business Services	73	3	2,151	1.0	1,624	4.0	541.3	901.2	527	0.3	--	--
Miscellaneous	89	2	594	0.3	517	1.3	--	--	77	0	--	--
Public Administration	90	17	106,761	48.6	15,708	38.6	1,208.3	2,241.8	91,053	50.9	8,277.5	24,183.1
Nonclassifiable	99	7	21,911	10.0	3,118	7.7	445.4	959.1	18,793	10.5	4,698.3	8,869.6
Total		88	$219,666	100.0%	$40,664	100.0%			$179,002	100.0%		

Source: CIC Research, Inc., "A Survey of APCI Firms," 1982.