

American Semiconductor Equipment Technologies

American Semiconductor Equipment Technologies
6110 Variel Avenue
Woodland Hills, California 91367
Telephone: (818) 884-5050
(Thousands of Dollars)

Balance Sheet (Fiscal year ending 3/31/86)

Working Capital	\$4,375
Long-Term Debt	\$2,000
Net Worth	\$3,446
Current Liability to Net Worth	183.75%
Current Liability to Inventory	131.89%
Total Liability to Net Worth	241.79%
Fixed Assets to Net Worth	241.79%
Total Employees	150

Operating performance data are not available

Source: Dun & Bradstreet

American Semiconductor Equipment Technologies

(Material in this section has been compiled from Dun & Bradstreet financials, Dataquest's SEMS data base, and company literature supplied by ASET. For more information on this start-up company, Dataquest clients are invited to use their inquiry privileges.)

THE COMPANY

Background

American Semiconductor Equipment Technologies (ASET) was formed in February 1986 to pursue both ongoing and newly developing markets for lithographic systems. The Company was organized by Greg Reyes and Ralph Miller with funding of \$3.9 million from four venture capital firms. ASET's product line includes i-line wafer steppers, g-line wafer steppers, substrate steppers, standalone image repeaters and pattern generators, and combination systems.

Operations and Strategy

ASET Corporation currently serves the semiconductor equipment markets in the image patterning area. The Company also looks to develop business in alternate industries, including laser cards, flat panel displays, and hybrid substrates. ASET maintains research efforts directed toward expanding micro-lithographic technology.

ASET acquired the assets of TRE Corporation's wafer stepper and pattern generation manufacturing unit early in 1986. Dataquest estimates that TRE shipped \$18 million in wafer steppers in 1982. Stepper revenue declined to \$8 million in 1985 and rose to \$10 million by year-end 1986.

Products

ASET's current product line is shown in Table 1.

American Semiconductor Equipment Technologies

Table 1

ASET PRODUCT TABLE

<u>Product Family</u>	<u>Product Name</u>	<u>Features</u>	<u>Alignment Accuracy</u>	<u>Wave-length</u>	<u>Field Diameter</u>
Lithography	802 Wafer Stepper		0.2um	432um	29, 14.5nm
Lithography	803 Wafer Stepper		0.2um	436um	20, 29, 14.5nm
Lithography	804 Wafer Stepper		0.2um	365um	13, 23nm
Lithography	900 SLR Wafer Stepper Series	i-line and g-line steppers for silicon and GaAs. Auto wafer-to-reticle alignment, auto wafer and reticle handling, system diagnostics, high-volume lum production.	0.2um	365um	13, 23nm
Maskmaking Systems	600 Series Pattern Generator/Image Repeater Systems	Auto air gauge focus camera, extended stage travel, independent reticle edge masking, four-position reticle chamber		436um	14.5, 20 29nm

Source: Dataquest
May 1987

Company Management

Greg Reyes is President and CEO of ASET. He has 20 years of experience in the semiconductor industry and held executive management positions at Eaton Corporation, Fairchild Semiconductor, Motorola Semiconductor, and National Semiconductor.

American Semiconductor Equipment Technologies

Ralph Miller is Senior Vice President of Marketing. His background includes 33 years in the semiconductor, semiconductor equipment, and magnetic media industries. His previous positions have included President of National Micronetics Disc Inc., President of the Optimetrix Division of Eaton Corporation, and President of TRE Semiconductor.

Dr. Boris Meshman was employed at ASET's antecedent, TRE Semiconductor, since 1981, and is now Vice President of Engineering at ASET. He is responsible for advanced wafer stepper and laser pattern generator development.

Chris Van Peski, ASET's Vice President of Special Products, was also previously employed at TRE Semiconductor; he had been with TRE since 1967. He has 28 years of experience in electrical engineering and controls, including 18 years in the semiconductor equipment field.

Dr. Harry Stover, Vice President of Technologies and Applications, was previously Vice President of Technology for ASM Lithography. Dr. Stover also worked with Bell Labs and Texas Instruments and held R&D management positions at Hughes Research Labs, Signetics Advanced Technology Center, and TRE Semiconductor.

Rick Walter, Vice President of Operations, came to ASET from the Reichert-McGain Division of Warner-Lambert, where he was Vice President of Operations and General Manager. Mr. Walter has also worked for Bausch-Lomb and served as Vice President of Operations for the Optimetrix Division of Eaton Corporation.

Anelva Corporation

Anelva Corporation
8-1 Yotsuya 5-chome, Fuchu-shi, Tokyo
Tel (0423) 64-2111
Telex 2832558 ANELVA 3

California Branch Office
121 East Brokaw Road
San Jose, California 95112
Tel (408)998-7311
Telex 352123

Anelva Corporation is a wholly owned subsidiary of Nippon Electric Corporation; therefore, balance sheet data and income statements are not available.

Anelva Corporation

THE COMPANY

Background

Anelva Corporation is a subsidiary of Nippon Electric Corporation (NEC). Anelva began in 1967 as a joint venture between NEC and Varian Associates. Its name then was NEVA (Nippon Electric Varian). In 1979, Varian relinquished managerial control to NEC; in September 1985, Varian sold its final 18 percent of interest to NEC.

ANELVA is an acronym for what the Company sees as its three main areas of expertise: AN from analysis, EL from electronics, and VA from vacuum.

The Company's first products were analytical instruments newly introduced from Varian and vacuum equipment produced by NEC. Anelva has continued the research and development of vacuum equipment, particularly on thin film deposition for electronic devices and on surface analysis using ultrahigh-vacuum technology.

Anelva believes that its technology is especially viable in the following fields:

- The development and production of LSI and compound semiconductor devices
- Vacuum thin film deposition
- The fields of atomic energy, high-energy physics, and new exotic materials and space science

Presently, Anelva manufactures and markets analytical instruments, vacuum instruments, and thin film products (see Table 1).

Anelva Corporation

Table 1

**Anelva Corporation
MAIN PRODUCTS**

<u>Category</u>	<u>Product</u>
Analytical Instruments	Mass Spectrometer GC/QMS Surface Analysis (Auger) Auger Spectrometer
Vacuum Instruments	Vacuum Pumps Ion Pump Combination Pump Ti-Sublimation Pump Sorption Pump Diffusion Pump Mechanical Pump Film Thickness Monitor Vacuum Gauges Valves and Fittings HV or UHV Evaporation System Sputtering System Reactive Ion Etching System Plasma CVD System Molecular Beam Epitaxy System
Thin Film Products	Plastic Metalizing

Source: DATAQUEST
February 1986

Anelva Corporation

Operations

All of the Company's production facilities are located in Japan. Anelva has its main factory in Fuchu, Japan, and in 1984 it opened its Fuji plant in Yamanashi prefecture.

In 1980, Anelva opened a California branch sales office.

International Operations

For the fiscal year ended in March 1985, the Company's sales outside of Japan accounted for approximately 5 percent of sales (see Table 2).

Table 2

Anelva Corporation PERCENTAGE OF SALES OUTSIDE OF JAPAN

<u>Year</u>	<u>Percentage</u>
1981*	3.2%
1982*	5.8%
1983*	5.1%
1984*	4.7%
1985*	5.0%

*Fiscal year ends
March 31

Source: DATAQUEST
February 1986

Marketing

Presently, Anelva does not have a direct sales force in the United States and does not plan to have one before the end of 1986. Preparatory to hiring such a force, the Company wants to develop a total customer support system during 1986. The elements of such a system are: technical training (courses are already being offered at the San Jose, California, office), service, maintenance, and documentation.

Anelva Corporation

Research and Development

In 1975, Anelva discovered that by introducing reactive gas into a sputtering system, it was possible to achieve anisotropic dry etching. Anelva claims that this was one of the discoveries that led to the development of reactive ion etch (RIE). From this discovery, the Company developed the ILD-4000 series of RIE systems.

Anelva is presently devoting resources to the manufacture of molecular beam epitaxy (MBE) for use in the manufacture of GaAs ICs and super-lattice devices.

The Company is also directing research into the development of a third main product line, plasma CVD equipment.

Employees

Anelva has approximately 1,000 employees worldwide: 601 at the Company's main factory in Fuchu, Japan; 376 at the Fuji plant in Japan; 28 at the Osaka branch office in Japan; 8 at the Kyushu sales office in Japan; and 6 at the San Jose, California, office.

PRODUCTS AND SALES

Until 1975, Anelva's products were used primarily in the universities and research and development labs of various enterprises. However, with the growing popularity of thin film deposition, especially in LSI and VLSI, Anelva has been able to develop a series of thin film deposition systems for mass production use: the ILC-1000 series of sputter systems. These systems feature four vacuum chambers and are used for thin film application in 256K devices.

Anelva claims to be one of the world's leading manufacturers of dry etch equipment and of sputtering equipment, both in terms of technical know-how and in terms of sales results. Presently, the only equipment that Anelva markets in the United States is its etching and sputtering equipment. The Company markets three models of etchers and two sputtering systems. Average selling prices (ASPs) of this equipment are shown in Table 3.

Anelva Corporation

Table 3

Anelva Corporation
AVERAGE SELLING PRICE OF EQUIPMENT
SOLD IN THE UNITED STATES
(Thousands of Dollars)

<u>Type</u>	<u>Model</u>	<u>Description</u>	<u>Average Selling Price</u>
Etching System	506	R&D use	\$135
Etching System	4003	4" and 5" wafers	\$370
Etching System	4013	6" wafers	\$600
Sputtering System	1012	4" and 5" wafers	\$570
Sputtering System	1013	6" wafers	\$640

Source: DATAQUEST
February 1986

Products

Anelva is planning to introduce three MBE systems in the United States in the second half of 1986. They are the following:

- A research and development application model that will have an ASP of approximately \$400,000
- A preproduction application model that will have an ASP of approximately \$600,000
- A production application model that also will have an ASP of approximately \$600,000

In addition, during the second half of 1986, Anelva also plans to introduce in the United States an electron cyclotron resonance (ECR) system. An ECR system employs a remote ECR plasma to generate radicals for low-temperature deposition. This system was developed jointly by the Japanese government and Anelva. The Company estimates that this system will have an ASP of approximately \$250,000.

The Company also markets a scanning microprobe Auger spectrometer, the EMAS-II, with the capability of a scanning electron microscope. It is used for contamination analysis on metal and semiconductor surfaces and in-depth profiling of surface layers or multilayer film boundaries.

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Outside of the semiconductor area, Anelva also makes the quadrupole mass spectrometer (QMS), which is used for residual gas analysis in an ultrahigh vacuum. The QMS can be used in combination with a gas chromatograph (GC) as a GC/QMS, a trace gas analyzer with a capability of detecting 1.0 parts per billion.

Sales

Anelva's sales for the fiscal year ended in March 1985 were \$140 million (see Table 4). The Company claims that for the three years ending in March 1985, its sales of vacuum equipment grew at the rate of 40 percent. More than 60 percent of Anelva's product sales are for sputtering and etching systems (see Table 5). Approximately 80 percent of the Company's sales are to the semiconductor industry and electronic device industries; about 20 percent of sales are outside the semiconductor industry.

Table 4

Anelva Corporation
SALES HISTORY
(Millions of Dollars)

<u>Year</u>	<u>Sales</u>
1980*	\$ 48
1981*	\$ 57
1982*	\$ 66
1983*	\$ 90
1984*	\$120
1985*	\$140

*Fiscal year ends
March 31

Source: DATAQUEST
February 1986

Sales to Anelva's parent company, NEC, make up only 25 percent of its total sales. No other company accounts for more than 10 percent of Anelva's sales (see Table 6). Anelva's sales into the United States were

Anelva Corporation

approximately \$5.75 million for the fiscal year ended in March 1985. Of this \$5.75 million, approximately \$1.15 million was for sputtering equipment and approximately \$4.6 million was for etching systems.

Table 5

Anelva Corporation
PRODUCT SALES AS A PERCENT OF TOTAL SALES

<u>Product</u>	<u>Total Sales (%)</u>
Sputtering Equipment	38%
Etching Systems	28
Plasma CVD	4
Evaporation Systems	3
Molecular Beam Epitaxy	3
Other Systems (Surface and Gas Analysis Systems)	3
Component	<u>21</u>
Total	100%

Table 6

Anelva Corporation
SALES TO MAJOR CUSTOMERS

<u>Customer</u>	<u>Total Sales (%)</u>
NEC	25%
Matsushita	7
Fujitsu	3
Sharp	3
Hitachi	2
Sony	2
Other Japanese Companies	53
United States	4
Rest of World	<u>1</u>
Total	100%

Source: Anelva Corporation

Applied Materials

Applied Materials, Inc.
3050 Bowers Avenue
Santa Clara, California 95054
Telephone: (408) 727-5555

(Thousands of Dollars Except Per Share Data)

Balance Sheet (October 28)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Current Assets	\$56,995	\$ 93,516	\$107,298	\$107,482	\$104,166
Current Liabilities	\$39,381	\$ 34,812	\$ 41,684	\$ 37,582	\$ 32,384
Current Ratio	1.45	2.69	2.57	2.86	3.22
Working Capital	\$17,614	\$ 58,704	\$ 65,614	\$ 69,900	\$ 71,782
Long-Term Debt	\$16,226	\$ 16,250	\$ 18,573	\$ 16,880	\$ 19,615
Debt/Equity	47%	26%	25%	20%	21%
Shareholders' Equity	\$34,656	\$ 61,553	\$ 74,299	\$ 86,426	\$ 92,758
After-Tax Return on Average Equity	(28.54%)	6.35%	19.88%	11.54%	1.39%
Capital Expenditures	\$ 5,249	\$ 7,825	\$ 14,567	\$ 12,930	\$ 11,541

Operating Performance (Fiscal Year Ending October 28)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Revenue	\$90,830	\$105,527	\$168,400	\$174,595	\$149,261
Gross Margin	27%	39%	49%	46%	40%
Cost of Revenue	\$66,697	\$ 64,128	\$ 85,207	\$ 94,210	\$ 88,902
RD&E Expense	\$14,689	\$ 16,436	\$ 31,219	\$ 31,519	\$ 24,621
RD&E/Revenue	16%	16%	19%	18%	16%
GA&S Expense	\$19,599	\$ 18,373	\$ 27,736	\$ 15,927	\$ 13,514
G&A/Revenue	22%	17%	16%	9%	9%
Other Expenses (Income)	\$ 3,663	\$ 1,537	(\$ 320)	\$ 120	\$ 1,786
Pretax Income	(\$13,818)	\$ 5,053	\$ 24,558	\$ 15,983	\$ 2,141
Pretax Margin	(15.21%)	4.79%	14.58%	9.15%	1.43%
Effective Tax Rate	33.15%	39.58%	45.01%	42.00%	41.99%
Net Income	(\$ 9,237)	\$ 3,053	\$ 13,504	\$ 9,270	\$ 1,242
Average Shares Outstanding (Thousands)*	9,944	12,328	13,076	13,160	13,322
Per Share Earnings	(\$ 0.93)	\$ 0.25	\$ 1.03	\$ 0.70	\$ 0.09
Total Employees	1,038	1,130	1,474	1,359	1,415

*Restated 1982 through 1986 to reflect a two-for-one stock split effective April 25, 1986

Source: Applied Materials, Inc.
Annual Reports and
Forms 10-K
Dataquest
May 1987

Applied Materials

(Material in this section has been excerpted from the Applied Materials, Inc., Annual Report for the fiscal year ended October 1986 and from Company press releases and product information. For more detailed information and opinions about Applied Materials, Dataquest clients are invited to use their inquiry privileges.)

THE COMPANY

Background

Applied Materials, Inc., is the largest independent company in the world whose sole business is to supply wafer fabrication equipment and related products and services to the semiconductor industry. When the Company was founded in 1967, its first products were chemical vapor deposition (CVD) systems. Dry plasma etch systems were introduced in 1981, and high-current ion implantation systems were added in 1985. Company revenue has increased at a compound annual growth rate (CAGR) of 10.4 percent from \$90.8 million in 1982 to \$149.3 million in 1986.

Operations

Applied Materials focuses on leading-edge semiconductor process technology and historically has worked to develop processes and production equipment to meet advanced processing requirements. It is the leading supplier worldwide of both epitaxial processing systems and plasma etch systems. The Company has shown a record of stable financial management, leveraging a capital infusion of slightly more than \$20 million from General Electric Venture Capital Corporation in 1982 to launch itself from the number one position in the etch market into new product areas.

Strategy and International Competitiveness

Applied Materials' product strategy is focused on development of new products and technologies in order to ride the product life cycle for as long as possible, and to concentrate on advanced device niches in order to minimize price competition and market downturns.

The Company maintains a strong worldwide presence. It has production and development facilities in the United States, Japan, and the United Kingdom. Applied Materials Japan, Inc., a wholly owned subsidiary, was formed as a joint venture with several Japanese electronics executives in 1979 to provide the Company with access to the rapidly growing Japanese semiconductor manufacturing equipment market. This was the first company not wholly Japanese owned that received funding from the Japan Development Bank.

Applied Materials

Applied Materials Japan has also allowed the Company to build a strong marketing presence in the rapidly growing Far East markets. It has restarted production of some early-generation CVD products targeted for the semiconductor industry in China.

Research and Development

Applied Materials conducts a global research and development (R&D) effort. It maintains product development organizations in the United States and in the United Kingdom. It also has process support and demonstration laboratories in the United States, Japan, and the United Kingdom. In 1984, the Company built the Japan Technology Center outside of Narita. This 57,000-square-foot facility includes a research and development laboratory, a Class 10 clean room, and a customer service and training facility.

Research, development, and engineering (RD&E) investment in 1986 was 16.5 percent of sales. The Company has invested an average of 17.0 percent of its annual revenue in RD&E for the past five years. RD&E activities are directed primarily toward the development of new wafer processing systems and new process applications for existing CVD, epitaxial processing, dry processing, and ion implant products. Applied has developed more than 100 processes for use on its installed base of more than 500 plasma etch systems worldwide. The Company also has an ongoing program for development of new applications for epitaxial layers, with a current focus on CMOS.

EXECUTIVE MANAGEMENT

Applied Materials' executive management is as follows:

- James C. Morgan--President and CEO--Previous experience includes senior partner with WestVen Management, corporate staff at Textron in two high-technology divisions, officer and 1983-84 president of SEMI--B.S.M.E. and M.B.A., Cornell University, Ithaca, New York (Mr. Morgan has been with the Company since 1976.)
- James W. Bagley--Senior Vice President, Operations--Previous experience includes 15 years with Texas Instruments, during which he became assistant vice president and manager of Automation Systems Division--B.S.E.E. and M.S.E.E., Mississippi State Univ. (Mr. Bagley has been with the Company since 1981.)
- Robert F. Graham--Senior Vice President--Vice president and founder of Intel; management positions at Fairchild Camera and Instrument and at ITT--B.S.E.E., Univ. of California, Los Angeles (Mr. Graham has been with the Company since 1974.)

Applied Materials

- Gerald F. Taylor--Senior Vice President and CFO--International and domestic controllerships at Schlumberger, Fairchild Camera and Instrument, and Honeywell; controller of Schlumberger Well Services--B.S., Univ. of Nebraska; M.B.A., Univ. of So. California (Mr. Taylor has been with the Company since 1974.)
- Walter C. Benzing--Technical Advisor to the President--Previous experience includes director of technology for Union Carbide Electronics; Coinventor of first radiantly heated, multiwafer epitaxial reactor--B.S. and M.S. in Chemical Engineering from MIT; Ph.D., Princeton Univ. (Dr. Benzing has been with the Company since 1968.)
- Dana C. Ditmore--Vice President, Corporate Quality and Services, Customer Services Div.--Engineering and management posts at General Electric's Nuclear Energy Division--B.S. and M.S. in Mechanical Engineering, Univ. of California, Berkeley (Mr. Ditmore has been with the Company since 1980.)
- Peter R. Hanley--Vice President, Etch Products Div.--President of Tegal Corporation and vice president of technology for the semiconductor equipment group at Varian Associates--B.S.M.E., Northeastern Univ.; Ph.D. in Engineering Physics from Cornell Univ. (Dr. Hanley has been with the Company since 1985.)
- Tetsuo Iwasaki--Vice President, Applied Materials Japan--Sales and management positions with Kanematsu Goshu, a Japanese trading company specializing in marketing semiconductor production equipment for U.S. companies (Mr. Iwasaki has been with the Company since 1979.)
- Dan Maydan--Vice President and President, Applied Deposition Technology--Previous experience includes 13 years at Bell Laboratories--B.S.E.E. and M.S.E.E., Israel Institute of Technology; Ph.D. in Physics, Edinburgh Univ. (Dr. Maydan has been with the Company since 1980.)
- Howard L. Neff--Vice President, Epitaxial Products Div.--Previous experience includes 12 years with Johnson and Johnson in manufacturing and management positions--B.A. in Economics, Dartmouth College, Hanover, New Hampshire (Mr. Neff has been with the Company since 1980.)
- Glen O. Toney--Vice President, Human Resources--Previous experience includes 11 years in human relations, as assistant to superintendent of a unified school district and as personnel counselor for Lucky Stores, Inc--B.A. and M.A. in Curriculum Development; Ph.D. in Education (Dr. Toney has been with the Company since 1979.)

Applied Materials

PRODUCTS

Applied Materials is a leading U.S. developer and producer of chemical vapor deposition systems, including epitaxial CVD systems. The Company also develops and manufactures dry plasma etching equipment and ion implantation systems.

In the course of the past two years, in spite of the general industry downturn, the Company has introduced three new-generation products. In 1985, it introduced the Precision Etch 8300, a new-generation reactive ion etch system. Its Precision Epi 7010, one of the industry's first fully automated epi reactors, came out in early 1986.

The third major new product resulting from ongoing efforts to developing products based on leading-edge semiconductor processing technology is the Precision Implant 9000. In 1979, Applied Materials reached an agreement to purchase the ion implantation business of Lintott Engineering Ltd., a British company. The acquisition was completed in 1980, and this business became the subsidiary Applied Implant Technology, which conducts R&D efforts in implant technology in Horsham, England. As of April 1987, the Company has shipped two systems, one to Siemens and one to a Japanese customer.

Applied Materials has followed a plan of continuing to supply customers with new products and process support. It is now pursuing contractual agreements with key customers that specify long-range cooperation on process and hardware development. This policy has proved to be successful; 45 percent of the Company's 1986 sales came from new-generation products.

Products of Applied Materials are listed in Table 1. Table 2 shows the Company's sales history by product, and Table 3 shows its sales history by region.

Table 1

Applied Materials, Inc.
PRODUCTS

<u>Product Family</u>	<u>Product Name</u>	<u>Date of Introduction</u>	<u>Average Selling Price</u>	<u>Features</u>	<u>Maximum Wafer Size</u>	<u>Throughput Wafers/Hour</u>
Deposition	AMC 7810/20	1978 (series 7800)	N/A	Barrel chamber; silicon epi films	8-inch	36/4-inch
	Precision EPI 7010	1986	\$1.2 million to \$1.5 million	Silicon epi films; single-chamber, dual susceptor design; full automation; closed-loop computer control	8-inch	27/6-inch
	AMV-1284	N/A	N/A	Silicon epi; dual-chamber, vertical track	4-inch	15/4-inch
	AMS-2100	1978 (2000 series) 1986 (fully automated version)	\$420,000 for fully automated	Silicon dioxide; track; automated cassette-to-cassette wafer handling	6-inch	50/6-inch
	AMP 3300	1978	N/A	Pancake chamber; plasma nitride and oxide films	8-inch	25/4-inch
Etch and Clean	AME 8100 Series	1981	\$400,000	Batch processing RIE; end-point detection; auto cassette-to-cassette wafer handling; hexode chamber	6-inch	40-80/5-inch
	PE 8300	1985	\$675,000	Batch processing; low-pressure RIE; end-point detection; auto cassette-to-cassette wafer handling; vacuum-controlled load lock	6-inch	40-100/5-inch
Ion Implant	PI 9000	1985	N/A	Batch processing; high current; fully automated; acceleration energy range 10-180 KeV	8-inch	N/A

N/A = Not Available

Source: Dataquest
May 1987

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Table 2

Applied Materials, Inc.
SALES HISTORY BY PRODUCT
(Millions of Dollars)

<u>Product Family</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>CAGR</u>
Ion Implant	0	0	0	0	4.4	N/A
Dry Etch	31.7	46.8	69.0	69.6	73.4	23.4%
Epitaxy	26.0	41.1	70.0	44.0	34.3	7.2%
PECVD	5.5	6.3	8.0	6.3	5.2	(1.4%)
APCVD	<u>4.8</u>	<u>8.0</u>	<u>9.8</u>	<u>9.5</u>	<u>6.3</u>	7.0%
Total	68.0	102.2	156.8	129.4	123.6	16.1%

(Percentage of Total)

<u>Product Family</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Ion Implant	0	0	0	0	3.6%
Dry Etch	46.6%	45.8%	44.0%	53.8%	59.4
Epitaxy	38.2	40.2	44.6	34.0	27.8
PECVD	8.1	6.2	5.1	4.9	4.2
APCVD	<u>7.1</u>	<u>7.8</u>	<u>6.3</u>	<u>7.3</u>	<u>5.1</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%

N/A = Not Available

Note: Columns may not add to totals shown due to rounding.

Source: Dataquest
May 1987

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Table 3

Applied Materials, Inc.
SALES HISTORY BY REGION
(Thousands of Dollars)

<u>Net Sales by Region*</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
United States	\$111,762	\$118,395	\$102,627
Europe	4,179	3,707	4,549
Japan	<u>52,459</u>	<u>52,493</u>	<u>42,085</u>
Total	\$168,400	\$174,595	\$149,261

(Percentage of Total)

<u>Net Sales by Region*</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
United States	66.4%	67.8%	68.8%
Europe	2.5	2.1	3.0
Japan	<u>31.2</u>	<u>30.1</u>	<u>28.2</u>
Total	100.0%	100.0%	100.0%

*Does not include transfers between regions

Note: Columns may not add to totals shown due to rounding.

Source: Applied Materials
Annual Report 1986

ASM International N.V.

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ASM International N.V.

ASM International N.V.
 Jan Steenlaan 9
 3723 BS Bilthoven
 The Netherlands
 Telephone: (030) 781836
 (Thousands of Guilders, except Per Share Data)

Balance Sheet for Year Ending December 31

	1983	1984	1985	1986
Total Assets	F 266.40	F 380.10	F 374.80	F 369.20
Accounts Receivable	F 64.60	F 91.40	F 67.50	F 84.30
Inventory	F 70.70	F 148.30	F 145.00	F 127.10
Other Current Assets	F 80.10	F 58.30	F 48.80	F 44.10
Total Current Assets	F 215.40	F 298.00	F 261.30	F 255.50
Property, Plant & Equip., Net Depr.	F 48.90	F 80.80	F 108.10	F 110.60
Other Assets	F 2.10	F 1.30	F 5.40	F 3.10
Total Liability	F 104.30	F 177.00	F 217.80	F 288.20
Accounts Payable	F 56.50	F 109.50	F 115.00	F 146.20
Other Current Liability	F 37.6	F 56.3	F 56.1	F 50.3
Total Current Liability	F 94.10	F 165.80	F 171.10	F 196.50
Long Term Debt	F 7.00	F 7.10	F 44.30	F 59.00
Other Long Term Liability	F 3.20	F 4.10	F 2.40	F 32.70
Total Long Term Liability	F 10.20	F 11.20	F 46.70	F 91.70
Shareholder Equity	F 162.10	F 203.10	F 157.00	F 81.00

Income Statement for Year Ending December 31

Net Sales	F 217.00	F 352.90	F 350.80	F 328.40
Cost of Goods Sold	F 126.20	F 202.50	F 220.60	F 227.20
Selling & General	F 52.70	F 80.50	F 104.00	F 102.10
R&D	F 17.40	F 37.00	F 39.90	F 50.10
Special Expenses	(F 1.40)	F 1.20	F 1.00	(F 0.10)
Income from Operations				
Interest Expenses	F 2.20	F 0.40	F 6.70	F 11.60
EBT	F 19.90	F 31.40	(F 21.30)	(F 62.60)
Income Taxes	F 4.10	F 11.40	(F 1.20)	(F 0.90)
Net Income	F 18.30	F 23.30	(F 19.20)	(F 61.70)
EPS	F 3.00	F 3.35	(F 2.77)	(F 8.87)
Shares Outstanding (in Millions)	F 6.11	F 6.95	F 6.96	F 6.96

Operating Ratios

Profit Margin	8%	(7%)	(5%)	(19%)
Return on Equity	11%	(12%)	(12%)	(77%)
Return on Assets	7%	(6%)	(5%)	(17%)
Gross Margin	42%	43%	37%	31%
Asset Turnover	0.81	0.93	0.94	0.89
Working Capital Turnover	1.79	2.67	3.89	5.57
Inventory to Working Capital	0.58	1.12	1.61	2.15
Current Ratio	2.29	1.80	1.53	1.30
Quick Ratio	1.44	0.81	0.51	0.50
Inventory Turnover	3.07	2.38	2.42	2.58
Fixed Assets to Tangible Net Worth	0.30	0.40	0.69	1.38
Current Liability to Tangible Net Worth	0.58	0.82	1.10	2.44
Total Liability to Tangible Net Worth	0.65	0.88	1.39	3.58
Exchange Rate	2.85	3.21	3.32	2.45

Source: ASM International N.V.
 Annual Reports
 Dataquest
 August 1987

ASM International N.V.

ASM International N.V.
 Jan Steenlaan 9
 3723 BS Bilthoven
 The Netherlands
 Telephone: (030) 781836
 (Thousands of Dollars, except Per Share Data)

Balance Sheet for Year Ending December 31

	1983	1984	1985	1986
Total Assets	\$759	\$1,220	\$1,244	\$905
Accounts Receivable	\$184	\$ 293	\$ 224	\$207
Inventory	\$201	\$ 476	\$ 481	\$311
Other Current Assets	\$228	\$ 187	\$ 162	\$108
Total Current Assets	\$614	\$ 957	\$ 868	\$626
Property, Plant & Equip., Net Depr.	\$139	\$ 259	\$ 359	\$271
Other Assets	\$ 6	\$ 4	\$ 18	\$ 8
Total Liability	\$297	\$ 568	\$ 723	\$706
Accounts Payable	\$161	\$ 351	\$ 382	\$358
Other Current Liability	\$107	\$ 181	\$ 186	\$123
Total Current Liability	\$268	\$ 532	\$ 568	\$481
Long-Term Debt	\$ 20	\$ 23	\$ 147	\$145
Other Long-Term Liability	\$ 9	\$ 13	\$ 8	\$ 80
Total Long-Term Liability	\$ 29	\$ 36	\$ 155	\$225
Shareholder Equity	\$462	\$ 652	\$ 521	\$198

Income Statement for Year Ending December 31

Net Sales	\$618	\$1,133	\$1,165	\$805
Cost of Goods Sold	\$360	\$ 650	\$ 732	\$557
Selling & General	\$150	\$ 258	\$ 345	\$250
R&D	\$ 50	\$ 119	\$ 132	\$123
Special Expenses	(\$ 4)	\$ 4	\$ 3	0
Income from Operations	0	0	0	0
Interest Expenses	\$ 6	\$ 1	\$ 22	\$ 28
EBT	\$ 57	\$ 101	(\$ 71)	(\$153)
Income Taxes	\$ 12	\$ 37	(\$ 4)	(\$ 2)
Net Income	\$ 52	\$ 75	(\$ 64)	(\$151)
EPS	\$ 9	\$ 11	(\$ 9)	(\$ 22)
Shares Outstanding (in Millions)	\$ 6	\$ 7	\$ 7	\$ 7

Operating Ratios

Profit Margin	8%	7%	(5%)	(19%)
Return on Equity	11%	12%	(12%)	(77%)
Return on Assets	7%	6%	(5%)	(17%)
Gross Margin	42%	43%	37%	31%
Asset Turnover	0.81	0.93	0.94	0.89
Working Capital Turnover	1.79	2.67	3.89	5.57
Inventory to Working Capital	0.58	1.12	1.61	2.15
Current Ratio	2.29	1.80	1.53	1.30
Quick Ratio	1.44	0.81	0.51	0.50
Inventory Turnover	3.07	2.38	2.42	2.58
Fixed Assets to Tangible Net Worth	0.30	0.40	0.69	1.38
Current Liability to Tangible Net Worth	0.58	0.82	1.10	2.44
Total Liability to Tangible Net Worth	0.65	0.88	1.39	3.58

Source: ASM International N.V.
 Annual Reports
 Dataquest
 August 1987

ASM International N.V.

THE COMPANY

Background

Advanced Semiconductor Material International N.V. was established in 1968 and is headquartered in the Netherlands. ASM International N.V. and its subsidiaries (collectively referred to as ASMI) design, manufacture, and market semiconductor production equipment and materials. The scope of this equipment includes wafer processing, assembly, and encapsulation. ASM is the world leader in plasma-enhanced chemical vapor deposition, or CVD. The Company also produces assembly and encapsulation products.

Operations

The semiconductor equipment business has been poor during the last two years, and 1986 was exceptionally so for ASM International. Losses from U.S. and Japanese operations accompanied large outlays in research. Strategically, however, R&D investments are necessary for market positioning in the future, and the Company's research work is expected to pay off in the near future. Efficiency cuts were also made at all levels of the organization. As a result, business has been streamlined going into 1987.

ASM International has dedicated manufacturing and marketing facilities in the regions of Europe, Hong Kong, Japan, and the United States. In Hong Kong, Japan, and the United States, manufacturing operations are run through the Company's wholly owned subsidiaries. In Hong Kong, this is ASM Asia Ltd.; in Japan, ASM Japan K.K.; and in the United States, ASM America, Inc. See Table 1 for the Company's major facilities and their activities.

ASM International calls upon its world research network and has formed technology-driven joint ventures and partnerships in its aim to advance state-of-the-art manufacturing equipment. A discussion of some of these joint ventures and partnerships follows.

ASM Lithography, Inc., is a joint venture between ASM International and N.V. Philips of the Netherlands. Founded in 1984, it has facilities in Tempe, Arizona, and Veldhoven, the Netherlands. Both centers have complete process and analytical equipment, as well as a staff of process engineers. The Company was founded to develop and market advanced lithography equipment.

ASM Ion Implant is a division of ASM International N.V. This division is headquartered in Beverly, Massachusetts, and was formed in early 1986 to develop and market a new generation of advanced ion implantation equipment.

Epsilon Technology was formed through a limited R&D partnership by ASM America in 1982 in order to develop and manufacture an advanced silicon epitaxial reactor.

ASM International N.V.

Table 1

ASM International N.V.
MAJOR FACILITIES

<u>Location</u>	<u>Primary Uses</u>
Bilthoven, the Netherlands	Wafer processing manufacturing, research, and executive offices
Brunssum, the Netherlands	Encapsulation manufacturing and offices
Eindhoven, the Netherlands	Lithography equipment manufacturing, research, and offices
Herwen, the Netherlands	Encapsulation manufacturing, research, and offices
Zevenaar, the Netherlands	Lead-frame stamping and offices
Montpellier, France	Gas component manufacturing and offices
Hung Hom, Hong Kong	Lead-frame stamping
Kwai Chung, N.T., Hong Kong	Assembly automation encapsulation and plating manufacturing, research, and offices
Kwun Tong, Kowloon, Hong Kong	Plating manufacturing
Tokyo, Japan	Wafer processing equipment, assembly, research, and offices
Phoenix, Arizona United States	Assembly and wafer processing manufacturing, research, and offices
Tempe, Arizona United States	Research and offices

Source: ASM International N.V.
Dataquest
August 1987

ASM International N.V.

Strategy and International Competitiveness

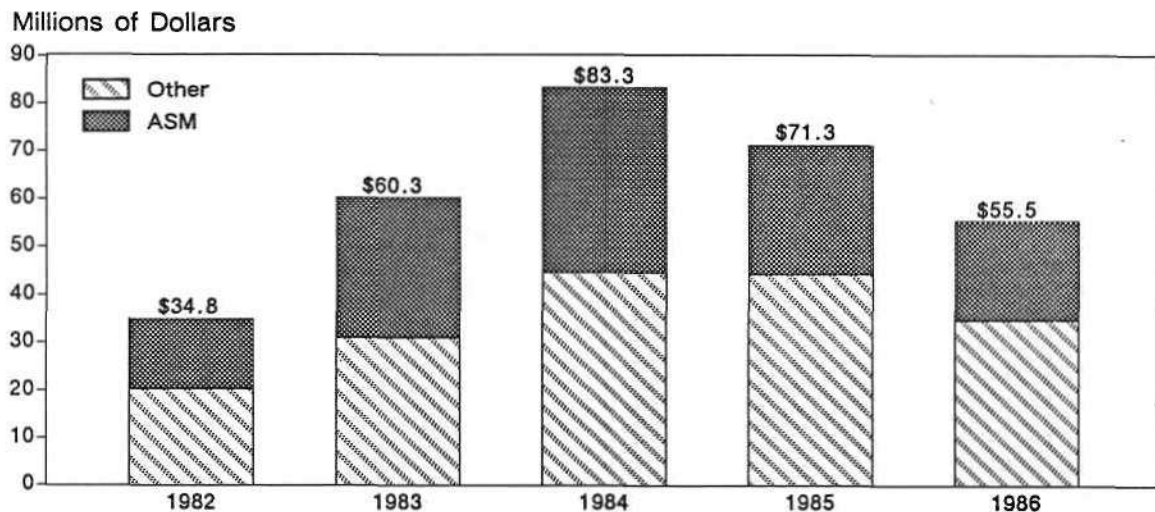
The Company perceives that the principal factors affecting its competitive position include product diversification, quality and performance, reliability, service and support, delivery, and price. With respect to these factors, the Company believes that it is competitive. Its products are generally on the high side of the price range, but they are cost-effective over the product's life cycle.

Competition from one or more companies is present in each segment of ASM International's markets. No one company is considered dominant in the industry, however, and the Company's diversified product line is considered to be an advantage over its competitors. The Company can also manufacture, market, and service its products on a worldwide basis from each of its principal facilities in Europe, Hong Kong, Japan, and the United States.

The Company is the world's leader in the manufacture of plasma-enhanced CVD (see Figure 1). This area is increasingly important to the manufacture of VLSI devices, since it operates in lower pressure and temperature environments. ASMI introduced its first CVD reactor in 1979 for deposition of nitride thin-film layers. The Company is continually expanding the applications of its CVD equipment into other areas, including deposition of other thin films such as oxide, polysilicon, and silicides.

Figure 1

WORLDWIDE MARKET SHARE OF PECVD ASM versus Total Market



Source: Dataquest
August 1987

ASM International N.V.

ASMI's diffusion system allows close control of wafer fabrication parameters and resultant close-tolerance production. The Company also manufactures epitaxial reactors that are used to form low- and high-resistivity epitaxial silicon used for bipolar technology. ASMI manufactures the critical components that go into its CVD reactors, which allows quality control. It makes high-integrity valves, electronic gas flow meters, and flow controllers used in gas control systems.

The Company's international sales are shown in Table 2.

Table 2

ASM International N.V.
WORLDWIDE SALES BY MAJOR GEOGRAPHIC REGION
(Thousands of Dollars)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Europe	\$18,649	\$20,632	\$ 21,189	\$ 29,234	\$ 62,716
Far East/Japan	17,055	33,138	51,075	44,645	50,243
United States	<u>16,979</u>	<u>22,389</u>	<u>37,680</u>	<u>31,799</u>	<u>21,067</u>
Total	\$52,683	\$76,159	\$109,944	\$105,678	\$134,026
Exchange Rate (Guilders per Dollar)	2.67	2.85	3.21	3.32	2.45

Source: ASM International N.V.
Annual Reports
Dataquest
August 1987

ASM's dedicated manufacturing and marketing facilities in Europe, Hong Kong, Japan, and the United States permit the Company to tailor its products to regional equipment markets, and to assure timely delivery and quality.

Research and Development

ASMI participates in research and development in a number of areas to remain competitive in its diverse markets. Recent research activity has focused on chemical vapor deposition, lithography, epitaxy, and ion implant, which are the Company's highest growth markets. Research activity involves physics, electrical engineering, process technology, precision mechanical engineering, and software.

ASM International N.V.

The Company has separate R&D centers in each of its manufacturing locations. These centers participate in both separate and shared research activities aimed at customer-oriented marketing. The Company also enjoys a unique relationship with Philips; its numerous joint ventures and research sharing with Philips are beneficial to its leading edge.

Company Management

ASMI's top management personnel are listed below:

- Arthur del Prado--Founder of the Company; managing director, president, and CEO since Company's formation in 1968
- Richard H.J. Fierkens--Vice president of European Tooling Operations and managing director of ASM FICO Tooling B.V. and ASM FICO Tooling (Limburg) B.V. since 1981; has served in various positions within Tooling Operations (Mr. Fierkens has been with the Company since 1972.)
- John E. Krickl--President of ASM America, Inc., and Epsilon Technology, Inc., an R&D subsidiary; previously served as vice president of VTR Division of Silicon Valley Group, Inc., and president of Thermco Products (Mr. Krickl has been with the Company since December 1986.)
- Patrick Lam See-Pong--Vice president of the Company's Asian Operations and managing director of ASM Assembly Automation Limited, ASM Asia Limited, and ASM Assembly Materials Limited; formerly held various positions within the Company (Mr. See-Pong has been with the Company since 1975.)
- Willem H. de Leeuw--Director of Technology of ASM International; previously with Fokker Aircraft Company in various capacities, including director of Space Division and manager of Aircraft Engineering (Mr. de Leeuw has been with the Company since March 1983.)
- Joop Wallenburg--General manager of ASM Europe B.V.
- Yo Miyazaki--Vice president of Japanese Operations and managing director of ASM Japan; previously was general manager of the semiconductor manufacturing equipment business of a Marubeni Corporation subsidiary (Mr. Miyazaki has been with the Company since August 1982.)

ASM International N.V.

PRODUCTS

ASMI manufactures products in the three major categories of semiconductor production: wafer processing, assembly, and encapsulation. ASMI has various subsidiary and venture organizations focusing on specific market segments. A discussion of the activities of some of these segments follows.

The first product of ASM Lithography, the PAS-2000 wafer stepper, was developed by a team of scientists from Philips. The third generation of this product, the PAS-2500, was introduced in 1985. This product is the first fully automatic wafer stepper capable of submicron working resolution with an overlay accuracy of 0.15 microns and throughput of over 55 six-inch wafers per hour. The company continues to add Philips' products to its lines. A fourth-generation EBPG-4 Beamwriter vectorscan electron-beam pattern generator is being marketed by ASM Lithography.

ASM Ion Implanter's first product, the ASM-220 Medium-Current Serial Process Ion Implanter, was recently released. This product is fully automated for wafer sizes up to 8 inches and for the small geometries encountered in VLSI environments.

Epsilon Technology will introduce a CMOS epitaxial single-wafer reactor in the second half of 1987. This product will be compatible with wafer sizes up through 8 inches and will provide high uniformity and low-particulate contamination. Full production is expected in 1988.

Table 3 is a list of ASM International's products.

Table 3

ASM International N.V. PRODUCTS

<u>Category</u>	<u>Product Class</u>	<u>Description</u>
Processing	Plasma-enhanced micro-pressure CVD systems	Deposits silicon nitride, silicon dioxide, and other films at low temperature
	Micropressure CVD systems	Deposits silicon dioxide, silicon nitride, and polycrystalline silicon films at low temperature and low pressure

(Continued)

ASM International N.V.

Table 3 (Continued)

ASM International N.V. PRODUCTS

<u>Category</u>	<u>Product Class</u>	<u>Description</u>
Processing (Continued)	Integrated computer-controlled diffusion systems	Fully computerized large-scale systems for diffusion of electrically active impurities
	Lithographic equipment	Advanced wafer stepper
Assembly	Automatic die saws	High-speed diamond saws that automatically separate die in a wafer
	Automatic die inspection	High-speed computerized visual inspection of finished die
	Automatic die bonding equipment	High-speed selection and bonding of die chips to various carriers
	Loading stations	Convert existing manual inspection and bonding operations to semiautomatic operation
	Automated wire bonders and bonder automation conversion kits	Precise welding and positioning of wire between the die and pins on the metal lead frame
	Inspection stations	Facilitate rapid visual microscope inspection of lead frames with die attached and wire bond
Encapsulation	High-precision transfer molds	Encapsulation of devices in plastic or epoxy materials
	High-speed automated trim-and-form tooling	Separation of individual devices from lead frames

(Continued)

ASM International N.V.

Table 3 (Continued)

ASM International N.V. PRODUCTS

<u>Category</u>	<u>Product Class</u>	<u>Description</u>
Encapsulation (Continued)	Stamping die and tooling	Fabrication of precision lead frames
	Automatic molding systems	In-line molding systems to automate the sealing of the semiconductor device and lead frame in plastic

Source: ASM International N.V.
Dataquest
August 1987

ASMI's product revenue is shown in Table 4.

Table 4

ASM International N.V. WORLDWIDE SALES BY PRODUCT (Millions of Dollars)

<u>Product</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Wafer Processing Equipment	\$29.8	\$51.3	\$ 60.4	\$ 47.0	\$ 44.7
Plasma-Enhanced CVD (PECVD)	14.6	29.4	38.7	27.1	20.8
Low-Pressure CVD (LPCVD)	7.1	5.6	8.3	7.6	5.3
Diffusion Systems	6.9	15.0	10.6	9.5	8.8
Wafer Steppers	1.2	1.3	2.8	2.8	9.8
Other Products	<u>\$22.9</u>	<u>\$24.9</u>	<u>\$ 49.5</u>	<u>\$ 58.7</u>	<u>\$ 89.3</u>
Total Sales	\$52.7	\$76.2	\$109.9	\$105.7	\$134.0
Exchange Rate (Guilders per Dollar)	2.67	2.85	3.21	3.32	2.45

Source: Dataquest
August 1987

Varian Associates

Varian Associates
611 Hansen Way
P.O. Box 10800
Palo Alto, California 94303
Telephone: (415) 493-4000 Telex: 348746
(Millions of Dollars Except Per Share Data)

Balance Sheet (September 28)

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Current Assets	\$393.8	\$ 362.7	\$379.1	\$446.0	\$514.3	\$473.8
Current Liabilities	\$188.8	\$ 177.4	\$161.9	\$182.4	\$231.3	\$247.1
Current Ratio	2.09	2.04	2.34	2.45	2.22	1.92
Working Capital	\$205.0	\$ 185.3	\$217.2	\$263.6	\$283.0	\$226.7
Long-Term Debt	\$114.4	\$ 109.8	\$ 76.4	\$ 42.3	\$ 43.0	\$ 46.2
Debt/Equity (%)	59	57	28	12	10	11
Shareholders' Equity	\$195.2	\$ 192.1	\$274.7	\$362.5	\$426.9	\$429.2
After-Tax Return on						
Average Equity (%)	0.03	(1.86)	11.35	14.09	15.17	6.10
Capital Expenditures	\$ 33.0	\$ 39.0	\$ 30.0	\$ 34.0	\$ 61.0	\$ 94.0

Operating Performance (Fiscal Year Ending September 28)

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Revenue	\$554.3	\$ 638.4	\$691.2	\$755.9	\$927.8	\$972.5
Gross Revenue (%)	27	31	33	35	36	31
Cost of Revenue	\$406.4	\$ 438.9	\$460.6	\$493.7	\$595.8	\$669.5
R&D Expense	\$ 40.3	\$ 38.6	\$ 41.3	\$ 47.5	\$ 59.1	\$ 73.3
R&D/Rev (%)	7	6	6	6	6	8
GA&S Expense	\$ 42.0	\$ 123.3	\$136.1	\$141.5	\$160.1	\$172.4
GA&A/Rev (%)	8	19	20	19	17	18
Other Expense (Income)	\$ 31.8	\$ 38.7	\$ 12.3	(\$ 4.5)	(\$ 4.1)	\$ 0.6
Pretax Income	\$ 33.8	(\$ 1.1)	\$ 40.8	\$ 77.7	\$116.9	\$ 56.8
Pretax Margin (%)	6.10	(0.17)	5.91	10.28	12.60	5.84
Effective Tax Rate (%)	34.62	(227.27)	35.11	42.46	48.77	54.03
Net Income	\$ 22.1	(\$ 3.6)	\$ 26.5	\$ 44.9	\$ 59.9	\$ 26.1
Average Shares						
Outstanding (Millions)	15.60	16.00	19.50	21.40	21.80	21.30
Per Share						
Earnings	\$ 1.3	(\$ 0.2)	\$ 1.3	\$ 2.1	\$ 2.7	\$ 1.2
Total Employees	12,900	12,800	12,600	13,600	15,900	13,600

Source: Varian Associates
1985 Annual Report and
Form 10-K

Varian Associates

FINANCIAL SUMMARY
TOTAL COMPANY
FIRST NINE MONTHS ENDED JULY 4, 1985 AND 1986
(Millions of Dollars)

	<u>1985</u>	<u>1986</u>	<u>Percent Change</u>
Orders	\$ 700	\$ 664	(5.2%)
Sales	\$ 733	\$ 676	(7.8%)
Backlog	\$ 590	\$ 593	0.6%
Net Income	\$15.1	(\$ 3.5)	
Net Per Share	\$0.68	(\$0.24)	

Source: Varian Associates
Quarterly Financial Data

Varian Associates

THE COMPANY

Background

Varian Associates, founded 37 years ago, engages in the research, development, manufacture, and marketing of various products and services for the fields of communications, defense, industrial production, scientific and industrial research, and health care. Varian's principal lines of business are electron devices, analytical instruments, semiconductor equipment, and medical and industrial products.

Fiscal 1985 was a difficult and disappointing year for Varian, as financial performance fell well below expectations. A combination of internal and external factors were responsible for the lower results. Internally, Varian suffered from high costs and delays in product development and abnormally high manufacturing start-up costs in the Electron Device Group. Externally, the sharp decline in the semiconductor industry and slowdown in computer markets had a heavy impact on Varian's related businesses. The strength of the U.S. dollar through most of 1985 also had a depressing effect on Varian's results. Thus, during fiscal 1985, Varian's sales increased only 4.8 percent over the previous year, as compared to sales growth of 22 percent for 1984 over 1983. Gross profit as a percent of sales was 5.8 percent in fiscal 1985, down from 12.5 percent in fiscal 1984 and 10.2 percent in fiscal 1983.

Reorganization and Cost Reduction

During the second quarter of 1985, Varian discontinued operations of its Lithography Products Division. This action was taken to refocus Varian's resources on its strengths, which the Company believes are in sputter deposition systems and ion implantation. The action resulted in charges of \$13.7 million or \$0.62 per share in 1985, \$9.8 million or \$0.44 per share in 1984, and \$2.8 million or \$0.14 per share in 1983.

Another aspect of its refocusing program was the acquisition of Torrex, a young company that designs chemical vapor deposition (CVD) systems. This acquisition has produced two CVD systems and will allow for research and development of metal and insulator deposition systems for the next generation of semiconductor devices.

As part of its refocusing program, Varian has also sold its interest in Anelva, its Japanese affiliate.

At the beginning of 1985, a program that eliminated nearly 3,000 positions from Varian's 16,000-person work force by June 1986 was implemented. These reductions were achieved through a combination of attrition, job eliminations, and selective layoffs.

Varian Associates

During July 1986, Thomas D. Sege resumed operating control of Varian with the resignation of President Jerome J. Meyer. Mr. Sege has implemented another work force and cost reduction plan that left Varian with a little more than 12,000 employees at the end of September 1986. Other cost saving moves included a hiring freeze, voluntary salary cuts for approximately 57 top level executives, sharp reductions in the use of consultants and overtime, trimming down on travel, and temporary shutdowns at facilities where conditions permitted them. The Company expects these actions to reduce Varian's annual costs by \$20 million to \$30 million.

The Semiconductor Equipment Group (SEG) was reorganized during December 1986 to form a new Varian Fremont division. This division was created by combining the Zylin plasma etch division and the Torrex chemical vapor deposition unit. Steve Jensen, named general manager of the new Fremont division, reports directly to Tony Jurvenson, SEG vice president of operations.

Current Financial Information

Sales for the first nine months of fiscal 1986 were down 7.8 percent from the same period in fiscal 1985 to \$676 million. Year-to-date orders of \$664 million dropped 5.2 percent from the \$700 million level of the prior year. The order backlog of \$593 million was \$3 million higher than at the same point in 1985. For the first nine months of fiscal 1986 Varian had a net loss from continuing operations of \$3.5 million, or \$0.24 per share. During the first nine months of fiscal 1985 the Company produced a net income of \$15 million, or \$0.68 per share.

For the third quarter of 1986, Varian posted a loss of \$5.2 million. Chairman Thomas D. Sege attributed the loss to a combination of factors, primarily continuing losses in the semiconductor equipment area and lower-than-anticipated profit performances by the Electron Device and Instrument Groups. Two corporate manufacturing feeder plants, one of which is now being shut down, also incurred higher-than-planned expenses.

Operations

The Electron Device Group is the leading manufacturer of microwave, power, and special-purpose electron tubes. It also produces solid-state microwave devices and components, and integrated subsystems. More than half of its sales are for defense applications, including electronic countermeasures, radar, and missile guidance. About one-third of its sales are for communications applications, including radio and television broadcasting and satellite communications. The group also serves the industrial and medical markets, with its X-ray generation and imaging techniques. Replacements and spares represent more than one-half of the group's tube sales volume.

Varian Associates

The Instrument Group manufactures, sells, and services a wide variety of analytical instruments that analyze the chemical structure and composition of substances and the concentration of material in a sample. Products include liquid and gas chromatographs, spectrometers, and spectrophotometers. Major markets served are petrochemical, environmental, pharmaceutical, and life science in industry, government, and academic laboratories. Typical applications include traditional chemical analyses, biochemical research, industrial hygiene, and process information for increased energy efficiency and quality control. Large and growing markets for the Company's analytical instruments are the development of standards for the presence of dangerous chemicals, the monitoring and controlling of these substances, and the field of genetic research.

The SEG manufactures process equipment used to make semiconductor devices. The group's two most important product lines are ion implantation and sputter deposition systems. The Company is a leader in the development, manufacture, and application of equipment that performs ion implantation and sputter coating in semiconductor wafer processing. Varian's new equipment places heavy emphasis on microprocessor control and automation. The group also produces high-purity metals for thin-film coating (sputtering and evaporation) of materials in a vacuum deposition process.

The Medical and Industrial Products Group manufactures linear accelerators, vacuum equipment and supplies, and electrical components. Its linear accelerators are used in cancer therapy and for industrial radiographic applications. The Company's leading CLINAC series of accelerators, marketed to hospitals and clinics worldwide, generate therapeutic X rays and electron beams for cancer treatment. LINATRON linear accelerators are used in industrial applications for X-ray examinations of heavy metallic structures for quality control. The vacuum equipment is used to produce, contain, measure, and control a vacuum environment for industrial and scientific purposes. The group's electrical components are low-priced devices used primarily in the telecommunications and computer industries.

International Operations

In fiscal 1985, international sales accounted for 22 percent of Varian's total sales. To increase its overseas competitiveness, Varian is expanding its purchases from overseas vendors and increasing the output of its offshore production facilities.

Varian Associates

Marketing

Varian markets its products throughout most of the world, with 65 field sales offices in the United States and 35 offices in other countries. In general, the Company's markets are quite competitive, characterized by the application of advanced technology and by the development of new products and applications.

Research and Development

In 1982 Varian formed its Office of Technology to focus its technological strength. It has substantially increased the level of investment in both product and manufacturing technology. Using CAE, CAD, and CAM, Varian is aiming at long-term cost reductions through the automation of labor-intensive manufacturing processes.

During 1985, Varian and Nippon Telegraph and Telephone Corporation (NTT) signed an agreement to cooperate in the development of new sputtering systems for planarization processes. These processes will be used for deposition of aluminum thin films on silicon wafers. Under the agreement between Varian and NTT, work in both countries will further develop and refine the processes. Varian will incorporate the findings from both parties' efforts into its sputtering systems.

An active research and development program develops new products such as the gyrotron, which generates very high power and is now used in fusion energy research, and gallium arsenide (GaAs), which is used in the design and manufacture of monolithic microwave integrated circuits (MMICs) and many other new devices now being deployed.

During 1985, Varian's capital spending was \$94.1 million, up from the \$60.6 million 1984 figure. Its 1985 R&D spending was \$73.3 million, up 24 percent from 1984. The Company expects 1986 R&D to show 24 percent growth over 1985. Varian's future research activities will include gallium arsenide technology with emphasis on materials, discrete devices, and integrated circuits.

SEMICONDUCTOR EQUIPMENT GROUP (SEG)

Orders, sales, and backlog for the SEG were all down to approximately one-half or less for the first nine months of fiscal 1986 as compared to 1985. Sales dropped from \$171 million to \$82 million for the first nine months of 1985 and 1986. Orders dropped from \$140 million to \$67 million for the same time period. The SEG backlog for the third quarter of 1986 is down to \$42 million from \$79 million a year ago.

Varian Associates

Mr. Sege said the weak market and high research and development expenses associated with a record number of new products led to a substantial loss for the group. He said the group should return to profitability well before the end of 1987.

Financial information is given in Tables 1 through 5.

Table 1

**FINANCIAL SUMMARY
SEMICONDUCTOR EQUIPMENT GROUP
FIRST NINE MONTHS ENDED JULY 4, 1985 AND 1986**

	<u>1985</u>	<u>1986</u>	<u>Percent Change</u>
Orders	\$140	\$67	(52.0%)
Sales	\$171	\$82	(52.0%)
Backlog	\$ 79	\$42	(47.2%)

Table 2

**FINANCIAL SUMMARY
ELECTRON DEVICE GROUP
FIRST NINE MONTHS ENDED JULY 4, 1985 AND 1986**

	<u>1985</u>	<u>1986</u>	<u>Percent Change</u>
Orders	\$299	\$292	(2.3%)
Sales	\$294	\$313	6.4%
Backlog	\$372	\$376	1.2%

Source: Varian Associates
Quarterly Financial Data

Varian Associates

Table 3

**FINANCIAL SUMMARY
INSTRUMENT GROUP
FIRST NINE MONTHS ENDED JULY 4, 1985 AND 1986**

	<u>1985</u>	<u>1986</u>	<u>Percent Change</u>
Orders	\$123	\$131	6.4%
Sales	\$117	\$126	7.7%
Backlog	\$ 37	\$ 45	21.5%

Table 4

**FINANCIAL SUMMARY
MEDICAL AND INDUSTRIAL PRODUCTS GROUP
FIRST NINE MONTHS ENDED JULY 4, 1985 AND 1986**

	<u>1985</u>	<u>1986</u>	<u>Percent Change</u>
Orders	\$150	\$181	20.8%
Sales	\$162	\$164	1.0%
Backlog	\$109	\$132	21.3%

Source: Varian Associates
Quarterly Financial Data

Varian Associates

Table 5

SEMICONDUCTOR EQUIPMENT GROUP
FINANCIAL SUMMARY
(Millions of Dollars)

	<u>1983</u>	<u>1984</u>	<u>1985</u>
Orders	\$144	\$238	\$160
Sales	\$113	\$189	\$212
Pretax Operating Profit	\$ 13	\$ 37	\$ 23
As % of Sales	12%	20%	11%
Backlog	\$ 60	\$113	\$ 57
Capital Expenditures	\$ 2	\$ 5	\$ 18

Source: Varian Associates
1985 Annual Report

The SEG has four separate operational divisions: the Extrion Division located in Gloucester, Woburn, and New Bedford, Massachusetts; the Thin Film Division in Palo Alto, California; the Varian Fremont Division in Fremont, California; and the Specialty Metals Division in Grove City, Ohio. The Extrion Division's principal products are ion implantation equipment and rapid thermal processing equipment. The Thin Film Technology Division's principal products are sputtering systems and molecular beam epitaxy (MBE) systems. Those of the Varian Fremont Division are plasma etching equipment and CVD equipment.

New Product Introductions

During 1986, Varian continued its strong R&D commitment with a \$30 million R&D investment within the SEG. High investment levels during 1985 and 1986 resulted in the unveiling of nine new systems by Varian at SEMICON/West 1986. Varian's 1986 equipment introductions are summarized below.

With the acquisition of Torrex, now part of the Varian Fremont Division, Varian introduced two new automated CVD systems, Models 5101 and 5150. These were the first systems to offer cassette-to-cassette handling of wafers up to 8 inches in diameter. The two new systems also feature computer control and self-cleaning. Model 5101 is a cold-wall design that performs both thermal and plasma-enhanced processing. Model 5150 is a hot-wall system for depositing films such as low-temperature oxides, nitrides, and polysilicon. The 5150 has a vertical configuration that saves space in the clean room.

Varian Associates

Zylin, also part of the Varian Fremont division, has developed the Model 100 plasma etch system. This system can be equipped with up to five work chambers for multistep processes and parallel processing of individual wafers. The machine handles wafers from 3 to 8 inches in diameter and features an advanced automatic control system that is compatible with robotic cassette systems. It is housed in a stainless steel cabinet.

Model 3290 is Varian's fourth generation of the 3180 sputtering system. The 3290 is a cassette-to-cassette, vertical, single-wafer processing system. It is designed to handle 5- or 6-inch wafers at a throughput of 45 wafers per hour. Now equipped with three targets, the 3290 allows for 50 percent more uptime between target changes. ViaFil, a new processing technique that has been developed for the 3290, produces planarized aluminum silicon films for the enhanced step coverage needed for the production of submicron, complex devices.

The Model XM-8 sputtering system, which is based on the recently acquired GARTEK system, is designed primarily for gallium arsenide processing and backside metalization. The system is capable of sequential deposition of up to four materials with no cross-talk. It features a gentle wafer-handling system especially designed for deposition on fragile materials such as gallium arsenide or backlapped substrates.

The new RTP 8000 is a fully automated rapid thermal-processing system for wafers up to 8 inches in diameter. It has an operating range from 400 to 1,400 C with high-temperature uniformity. The system's cassette-to-cassette wafer-handling system, which has two robotic arms, processes 300 wafers per hour. This system is also available as a semiautomatic model, the RTP 800. Both systems offer significant advantages over diffusion furnaces for annealing implants of dopants, forming silicides, regrowing polysilicon, and rapid oxidation of silicon.

Varian has recently introduced four new Rapid Thermal Processing systems: Models 200 III-V, 400 XP, 160 XP, and 300 XP. These systems were designed for processing megabit devices, gallium arsenide, and advanced materials.

Models 200 III-V and 400 XP handle low- and high-energy implants, respectively. Both models can be used for production and research work with gallium arsenide.

For high dose applications, Model 160 XP is a high-current batch processing machine with flexible dual chambers. It is designed to handle wafers up to 8 inches. In the medium-current area, Model 300 XP offers the highest dose uniformity and reproduction across a broad operating range.

Varian Associates

A modular design MBE system is now available along with the Model 360 GEN II for gallium arsenide work. The new modular system has increased throughput and can be expanded to meet changing needs.

ELECTRON DEVICE GROUP

Sales for this group rose 6.4 percent for the first nine months of fiscal 1986, to \$313 million as compared to \$294 million for the same period in 1985. Orders and backlog had almost no change at \$292 million and \$376 million, respectively. Year-to-date operating margins improved over 1985, but weak demand in some markets held the gains below what was anticipated.

Financial information is given in Tables 2 through 6.

Thomas D. Sege, Varian's chairman, said the third-quarter orders were disappointing. He also anticipates the fourth-quarter order levels to be significantly higher due to the traditional pickup in government buying toward the end of the fiscal year. He noted that stronger demand for the group's equipment and gallium arsenide-based night-vision and solid-state products should contribute to the improvement.

Table 6

ELECTRON DEVICE GROUP FINANCIAL SUMMARY (Millions of Dollars)

	<u>1983</u>	<u>1984</u>	<u>1985</u>
Orders	\$401	\$434	\$425
Sales	\$364	\$403	\$395
Pretax Operating Profit	\$ 59	\$ 59	\$ 25
As % of Sales	16%	15%	6%
Backlog	\$304	\$331	\$397
Capital Expenditures	\$ 20	\$ 31	\$ 25

Source: Varian Associates
1985 Annual Report

Varian Associates

INSTRUMENT GROUP

Sales for the nine months of 1986 were ahead of 1985 by 7.7 percent to \$126 million. Orders for the same period were up 6.4 percent to \$131 million while backlog jumped 21.5 percent to \$45 million. Mr. Sege said the group's progress in improving margins was interrupted by high costs associated with the introduction of new nuclear magnetic resonance products. As a result, the group had a small loss for the third quarter.

Financial information is given in Tables 3 through 7.

Table 7

INSTRUMENT GROUP FINANCIAL SUMMARY (Millions of Dollars)

	<u>1983</u>	<u>1984</u>	<u>1985</u>
Orders	\$133	\$147	\$169
Sales	\$124	\$145	\$159
Pretax Operating Profit	\$ 3	\$ 7	\$ 5
As % of Sales	2%	5%	\$ 3%
Backlog	\$ 29	\$ 31	\$ 42
Capital Expenditures	\$ 6	\$ 3	\$ 4

Source: Varian Associates
1985 Annual Report

MEDICAL AND INDUSTRIAL PRODUCTS GROUP

Nine-month sales for the group were nearly flat at \$164 million. Orders, however, leaped 21.8 percent to \$181 million, and backlog leaped 21.3 percent to \$132 million. Year-to-date orders, sales, and earnings for Varian's cancer therapy equipment were very strong. The industrial sector of the group, however, was much weaker.

Financial information is given in Tables 4 through 8.

Varian Associates

Table 8

**MEDICAL AND INDUSTRIAL PRODUCTS GROUP
FINANCIAL SUMMARY
(Millions of Dollars)**

	<u>1983</u>	<u>1984</u>	<u>1985</u>
Orders	\$182	\$249	\$213
Sales	\$159	\$209	\$219
Pretax Operating Profit	\$ 13	\$ 28	\$ 15
As % of Sales	8%	13%	7%
Backlog	\$ 82	\$122	\$115
Capital Expenditures	\$ 3	\$ 8	\$ 10

Source: Varian Associates
1985 Annual Report

Silicon Valley Group

Silicon Valley Group, Inc.
541 East Trimble Road
San Jose, California 95131
Telephone: (408) 945-9300
(Thousands of Dollars Except Per Share Data)

Balance Sheet (September 30)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Current Assets	\$ 5,887	\$24,647	\$30,882	\$36,699	\$38,678
Current Liabilities	\$ 1,490	\$ 2,674	\$ 3,736	\$ 3,938	\$ 4,319
Current Ratio	3.95	9.22	8.27	9.32	8.96
Working Capital	\$ 4,397	\$21,973	\$27,146	\$32,761	\$34,359
Long-Term Debt	\$ 60	\$ 234	\$ 300	\$ 364	\$ 408
Debt/Equity	0.01	0.01	0.01	0.01	0.01
Shareholders' Equity	\$ 4,620	\$22,694	\$28,429	\$34,380	\$37,385
After-Tax Return on Average Equity (%)	51%	22%	21%	18%	7%
Capital Expenditures	\$ 126	\$ 570	\$ 824	\$ 849	\$ 1,914

Operating Performance (Fiscal Year Ending September 30)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Revenue	\$12,095	\$16,958	\$30,463	\$36,864	\$27,842
Gross Margin	62%	62%	60%	59%	56%
Cost of Revenue	\$ 4,595	\$ 6,493	\$12,039	\$15,130	\$12,378
R&D Expense	\$ 1,061	\$ 1,569	\$ 2,906	\$ 4,660	\$ 4,686
R&D/Revenue	9%	9%	10%	13%	17%
SG&A Expense	\$ 3,141	\$ 4,148	\$ 6,586	\$ 7,946	\$ 8,036
SG&A/Revenue	26%	24%	22%	22%	29%
Interest Income	\$ 135	\$ 926	\$ 1,521	\$ 1,695	\$ 1,997
Pretax Income	\$ 3,433	\$ 5,674	\$10,453	\$10,823	\$ 4,739
Pretax Margin (%)	28%	33%	34%	29%	17%
Effective Tax Rate (%)	45%	46%	48%	47%	44%
Provision for Income Taxes	\$ 1,545	\$ 2,611	\$ 4,997	\$ 5,090	\$ 2,093
Net Income	\$ 1,888	\$ 3,063	\$ 5,456	\$ 5,733	\$ 2,646
Average Shares Outstanding (Thousands)	3,392	4,014	4,360	4,382	4,438
Earnings per Share	\$ 0.56	\$ 0.76	\$ 1.25	\$ 1.31	\$ 0.60
Dividends per Share	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00
Total Employees	128	188	317	297	268

Source: Silicon Valley Group
Annual Reports and
10-K Reports
Dataquest
May 1987

Silicon Valley Group

(Material in this section has been excerpted from the following sources: 1986 Silicon Valley Group, Inc., Annual Report, product literature, Prudential-Bache, and the business press. For more detailed information and opinions on Silicon Valley Group, Dataquest clients are invited to use their inquiry privileges.)

THE COMPANY

Background

Silicon Valley Group, Inc., (SVG) develops, manufactures, and markets automated wafer-handling and production-processing equipment primarily for the semiconductor industry. Typically referred to as wafer track equipment, SVG's various systems perform wafer clean, photoresist coat, and bake before the wafers are exposed during the photolithographic process. The Company also offers automated interface systems between its track equipment and photolithography equipment, including aligners and all major stepper products.

SVG has recently expanded into a new product area, offering a vertical thermal reactor for chemical vapor deposition (CVD). The Company's equipment also aids the manufacture of thin-film recording heads used in disk drives for the computer industry and the processing of silicon wafers into solar cells. Table 1 is a list of SVG's product line.

SVG has shown steadily increasing sales over the past five years. Revenue of \$5.8 million in 1982 has increased at a cumulative annual growth rate (CAGR) of 60.1 percent to reach \$38.7 million in 1986. The majority of revenue through 1986 can be attributed to track equipment.

Silicon Valley Group

Table 1

Silicon Valley Group PRODUCT LINE

<u>Product Family</u>	<u>Product Name</u>	<u>Date of Introduction</u>	<u>Features/Description</u>	<u>Maximum Wafer Size</u>
Automatic Photoresist Equipment	SVG-G8126PC		In-line system; coat	5 inches
	SVG-8128PD		In-line system; develop	5 inches
	SVG-8132CTD		In-line system; develop	5 inches
	SVG-8136HPO		In-line system; hot plate bake	5 inches
	SVG-8138VP		In-line; prime; hot plate bake	5 inches
	SVG-8120SSC		In-line; brush and jet scrub; single-sided	5 inches
	SVG-8818 DMC	1986	Double-sided wader cleaner; automated vertical handling	8 inches
	SVG-8620SSC		In-line; brush and jet scrub	6 inches
	SVG-8626PC		In-line; coat	6 inches
	SVG-8632CTD		In-line; develop	6 inches
	SVG-8636HPO		In-line; hot plate bake	6 inches
	SVG-8638VP		In-line; prime; hot plate bake	6 inches
	SVG-8640MHP	1986	In-line; hot plate bake; long bake times possible; programmable; vacuum wafer transfer; oven priority baking	6 inches
	SVG-8642SOG		Spin-on-glass coater; bowl wash feature	6 inches
	SVG-6000VTR	1986	Vertical thermal reactor; low-pressure CVD; automatic wafer	6 inches
	SVG-630LSN		Handling and loading; throughput 160 wafers per hour	
Edge Grinder	SVG-146		Grinds silicon and 666; contour edge including flat; rims and dry; fully automated; throughput 300 wafers per hour	5 inches
Wafer Inspection	SVG-8024WV System/80		12 inspection programs stored in memory; accommodates H-type and box-type cassettes; variable chuck rotation; six possible sort cassettes	5 inches
	Wafer Abrader SVG-16 WATH		N/A	
	SVG-2215 Index Station		N/A	

N/A = Not Available

Source: Silicon Valley Group
Company Literature

Silicon Valley Group

Operations

The 1986 downturn in the semiconductor production equipment industry moved the Company to strengthen its competitiveness through increased customer involvement. SVG is focusing its engineering efforts to adapt equipment to individual customer needs. A sizable share of its products shipped during fiscal 1986 was customized, and some modifications have been integrated into SVG's standard equipment. The Company has also expanded its international network of field representatives and increased process support.

SVG began a program of development for stepper interfaces during 1985, and during fiscal 1986 followed the effort through, developing and installing interfaces for all the major steppers and aligners.

The Company entered a new product area with the development of a vertical thermal reactor (VTR), targeting the CVD market. It also developed CVD application processes including silicon nitride and flat-temperature polysilicon deposition. The Company has restructured, establishing the SVG Track Division to ensure that efforts in its more established product lines are not diluted.

The Company purchased Anicon, Inc., a major competitor in the CVD product segment, in January 1987. It is believed that Anicon can add important process technology to SVG's own deposition effort. Anicon has an installed base of over 120 systems whose major users include Seiko, Siemens, and Texas Instruments.

SVG confirmed that it had received a large order from Sandia Labs, the government-sponsored research facility in New Mexico, signaling early success for the VTR. Japanese interest was also reported to be high.

Strategy and International Competitiveness

SVG equipment is now operating in semiconductor production lines in more than twenty countries. Its products are sold through a worldwide network of sales offices, independent sales representatives, and distributor organizations. Service is provided by Company employees based in several countries. The Company is strengthening its international marketing and sales organization in order to service and support the growing base of equipment delivered worldwide.

The Company reported that 24 percent of its 1984 revenue was from exports. In 1986 this figure increased to 35 percent. Table 2 shows SVG's sales figures by region.

Silicon Valley Group

Table 2

ESTIMATED REGIONAL SALES (Thousands of Dollars)

	<u>1984</u>	<u>1985</u>	<u>1986</u>
United States	\$23,171	\$25,874	\$18,148
Export	<u>7,292</u>	<u>10,990</u>	<u>9,694</u>
Total	\$30,463	\$36,864	\$27,842

(Percent of Total)

	<u>1984</u>	<u>1985</u>	<u>1986</u>
United States	76.1%	70.2%	65.2%
Export	<u>23.9</u>	<u>29.8</u>	<u>34.8</u>
Total	100.0%	100.0%	100.0%
Total	200.0%	200.0%	200.0%

Source: Silicon Valley Group,
1986 Annual Report
Dataquest
May 1987

SVG's share of the Japanese track market has traditionally been low, although the Company has done well in other Far Eastern markets. The Japanese track equipment market tends to be dominated by large local manufacturers, such as Dai Nippon Screen.

As mentioned above, Japanese interest in SVG's new VTR is high.

To expand its resources and representation in the Japanese market, SVG formed a wholly owned subsidiary in Japan, and formalized a distribution agreement with a Japanese representative.

Silicon Valley Group

Research and Development

SVG has continuously expanded and improved its product line to remain competitive and to hold market share. The Company's track equipment offers a full range of automation, including diagnostics and cassette-to-cassette configurations for both standalone units and in-line systems.

In an effort started in 1975, SVG has been working with photolithographic equipment manufacturers to develop interfaces between SVG wafer track equipment and wafer steppers. It has also developed and shipped interfaces for all the major steppers and aligners, as well as an etcher interface.

As mentioned previously, the Company has developed not only a VTR, but also process designs, including silicon nitride and flat-temperature polysilicon deposition.

Research and development as a percentage of revenue has steadily risen from 10 percent in FY 1984 to 17 percent in FY 1986.

Company Management

SVG's President is Papken Der Totsian. Other officers include Senior Vice President of Marketing, Kenn Giles; Vice President of Finance, Tony Muller; Manager of Purchasing, Will Starek; Vice President of Manufacturing, Arthur Silver; and Vice President of Technology, Johan Tam.

Monsanto Company

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Monsanto Company

Monsanto Company
800 North Lindbergh Boulevard
St. Louis, Missouri 63167
Telephone: (314) 694-1000
(Millions of Dollars except Per Share Data)

Balance Sheet (December 31, 1986)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Total Assets	\$6,069	\$6,077	\$6,427	\$6,373	\$8,877	\$8,269
Accounts Receivable	\$1,071	\$1,076	\$1,115	\$1,078	\$ 402	\$ 221
Total Current Assets	\$2,550	\$2,454	\$2,755	\$2,597	\$3,277	\$2,808
Total Liabilities	\$2,739	\$2,587	\$2,760	\$2,739	\$5,470	\$4,488
Accounts Payable	\$ 492	\$ 379	\$ 500	\$ 497	\$ 522	\$ 460
Total Current Liabilities	\$1,064	\$ 951	\$1,220	\$1,202	\$2,378	\$1,716
Shareholders' Equity	\$3,330	\$3,490	\$3,667	\$3,634	\$3,407	\$3,781

Operating Performance (Fiscal Year Ending December 31)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Net Sales	\$6,948	\$6,325	\$6,299	\$6,691	\$6,747	\$6,879
COGS	\$5,293	\$4,804	\$4,704	\$4,839	\$4,841	\$4,344
Selling & Administrative	\$ 656	\$ 691	\$ 681	\$ 722	\$ 919	\$1,244
R&D	\$ 233	\$ 264	\$ 290	\$ 370	\$ 470	\$ 523
Income from Operations	\$ 702	\$ 501	\$ 555	\$ 677	(\$ 598)	\$ 635
EBT	\$ 693	\$ 501	\$ 570	\$ 707	(\$ 298)	\$ 636
Income Taxes	\$ 248	\$ 172	\$ 201	\$ 268	(\$ 170)	\$ 203
Net Income	\$ 445	\$ 329	\$ 369	\$ 439	(\$ 128)	\$ 433
EPS	\$11.50	\$ 8.21	\$ 8.97	\$ 5.42	(\$ 1.67)	\$ 5.55
Dividends per Share	\$ 1.88	\$ 1.98	\$ 2.08	\$ 2.25	\$ 2.45	\$ 2.58
Shares Outstanding	38.70	40.00	41.10	80.90	76.60	78.00
Ratios						
Profit Margin (%)	6.00	5.00	6.00	7.00	(2.00)	6.00
Return on Equity (%)	13.00	9.00	10.00	13.00	(11.00)	26.00
Return on Assets (%)	7.00	5.00	6.00	7.00	(1.00)	5.00
Gross Margin (%)	24.00	24.00	25.00	28.00	28.00	37.00
Current Ratio	2.40	2.58	2.26	2.16	1.38	1.64
Quick Ratio	1.41	1.50	1.45	1.28	0.64	0.89

Source: Monsanto Company
Annual Report
Dataquest
November 1987

Monsanto Company

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Monsanto Company

THE COMPANY

Background and Overview

Monsanto Company was founded in 1901 in Saint Louis, Missouri. Since that time, it has developed into a multinational company engaged in researching, manufacturing, and marketing a widely diversified range of products, which are reported under the following eight business segments:

- Agricultural Products
- Chemicals
- Electronic Materials
- Fisher Controls
- NutraSweet
- Pharmaceuticals
- Oil and Gas
- Biotechnology Product Discovery

Monsanto has recently completed a strategic redirection by taking several important steps. Beginning in late 1985 and continuing in 1986, Monsanto divested numerous low-return and nonstrategic businesses and assets. In addition, the Company streamlined operations by reducing the number of employees and levels of management.

As part of its strategic redirection, Monsanto has transformed its chemicals, fibers and plastics businesses from heavy dominance by commodity petrochemicals to a higher-performance, less cyclical mix. In 1985, the Company acquired a leading U.S. pharmaceutical firm, G.D. Searle & Co. Monsanto reports that it is looking forward to becoming one of the leading pharmaceutical companies in the world as a result of the combined strengths of Searle and Monsanto in chemistry and biotechnology.

The acquisition of Searle also added the NutraSweet brand sweetener to the Company's list of products.

Operations

Monsanto reports that the strategies planned in recent years and, particularly, the restructuring actions taken in 1985 yielded significant profit benefits in 1986. Net income in 1986 was \$433 million, compared with a net loss of \$98 million in 1985. The net loss in 1985 resulted from costs associated with the restructuring program. Earnings per share for 1986 were \$5.55, compared with a 1985 loss of \$1.27 per share.

Monsanto Company

Operating performance for 1986 was strong, with the company's chemicals, plastic and fiber products, Roundup herbicide, and NutraSweet performing well and accounting for most of the improvement over 1985 operating results. Searle made progress in expanding acceptance of several drugs in international markets. The Company reported disappointment over the 1986 results of Electronic Materials and of Fisher Controls, however.

Sales increased to \$6,879 million, compared with \$6,747 in 1985. Two factors affect this comparison. First, net sales of products that were subsequently divested as part of the restructuring program (\$931 million) were included in 1985. Second, the acquired Searle and NutraSweet businesses were included for only the last 5 months of 1985, versus the full 12 months of 1986.

The gross profit margin improved significantly in 1986 to 37 percent, compared with 28 percent in 1985. Partially depressing the improved gross profit margin was the \$90 million obsolescence charge for the Electronic Materials' property write-down.

For the first half of 1987, the Company reports that net sales were \$3.9 billion, up 8 percent from a year earlier (see Table 1). Net income for this period also grew, from \$266 million to \$292 million, an increase of 10 percent. Of particular note was the return to near break-even of the Electronic Materials division. Electronic Materials reported net sales for the first six months of 1987 at \$89 million, up 29 percent from \$69 million one year ago. Operating income for Electronic Materials was a negative \$2 million, compared with a negative \$24 million one year ago. The Company attributes the approach to break even not only to increased sales but also to cost-cutting measures instituted one year ago.

Table 1

Monsanto Company
Operating Unit Segment Data—Net Sales and Operating Income
Six Months Ended June 30
(1986 and 1987)

	<u>Net Sales</u>		<u>Operating Income</u>	
	<u>1986</u>	<u>1987</u>	<u>1986</u>	<u>1987</u>
Agricultural Products				
Crop Products	\$ 684	\$ 754	\$277	\$312
Animal Sciences	39	60	(20)	(15)
Chemicals	1,788	1,904	258	250
Electronic Materials	69	89	(24)	(2)
Fisher Controls	327	353	(6)	13
NutraSweet	388	360	78	65
Pharmaceuticals	316	371	(53)	(85)
Biotechnology Product				
Discovery	-	-	(17)	(19)
Corporate Items	-	-	(23)	(18)
Total	\$3,614	\$3,891	\$470	\$501

Source: Monsanto First Half Report, 1987
 Dataquest
 November 1987

Monsanto Company

Operating segment data for net sales, operating income, total assets, and capital spending are shown in Tables 2 through 5.

Table 2

**Monsanto Company
Operating Unit Segment Data—Net Sales
(Millions of Dollars)**

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Agricultural Products				
Crop Products	\$1,167	\$1,256	\$1,073	\$1,067
Animal Sciences	83	82	79	86
Chemicals	4,148	4,360	4,051	3,548
Electronic Materials	120	220	137	154
Fisher Controls	535	550	652	645
NutraSweet	-	-	317	771
Pharmaceuticals	-	15	262	665
Oil and Gas	241	203	172	-
Biotechnology Product				
Discovery	-	-	-	-
Corporate Items and Eliminations	<u>5</u>	<u>5</u>	<u>4</u>	<u>3</u>
Total	\$6,299	\$6,691	\$6,747	\$6,879

Source: Monsanto Annual Report, 1986
Dataquest
November 1987

Table 3

**Monsanto Company
Operating Unit Segment Data—Operating Income
(Millions of Dollars)**

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Agricultural Products				
Crop Products	\$400	\$438	\$177	\$318
Animal Sciences	(33)	(49)	(92)	(35)
Chemicals	230	336	(480)	613
Electronic Materials	(56)	4	(84)	(139)
Fisher Controls	24	27	34	(66)
NutraSweet	-	-	58	142
Pharmaceuticals	(15)	(30)	(139)	(119)
Oil and Gas	41	27	16	-
Biotechnology Product				
Discovery	(21)	(24)	(31)	(41)
Corporate Items and Eliminations	<u>(49)</u>	<u>(52)</u>	<u>(57)</u>	<u>(38)</u>
Total	\$521	\$677	(\$598)	\$635

Source: Monsanto Annual Report, 1986
Dataquest
November 1987

Monsanto Company

Table 4

Monsanto Company Operating Unit Segment Data—Total Assets (Millions of Dollars)

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Agricultural Products				
Crop Products	\$1,214	\$1,236	\$1,061	\$ 939
Animal Sciences	187	184	174	217
Chemicals	3,201	3,222	2,982	2,704
Electronic Materials	253	280	302	228
Fisher Controls	503	536	636	612
NutraSweet	-	-	1,862	1,883
Pharmaceuticals	3	80	1,438	1,394
Oil and Gas	543	578	-	-
Biotechnology Product				
Discovery	15	31	33	50
Corporate Items and Eliminations	<u>508</u>	<u>226</u>	<u>389</u>	<u>242</u>
Total	\$6,427	\$6,373	\$8,877	\$8,269

Source: Monsanto Annual Report, 1986
Dataquest
November 1987

Table 5

Monsanto Company Operating Unit Segment Data—Capital Spending (Millions of Dollars)

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Agricultural Products				
Crop Products	\$109	\$ 88	\$ 84	\$ 55
Animal Sciences	60	31	31	33
Chemicals	213	279	291	244
Electronic Materials	26	47	55	51
Fisher Controls	29	32	53	38
NutraSweet	-	-	73	205
Pharmaceuticals	4	7	39	67
Oil and Gas	85	69	59	-
Biotechnology Product				
Discovery	15	17	3	6
Corporate Items and Eliminations	<u>3</u>	<u>6</u>	<u>6</u>	<u>1</u>
Total	\$560	\$614	\$645	\$520

Source: Monsanto Annual Report, 1986
Dataquest
November 1987

Monsanto Company

Research and Development

Monsanto reports that in 1986 the Company crossed over from being a capital-intensive company to a research-intensive company, with R&D investment exceeding capital investment. Electronic Materials has maintained its spending commitment to R&D, even in the last few years when it experienced operating losses (see Table 6).

Table 6

Research and Development (Millions of Dollars)

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Agricultural Products				
Crop Products	\$ 78	\$107	\$110	\$ 94
Animal Sciences	14	22	32	41
Chemicals	112	131	128	105
Electronic Materials	14	14	16	15
Fisher Controls	13	23	20	21
NutraSweet	-	-	11	25
Pharmaceuticals	15	24	96	177
Oil and Gas	-	-	-	-
Biotechnology Product				
Discovery	21	24	31	39
Corporate Items and Eliminations	<u>23</u>	<u>25</u>	<u>26</u>	<u>6</u>
Total	\$290	\$370	\$470	\$523

Source: Monsanto Annual Report, 1986
Dataquest
November 1987

International Sales

Monsanto reports its international sales by the following geographic areas: Asia-Pacific, Europe-Africa, Canada, Latin America, and the United States (see Table 7).

Monsanto Company

Table 7

International Sales*
(Millions of Dollars)

	Net Sales to Unaffiliated Customers			Operating Income (Loss)		
	1984	1985	1986	1984	1985	1986
United States	\$4,914	\$4,794	\$4,638	\$475	(\$784)	\$506
Europe-Africa	\$ 945	\$1,076	\$1,231	\$192	\$191	\$117
Canada	\$ 278	\$ 298	\$ 290	\$ 25	\$ 34	\$ 26
Latin America	\$ 203	\$ 220	\$ 283	\$ 4	(\$ 3)	\$ 6
Asia-Pacific	\$ 351	\$ 359	\$ 437	\$ 31	\$ 9	\$ 16
Interarea						
Eliminations	-	-	-	\$ 2	\$ 12	\$ 2
Corporate Items	-	-	-	(\$ 52)	(\$ 57)	(\$ 38)

*The above data were prepared on an "entity basis," which means that the sales and operating income were assigned to the geographic area where the entity is located (e.g., a sale from the United States to Latin America is reported as a U.S. sale).

Source: Monsanto Annual Report, 1986
Dataquest
November 1987

Monsanto Electronic Materials Company

Monsanto's Electronic Materials segment does business under the name of Monsanto Electronic Materials Company (MEMC). MEMC is headquartered in Palo Alto, California, and is the largest U.S.-based silicon company, with silicon and epitaxial wafer sales of \$154 million in 1986, up 12 percent over the 1985 level. For 1985, Dataquest estimates that MEMC had 10.8 percent of the world market of \$1,266 million. Operating losses, however, increased in 1986, due in large measure to the \$90 million pretax write-down of property, plant, and equipment values. The decision to write down these assets was made because MEMC anticipates that there will be reduced growth in the semiconductor industry and a continued shift of demand to Japanese and other Pacific Basin producers of semiconductors. MEMC believes that the problem of reduced growth is compounded by its difficulty in effectively penetrating the large Japanese market. However, it also believes that the write-down has reduced asset values to a level more properly reflecting future cash flows under projected market conditions, especially in the United States.

Monsanto Company

Also in 1986, MEMC sold the assets of its Photoresist Products division to Aspect Systems Corporation, a start-up formed to purchase the operation. In addition to selling its photoresist division in 1986, MEMC reduced its number of employees, reduced manufacturing costs, and discontinued certain technical programs not related to current product lines. MEMC reports that these actions have significantly reduced its break-even point. Indeed, that point appears to have been reached in the first half of 1987 when MEMC achieved an operating loss of negative \$2 million on sales of \$89 million for the first six months of 1987.

Products

MEMC provides a controlled inventory for its customers. After joint QC sampling to specifications, MEMC stocks the wafers at its service facilities and at its own expense to provide its customers with a just-in-time shipment.

MEMC manufactures and markets three different silicon wafer application series. Each application series, or family, of silicon wafers corresponds to ULSI, VLSI, or LSI/MSI wafers. MEMC offers wafers from 3 inches to 200mm in diameter. Wafers in each series are available as polished wafers, externally gettered wafers (including enhanced gettering), and epitaxial wafers (offered generally for MOS applications).

MEMC also markets III-V materials, including gallium arsenide wafers, in the United States. It markets these materials through an agreement with Mitsubishi Monsanto Kaisei of Japan. Mitsubishi Monsanto Kaisei is a joint venture between Monsanto Company and Mitsubishi Chemical Industries.

MEMC is able to design its silicon and gallium arsenide wafer products to meet the needs of specific device-integration levels by engineering wafers with distinct, functional zones. Wafer characteristics are engineered to individual circuit requirement through the design of each of these zones.

Facilities

Table 8 summarizes MEMC's silicon facilities and plant activities. In Table 8, single-crystal ingot refers to the growth of silicon ingots at a given location, and wafer refers to the slicing, lapping, and polishing activities associated with wafer preparation.

MEMC's single-crystal operations are U.S. based. Both the Saint Peters plant and the newer Spartanburg facility grow single-crystal silicon ingots and produce wafers; epitaxial wafer production is performed in Spartanburg. Wafer capacity at MEMC's U.S. facilities is approximately 325 million square inches (MSI). MEMC's overseas facilities obtain single-crystal silicon ingots from the U.S. plants to produce wafers for their respective local markets.

MEMC closed its polysilicon facility in Saint Peters, Missouri, in 1987.

Monsanto Company

Three new offshore wafer facilities, in Korea, Japan, and the United Kingdom, became operational in 1986. Each new plant has 20-MSI wafer capacity, which can be expanded for future requirements. This offshore wafer manufacturing is part of Monsanto's strategy to better penetrate overseas markets.

Table 8

Monsanto Company Silicon Plant Locations

<u>Location</u>	<u>Single-Crystal Ingot</u>	<u>Wafers</u>	<u>Technical Center</u>
Saint Peters, MO, United States	X	-X	X
Spartanburg, SC, United States	X	X	
Kuala Lumpur, Malaysia		X	
Gumi, South Korea		X	
Utsonomiya, Tochigi, Japan		X	X
Milton Keynes, United Kingdom		X	X

Source: Dataquest
November 1987

International Activities

In Korea, MEMC's manufacturing facility for silicon wafers is in Gumi, adjacent to the country's developing semiconductor industry. The silicon facility, a 50-50 joint venture between Monsanto and Dongbu Industrial Company, is named Korsil Company, Ltd. Korsil's and MEMC's combined sales exceed those of other suppliers of silicon wafers in Korea. Korsil also provides engineering support and service for wafers produced by MEMC and sold by Monsanto Korea Ltd.

Also in Korea, MEMC signed an agreement in 1987 with Samsung Semiconductor & Telecommunications Company Ltd. to supply more than \$15 million of silicon wafers that year to the Korean manufacturer.

Most of the wafer manufacturing processes, including the crystal growing, slicing, etching, and lapping, will be handled outside Korea. Wafer polishing functions will be done by Korsil.

Monsanto Company

MEMC and Hitachi announced an agreement in July 1986, for a cooperative program in which Hitachi agreed to purchase up to 5 percent of its silicon wafers from MEMC. Both companies are working together to customize the wafers to Hitachi's specific requirements. This agreement represents the first volume sales of MEMC wafers to Hitachi and is particularly significant in light of the fact that MEMC has targeted the Japanese market as important in its long-range strategy.

Hoechst

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Hoechst

Hoechst Group*
D-6230 Frankfurt am Main 80
West Germany
(Millions of Deutsche Marks except Per Share Data)

Balance Sheet (December 31, 1986)

	<u>1984</u>	<u>1985</u>	<u>1986</u>
Fixed Assets & Investments	DM 10,293.2	DM 9,712.7	DM 9,346.4
Tangible & Intangible Fixed Assets	DM 9,705.0	DM 8,084.9	DM 8,672.7
Investments	DM 588.2	DM 627.8	DM 673.7
Current Assets	DM 17,890.7	DM 17,356.6	DM 18,154.9
Inventories	DM 7,318.4	DM 7,220.1	DM 6,464.5
Receivables	DM 8,164.9	DM 7,529.0	DM 6,646.5
Liquid Assets	DM 2,407.4	DM 2,907.5	DM 5,043.9
 Total Assets	 DM 28,183.9	 DM 27,369.3	 DM 27,501.3
 Shareholders' Equity	 DM 6,925.2	 DM 6,639.1	 DM 7,167.4
Long-Term Liabilities	DM 4,590.2	DM 3,631.8	DM 3,023.5
Other Liabilities	DM 7,650.9	DM 6,820.0	DM 6,005.8
Retained Earnings	DM 455.1	DM 515.9	DM 548.9
 Total Liabilities & Stockholders' Equity	 DM 28,183.9	 DM 27,369.3	 DM 27,501.3
 Total Operating Performance	 DM 42,079.6	 DM 43,680.2	 DM 38,331.9
Net Sales	DM 41,457.3	DM 42,821.9	DM 38,014.1
Capitalized Company-Constructed Assets	DM 622.3	DM 858.3	DM 317.8
Cost: Materials, Supplies, & Merchandise	DM 18,329.1	DM 18,713.6	DM 14,799.6
Gross Result for Operation	DM 23,750.5	DM 24,866.6	DM 23,532.3
Other Income	DM 1,231.2	DM 1,403.3	DM 1,542.1
Other Expenses	DM 21,929.6	DM 22,915.2	DM 21,683.7
Taxes	DM 1,699.8	DM 1,886.7	DM 1,991.6
Net Income	DM 1,352.3	DM 1,468.0	DM 1,399.1
 Exchange Rate (DM/US\$)	 2.85	 2.94	 2.17

*The Hoechst Group includes Hoechst AG and the affiliates at home and abroad in which the Company has a direct or indirect holding of 50 percent or more.

Source: Hoechst Group
Annual Report
Dataquest
September 1987

Hoechst

Hoechst Group*
D-6230 Frankfurt am Main 80
West Germany
(Millions of Dollars except Per Share Data)

Balance Sheet (December 31, 1986)

	<u>1984</u>	<u>1985</u>	<u>1986</u>
Fixed Assets & Investments	\$ 3,612	\$ 3,304	\$ 4,307
Tangible & Intangible Fixed Assets	\$ 3,405	\$ 2,750	\$ 3,997
Investments	\$ 206	\$ 214	\$ 310
Current Assets	\$ 6,277	\$ 5,904	\$ 8,366
Inventories	\$ 2,568	\$ 2,456	\$ 2,979
Receivables	\$ 2,865	\$ 2,561	\$ 3,063
Liquid Assets	\$ 845	\$ 989	\$ 2,324
Total Assets	\$ 9,889	\$ 9,309	\$12,673
Shareholders' Equity	\$ 2,430	\$ 2,258	\$ 3,303
Long-Term Liabilities	\$ 1,611	\$ 1,235	\$ 1,393
Other Liabilities	\$ 2,685	\$ 2,320	\$ 2,768
Retained Earnings	\$ 160	\$ 175	\$ 253
Total Liabilities & Stockholders' Equity	\$ 9,889	\$ 9,309	\$12,673
Total Operating Performance	\$14,765	\$14,857	\$17,664
Net Sales	\$14,546	\$14,565	\$17,518
Capitalized Company Constructed Assets	\$ 218	\$ 292	\$ 146
Cost: Materials, Supplies, & Merchandise	\$ 6,431	\$ 6,365	\$ 6,820
Gross Result for Operation	\$ 8,334	\$ 8,458	\$10,844
Other Income	\$ 432	\$ 477	\$ 711
Other Expenses	\$ 7,695	\$ 7,794	\$ 9,992
Taxes	\$ 596	\$ 642	\$ 918
Net Income	\$ 474	\$ 499	\$ 645

*The Hoechst Group includes Hoechst AG and the affiliates at home and abroad in which the Company has a direct or indirect holding of 50 percent or more.

Source: Hoechst Group
Annual Report
Dataquest
September 1987

Hoechst

THE COMPANY

Background

The Hoechst Group is a West German company with worldwide manufacturing and marketing operations. The Hoechst Group includes Hoechst AG and its 37 affiliates, companies in West Germany and abroad in which Hoechst has a direct or indirect holding of 50 percent or more. Hoechst AG accounted for 36 percent and 37 percent of Hoechst Group's sales in 1985 and 1986, respectively.

The Company operates the following lines of business: pharmaceuticals, plastics and waxes, paints and synthetic resins, fibers and fiber-starting products, inorganic chemicals, agrochemicals, organic chemicals, dyes, pigments and intermediates, industrial gases, welding technology, surfactants and auxiliaries, plastic film, technical information systems, plant engineering, consumer products, and semiconductor materials and chemicals.

Operations

Hoechst Group sales increased by approximately 3 percent to DM 42,722 million in 1985, and then declined by 11 percent to DM 38,014 million in 1986. The Company attributes the decrease in 1986 to these three factors:

- The appreciation of the deutsche mark (Just the translation of foreign sales into deutsche marks accounted for a drop of more than DM 3 billion.)
- The drastic fall in prices for crude oil and petrochemical feedstocks, which put pressure on prices
- The sale of the Company's styrene monomer and polystyrene business in the United States and in the Netherlands

A percentage distribution for the Hoechst Group's major product lines is shown in Figure 1.

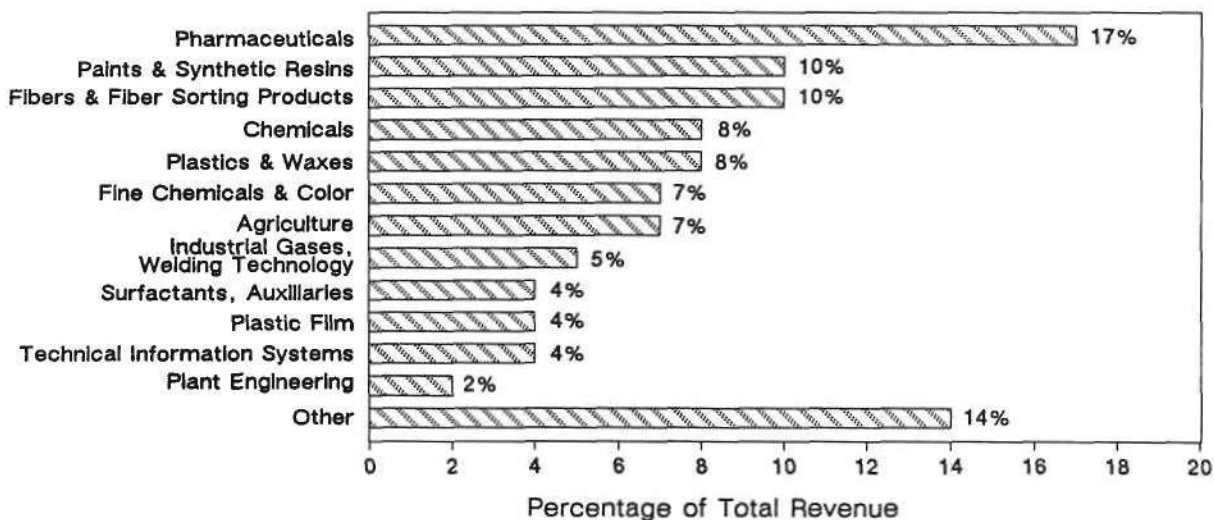
Net income for 1986 was down by DM 69 million to DM 1,399 million. However, the Company reports a continuing high level of return on equity at 14.1 percent. In 1986, the Hoechst Group raised an additional DM 879 million in equity through shareholders and reduced corporate debt to DM 4,538 million.

In February 1987, the FTC approved the \$2.85 billion takeover by Hoechst of Celanese Corporation. This takeover creates the largest chemical company in the world.

Hoechst

Figure 1

Hoechst Group Sales by Product Division



Source: Dataquest
September 1987

Strategy and International Competitiveness

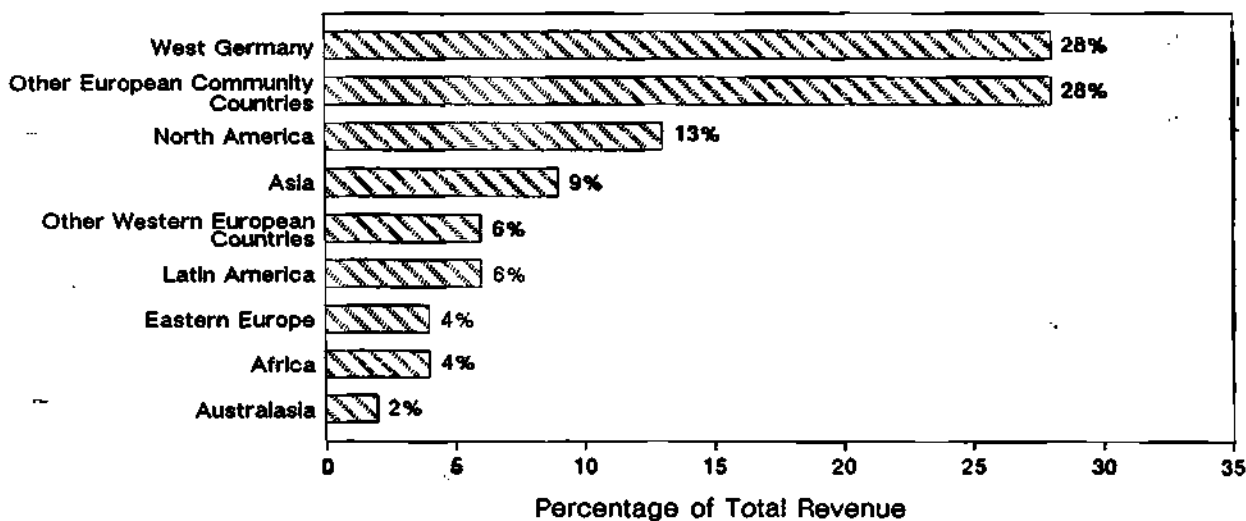
Specialties account for a large share of Hoechst's business. However, standard products continue to be a mainstay of the Company's sales. In standard products, the Company seeks to gain a competitive edge by the use of modern processes and by offering maximum quantity.

Hoechst's strategy for the semiconductor industry is to supply consistently reliable high-purity chemicals. The Company believes that this kind of quality requires production under controlled conditions with the smallest tolerances and continuous quality control to ensure reliability based on product consistency. In addition to manufacturing quality control, Hoechst believes that close relationships with semiconductor manufacturers are essential to achieve its desired purity levels. Hoechst also has a strong commitment to be actively involved in the early stages of future semiconductor technologies.

Hoechst's worldwide regional sales are shown in Figure 2.

Hoechst

Figure 2
Hoechst Group
Sales by Region



Source: Dataquest
September 1987

Research and Development

Hoechst and its subsidiaries and affiliates are involved in semiconductor material research in many areas. The Company is involved in resist development for the manufacture of fine-line structures by X-ray or electron-beam exposure. Hoechst is pursuing this research in a project sponsored by BMFT (German Federal Ministry for Research and Technology) for the development of megabit technology. Hoechst is also pursuing research in advanced polymers with improved temperature stability and chemical resistance.

Ringsdorff Werke GmbH, a Hoechst subsidiary, is active in the development of new materials such as gallium arsenide for the manufacturing of superfast semiconductors.

In 1986, research and development expenditures of Messer Griesheim GmbH and MG Industries, major suppliers of semiconductor materials and subsidiaries of Hoechst, exceeded \$23 million. MG Industries will open a new plant in Fairless Hills, Pennsylvania, in October of this year. This plant will include a development lab run by Messer Griesheim for the purification of electronic-grade ammonia, chlorine, and hydrogen chloride.

Hoechst

PRODUCTS

Hoechst manufactures semiconductor chemicals and materials in several subsidiary companies or divisions:

- Hoechst AG, Technical Information Systems Division
- Hoechst AG, Chemicals Division
- Hoechst Ceram Tec AG
- Messer Griesheim GmbH
- MG Industries (wholly owned by Messer Griesheim)
- Hoechst Celanese (formerly American Hoechst)
- AZ Photoresist (a wholly owned subsidiary of Hoechst Celanese)
- Wacker-Chemie GmbH (50 percent owned by Hoechst)
- Riedel-de Haen AG
- Ringsdorff Werke GmbH

Hoechst AG, Technical Information Systems Division

The Technical Information Systems Division manufactures AZ-positive photoresists, protective coatings, developers and thinners for photoresists, adhesion promoters, and strippers.

Hoechst's photoresist products are marketed under the AZ resist name and manufactured in Wiesbaden, West Germany, by Kalle Niederlassung der Hoechst AG. Hoechst's resist products are positive optical resists (1300 series, 1400 series, 4000 series, and 5200 series). The AZ 5200 series of positive resist can be used for image reversal; an additional postexposure bake between expose and development will allow a negative image to be formed. The 5200 series resists have wavelength sensitivity in the 310- to 405-nanometer range and so can act as positive UV and g-line resists. The AZ 5214 resist has potential applications as a positive e-beam resist material.

Both the 5200 series and the 1300 series were developed by AZ Photoresist Products (an operating group of American Hoechst Corporation in the United States) rather than by Kalle, which is Hoechst's photoresist research and manufacturing operation.

Hoechst

Hoechst AG, Chemicals Division

Hoechst's Chemicals Division manufactures ultrapure red phosphorus and ultrapure arsenic for doping and for the production of III/IV compounds. It also manufactures inorganic and fluorocarbon gases for doping and plasma etching processes.

Hoechst Ceram Tec AG

Hoechst Ceram Tec manufactures ceramic packages, chip carrier and pin grid arrays, and metallized substrates for rectifiers.

Messer Griesheim GmbH

Messer Griesheim supplies silane, dichlorosilane, nitrous oxide, ammonia, tungsten hexafluoride, and oxygen for deposition; arsine, phosphine, diborane, and boron trifluoride for doping; tetrafluoromethane, trifluoromethane, silicon tetrafluoride, sulphur hexafluoride, nitrogen trifluoride, chlorine, hydrogen chloride, and boron trichloride gases for etching; nitrogen, argon, helium, and hydrogen for purging and carrier gases; and storage and transfer equipment. Messer Griesheim has the only production plant for the plasma etch gas CF_4 (carbon tetrafluoride) in Europe.

Messer Griesheim's goal in the semiconductor industry is to reduce waste caused by microcontamination. To achieve this goal, Messer Griesheim has expanded its specialty gas works at Duisburg, West Germany, and is equipping its gas production plants worldwide with transport and storage systems and with the latest in new technology. In order to meet increasing purity standards, the Company has expanded its technical center at Krefeld in West Germany.

Messer Griesheim has a wholly owned subsidiary, MG Industries, in the United States. The Gas Products Division of MG Industries is headquartered in Valley Forge, Pennsylvania. Gas Products Division provides atmospheric gases such as oxygen, nitrogen, and argon, produced at one of its air separation plants. The division also provides carbon dioxide, hydrogen, and helium. It supplies its medium-size and large users either through dedicated pipelines or from its fleet of cryogenic transports and high-pressure gas tube trailers.

MG Industries has more than 150 high-purity specialty gases and provides the following specialty gases for the semiconductor industry: arsine phosphine mixtures, plasma etch gases, silane, dichlorosilane, disilane, silicon tetrachloride, and silicon tetrafluoride. MG Industries also sells cylinders for specialty gases, including specially treated cylinders to reduce particulates, and it is now in the process of introducing a stainless steel cylinder.

Hoechst

Hoechst Celanese and AZ Photoresist Products

AZ Photoresist is a major manufacturer and supplier of positive resist in the United States. It is an operating group of Hoechst Celanese Corporation, which is a wholly owned subsidiary of Hoechst AG of West Germany. AZ Photoresist Products was formerly part of Azoplate Corporation, which was acquired by American Hoechst in 1971. Its headquarters are in Somerville, New Jersey. Previous to the acquisition of Celanese Corporation in the first quarter of 1987, Hoechst Celanese was called American Hoechst.

Over the last several years, AZ Photoresist has made the transition from only supplying bulk resist materials and its AZ brand positive resists through distributors to becoming a major direct supplier of photoresists to the U.S. semiconductor industry. Dataquest estimates that AZ Photoresist's direct sales of positive resists to the U.S. semiconductor manufacturers represented approximately 60 to 65 percent by volume of its total photoresist sales in 1984. By 1985, direct sales to semiconductor manufacturers increased to 75 percent of AZ photoresist sales. In 1985, AZ Photoresist ranked third behind Shipley and Olin Hunt Specialty Products in direct sales of positive optical resists to U.S. manufacturers.

Hoechst AG's share of the European and North American optical photoresist markets in 1985 is shown in Table 1. Hoechst participates only in the positive optical resist market.

Table 1

**Hoechst AG
Regional Market Share—1985
(Millions of Dollars, Thousands of Gallons)**

	<u>Total</u>		<u>Positive Optical Resist</u>		
	<u>Sales</u>	<u>Share</u>	<u>Sales</u>	<u>Share</u>	<u>Volume</u>
Europe	\$3.9	22.8%	\$3.9	28.4%	12.5
North America	\$7.8	12.2%	\$7.8	15.2%	25.0

Source: Dataquest
September 1987

Hoechst

Wacker Chemitronic GmbH

Wacker Chemitronic is a subsidiary of Wacker Chemie AG, which is 50 percent owned by Hoechst AG. Wacker Chemitronic manufactures polycrystal silicon, silicon wafers, epi wafers, and gallium arsenide wafers.

Riedel-de Haen AG

Riedel-de Haen manufactures products specifically designed for cleaning and etching VLSI processes, such as hydrofluoric acid, ammonium fluoride solution, buffered oxide etchants, inorganic acids, and solvents.

Ringsdorff Werke GmbH

Ringsdorff Werke manufactures high-purity components such as susceptors, heating elements, heat shields for crystal growth, SiC-coated susceptors for epitaxy, and wafer trays for PECVD.

General Signal Corporation

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General Signal Corporation

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General Signal Corporation

General Signal Corporation
High Ridge Park
P.O. Box 10010
Stamford, Connecticut 06904
Telephone: (203) 357-8800
(Millions of Dollars except Per Share Data)

Balance Sheet (December 31)

	1986	1985	1984	1983	1982
Total Assets	\$ 1,458	\$ 1,483	\$ 1,438	\$ 1,314	\$ 1,222
Accounts Receivable	\$ 296	\$ 324	\$ 313	\$ 310	\$ 263
Total Current Assets	\$ 887	\$ 927	\$ 958	\$ 869	\$ 827
Property, Plant & Equipment, Net	\$ 346	\$ 361	\$ 345	\$ 314	\$ 281
Total Liabilities	\$ 531	\$ 579	\$ 537	\$ 468	\$ 418
Accounts Payable	\$ 95	\$ 111	\$ 120	\$ 113	\$ 96
Total Current Liabilities	\$ 351	\$ 406	\$ 387	\$ 347	\$ 304
Long-Term Debt	\$ 124	\$ 124	\$ 97	\$ 75	\$ 76
Shareholders' Equity	\$ 927	\$ 904	\$ 902	\$ 846	\$ 804

Operating Performance (Fiscal Year Ending December 31)

Net Sales	\$ 1,583	\$ 1,801	\$ 1,787	\$ 1,575	\$ 1,622
Cost of Goods Sold	\$ 1,115	\$ 1,279	\$ 1,240	\$ 1,097	\$ 1,110
Selling & Administrative Expense	\$ 349	\$ 372	\$ 362	\$ 326	\$ 322
R&D Expense	\$ 98	\$ 101	\$ 92	\$ 79	\$ 71
Provision for Restructuring	\$ 0	\$ 72	\$ 0	\$ 0	\$ 0
Income from Operations	\$ 120	\$ 78	\$ 186	\$ 151	\$ 189
Interest Expense	\$ 12	\$ 9	\$ 7	\$ 8	\$ 11
Interest Income	\$ 9	\$ 12	\$ 12	\$ 12	\$ 14
EBT	\$ 118	\$ 80	\$ 188	\$ 155	\$ 193
Income Taxes	\$ 43	\$ 31	\$ 80	\$ 65	\$ 85
Net Income	\$ 75	\$ 49	\$ 109	\$ 90	\$ 108
EPS	\$ 2.60	\$ 1.72	\$ 3.80	\$ 3.06	\$ 3.85
DPS	\$ 1.80	\$ 1.80	\$ 1.71	\$ 1.68	\$ 1.60
Shares Outstanding (Thousands)	27,930	28,706	28,568	28,414	28,013

Ratios

Profit Margin	7%	6%	6%	3%	5%
Return on Equity	15%	12%	13%	7%	10%
Return on Assets	9%	7%	8%	3%	5%
Gross Margin	32%	30%	31%	29%	30%
Current Ratio	2.72	2.50	2.48	2.28	2.53
Quick Ratio	1.37	1.24	1.19	0.99	1.20

Source: General Signal Corporation
Annual Reports
Dataquest
December 1987

General Signal Corporation

THE COMPANY

Background

General Signal Corporation, incorporated in New York in 1904, produces instrumentation and control technology for semiconductor production, telecommunications, industrial automation, energy management, and rail transportation.

Prior to the third quarter of 1987, General Signal reported its activities through these three product sectors:

- Electronic Controls and Systems
- Electrical Controls and Equipment
- Fluid Controls and Equipment

Annual report data listed in this profile are based on the above three product sectors.

Beginning in the third quarter of 1987 (ending September 30), however, General Signal's operations are reported through four product groups, or sectors. These four sectors portray operations consistent with the Company's product marketing and reflect General Signal's ongoing strategic restructuring.

These four new business sectors are as follows:

- Process Controls (41 percent of the Company's 1987 estimated sales)
- Technology Industries, which includes semiconductor equipment (20 percent)
- Electrical Controls (21 percent)
- Transportation Controls (18 percent)

The Process Controls sector serves the process industries by supplying valves, pumps, control systems, mixers and aerators, corrosion-control materials, heat-treating equipment, electronic feeders and scales, and instrumentation.

The Technology Industries sector is an equipment supplier for semiconductor manufacturing and telecommunications, as well as for defense electronics.

Electrical Controls serves the nonresidential and residential construction, electric utilities, computer and other sensitive electronic equipment, and petroleum and petrochemical markets with fire protection and building signaling systems, power distribution equipment, switch gear, electric motors, conduit fittings, and power conditioning equipment.

General Signal Corporation

The Transportation Controls sector produces control systems and braking and other equipment for the mainline railroad and rail and bus mass transit industries. It also supplies cold-forged components to the truck, auto, and bicycle markets, as well as fluid power systems for construction equipment and military vehicles.

The names and locations of General Signal's operating units are provided in Table 1.

Table 1

General Signal Corporation Operating Units

<u>Company</u>	<u>Location</u>
Advanced Mechanization, Inc.	Horsham, Pennsylvania
Aurora Pump	North Aurora, Illinois
Axel Electronics	Jamaica, New York
BIF	West Warwick, Rhode Island
Blue M Electric	Blue Island, Illinois
Celcote	Beaea, Ohio
Dezurik	Sartell, Minnesota
Dielectric Communications	Raymond, Maine
Dowzer Electric	Mt. Vernon, Illinois
Drytek	Wilmington, Massachusetts
Dynapower/Stratopower	Watertown, New York
Edwards	Farmington, Connecticut
GS Electric	Carlisle, Pennsylvania
General Railway Signal	Rochester, New York
Henschel	Newburyport, Massachusetts
Hevi-Duty Electric	Goldsboro, North Carolina
Karkar Electronics	San Francisco, California
Kinney Vacuum	Canton, Massachusetts
Leeds & Northrup Instruments	North Wales, Pennsylvania
Leeds & Northrup International	North Wales, Pennsylvania
Leeds & Northrup Systems	North Wales, Pennsylvania
Lindberg	Chicago, Illinois
Marsh Instrument	Skokie, Illinois
Metal Forge	Columbus, Ohio
Metallurgical Products	Warrendale, Pennsylvania
Mixing Equipment Company	Rochester, New York
Nelson Electric	Tulsa, Oklahoma
New York Air Brake	Watertown, New York
O-Z/Gedney	Terryville, Connecticut
Semiconductor Systems, Inc.	San Jose, California
Sola Electric	Elk Grove Village, Illinois
Stock Equipment Company	Chagrin Falls, Ohio
Tau-Tron	Westford, Massachusetts
Telecommunications Technology, Inc.	Milpitas, California
Telenex	Mt. Laurel, New Jersey
General Signal Thinfil	Fremont, California
Ultratech Stepper	Santa Clara, California
Xynetics, Inc.	Santa Clara, California

Source: General Signal Corporation
Dataquest
December 1987

General Signal Corporation

Restructuring

During the fourth quarter of 1985, the Company initiated a restructuring plan that includes divesting certain nonstrategic business units and product lines, consolidating selected production facilities, and disposing of, or revaluing, certain assets. The Company believes that these actions will allow it to focus its efforts and resources on business lines generating the greatest returns for the long term and to continue its strategic emphasis on higher technology growth businesses. As a result of this plan, the Company took a pretax charge against 1985 earnings of \$72 million.

Operations

Operating performance, stated in terms of the Company's former sector format, was down in 1986 compared to 1985. General Signal's sales for 1986 totaled \$1.58 billion, down \$220 million from 1985. The Company attributes all but \$60 million of this sales decline to the restructuring. Net earnings rose 51.5 percent to \$74.6 million, compared to restructured earnings of \$49.3 million in 1985. Earnings per share of \$2.60 gained 51.2 percent on the same basis.

Before restructuring, however, the Company's net earnings and earnings per share in 1985 were \$93.3 million and \$3.25, respectively, higher than 1986's results. The Company attributes this shortfall to overoptimism in estimating the timing of the semiconductor recovery, the belief that its telecommunications operations would continue to post record results, and, finally, the belief that capital spending would be better in 1986 than in fact it turned out to be.

The Electronic sector's operating earnings fell sharply in 1986, declining 50.9 percent to \$39.8 million, compared with 1985's \$81.1 million. Sales after restructuring of \$754.3 million were down 13 percent, compared with sales of \$867.5 million in 1985. Sector operating margins were 5.3 percent in 1986, down from 9.3 percent in 1985. The Company attributes approximately three-fourths of the sector's sales and earnings decline to continued weakness in the semiconductor industry.

The Company's telecommunications operations weakened in the latter part of 1986 as the domestic telephone industry curtailed spending. General Signal is looking forward to a resumption of growth in telecommunications in late 1987 or early 1988, when it expects that user demand will catch up with network offerings.

The Electrical sector's operating earnings improved in 1986 following declines in 1985 and 1984. Stronger performances in power distribution, fire protection and building signaling, and fractional horsepower motor operations more than offset flat-to-down results in conduit and cable fittings, heat treating, and petroleum-related businesses. Operating earnings increased 12.3 percent to \$40.8 million, compared with \$36.3 million in 1985. Due principally to restructuring, sales declined 12.9 percent to \$325.6 million, compared with \$373.7 million in 1985.

General Signal Corporation

The Fluid Controls and Equipment sector improved its performance in 1986, due to gains in General Signal's mixing equipment and cold-forged component operations, as well as the return to profitability of its railroad air brake unit. Other product areas such as valves, pumps, and instrumentation recorded generally lower results, as they were affected once again by the restricted capital spending programs of many industrial users. Operating earnings rose 22.4 percent to \$55.1 million in 1986, which compares with \$45.0 million in 1985. Sector sales fell 10.0 percent to \$503.4 million, due almost entirely to restructuring.

For the nine months ended September 30, net earnings were off 15.3 percent, at \$48.2 million, from the year-earlier results of \$57.0 million. Sales of \$1.18 billion were 2.3 percent below the previous year's levels, and earnings per share were down 14.1 percent to \$1.70.

Although operating earnings for the Company as a whole have not been very strong in 1987, General Signal is encouraged by the fact that operating earnings have been increasing since the first quarter of 1987. Of particular note has been the performance of the Semiconductor Equipment Group (SEG). Throughout the year, SEG has posted increasing volumes and decreasing losses. In fact, SEG recorded a profit in the third quarter of 1987 and expects sales to increase in 1987 from 10 to 15 percent.

The results of operations in terms of the new format are shown in Table 2 for the nine months ending September 30, 1987. Table 3 presents a five-year summary of the Company's operations under the new sector reporting format.

Table 2

**General Signal Corporation
Sector Performance (Unaudited)
For 9 Months Ended September 30
(Millions of Dollars)**

<u>Net Sales</u>	<u>1987</u>	<u>1986</u>
Process Controls	\$ 482	\$ 506
Technology Industries	222	233
Electrical Controls	263	261
Transportation Controls	<u>214</u>	<u>209</u>
	\$1,181	\$1,209
 <u>Operating Earnings</u>		
Process Controls	\$ 37	\$ 43
Technology Industries	(10)	6
Electrical Controls	30	34
Transportation Controls	<u>23</u>	<u>27</u>
	\$ 81	\$ 110

Source: General Signal Corporation
Quarterly Reports
Dataquest
December 1987

General Signal Corporation

Table 3

**General Signal Corporation
Five-Year Summary New Sector Reporting Format (Unaudited)
(Millions of Dollars)**

<u>Net Sales</u>	<u>1986</u>	<u>1985*</u>	<u>1984</u>	<u>1983</u>	<u>1982</u>
Process Controls	\$ 659	\$ 702	\$ 679	\$ 668	\$ 783
Technology Industries	311	417	413	262	197
Electrical Controls	333	386	418	416	409
Transportation Controls	<u>280</u>	<u>296</u>	<u>277</u>	<u>230</u>	<u>233</u>
	\$1,583	\$1,801	\$1,787	\$1,575	\$1,622
 <u>Operating Earnings:</u>					
Process Controls	\$ 53	\$ 59	\$ 52	\$ 59	\$ 97
Technology Industries	6	36	80	36	29
Electrical Controls	42	38	41	47	45
Transportation Controls	<u>34</u>	<u>29</u>	<u>27</u>	<u>21</u>	<u>31</u>
	\$ 136	\$ 162	\$ 200	\$ 164	\$ 201

*Tabular data do not include the allocation of restructuring charges to each of the sector's operating earnings. Such charges were: Process Controls, \$15; Technology Industries, \$35; Electrical Controls, \$11; and Transportation Controls, \$11. The total restructuring charge to operating earnings was \$72.

Note: Columns may not add to totals shown because of rounding.

Source: General Signal Corporation
Quarterly Reports
Dataquest
December 1987

General Signal Corporation

Acquisitions

In the year ended December 31, 1986, the Company made several acquisitions. These acquisitions are listed in Table 4.

Table 4
General Signal Corporation
1986 Acquisitions

<u>Company</u>	<u>Principal Business</u>	<u>Date Acquired</u>
Aerotronic Associates, Inc.	Stress-Screening Systems for Electronics	March 1986
Aerotron, Inc.	Mobile Radio Systems	May 1984
Drytek, Inc.	Plasma Etching & Stripping Equipment	August 1986
Nord Engineering Co., Inc.	Precision Polishing Equipment	June 1986
Northeast Electronics (Instruments Product Line of Northern Telecom, Inc.)	Test Instruments for Telecommunications	September 1985
Optoscan Corporation	Wafer-Feature Measurement Equipment	March 1985
RCA Broadcast Systems Division's Antenna Product Line	Broadcast Antennas	January 1986
Rockcor, Inc's Ionscan Product Line	Semiconductor Device Test Instruments	June 1985
Sideband Technology, Inc.	Mobile Radio Equipment	September 1984
Telnex Corporation	Data Communications Network Management Systems & Products	September 1986

Source: General Signal Corporation
Annual Reports
Dataquest
December 1987

General Signal Corporation

SEMICONDUCTOR EQUIPMENT

General Signal's Semiconductor Equipment Group (SEG) manufactures and markets semiconductor capital equipment. SEG is a part of the Technology Industries sector. In addition to SEG companies, other General Signal companies also manufacture and market semiconductor capital equipment. Table 5 lists SEG and non-SEG General Signal companies that sell equipment to the semiconductor industry.

In April 1987, General Signal shut down its wafer-inspection subsidiary, Optoscan Corporation, and withdrew its products from the market.

Table 5

General Signal Corporation Semiconductor Equipment Companies

<u>Company</u>	<u>Location</u>
Advanced Mechanization, Inc.	Horsham, Pennsylvania
Blue M Electric*	Blue Island, Illinois
Circuits Processing Apparatus, A Division of the Thinfilm Company	Fremont, California
Drytek	Wilmington, Massachusetts
Electroglas, A Division of Xynetics, Inc.	Santa Clara, California
Ionscan, A Division of the Thinfilm Co.	Mountain View, California
Kayex, A Division of Drytek	Wilmington, Massachusetts
Kinney Vacuum*	Canton, Massachusetts
Lindberg*	Chicago, Illinois
Micro Automation, A Division of Xynetics, Inc.	Fremont, California
Rucker & Kolls, A Division of Xynetics, Inc.	Santa Clara, California
Semiconductor Systems, Inc.	San Jose, California
Tempress, A Division of the Thinfilm Co.	Fremont, California
The Thinfilm Company	Fremont, California
Ultraglas, A Division of Xynetics, Inc.	Santa Clara, California
Ultratech Equipment, A Division of Semiconductor Systems, Inc.	San Jose, California
Ultratech Photolytics, A Division of the Thinfilm Co.	Fremont, California
Ultratech Photomask, A Division of Xynetics, Inc.	Santa Clara, California
Ultratech Stepper	Santa Clara, California
Xynetics, Inc.	Santa Clara, California
Xynetics Products, A Division of Electroglas	Santa Clara, California

*Denotes a non-SEG company

Source: General Signal Corporation
Dataquest
December 1987

General Signal Corporation

International Companies

In 1985, General Signal established a Japanese subsidiary in Tokyo, Japan—General Signal K.K. This subsidiary will coordinate the Company's semiconductor equipment sales and service efforts in Japan. The Company also plans for General Signal K.K. to pave the way toward establishing manufacturing operations in Japan, which it intends to set up by the end of 1988. Initially, the new organization will have responsibility for the direct sales efforts of Ultratech Stepper and Electroglas.

In addition to General Signal K.K., the Company also has a manufacturing joint venture in Japan—Koyo Lindberg—for the manufacture of diffusion furnaces, oxidation, CVD, industrial treating equipment, and conveyor furnaces.

General Signal Thinfil

General Signal Thinfil was created in June 1987 by combining the operations of Tempres, which makes diffusion and CVD equipment; Ionscan, which makes ion implantation uniformity measuring equipment; Circuits Processing Apparatus, which makes sputtering equipment; and an excimer laser CVD known as Ultratech Photolytics.

Industry sources report that General Signal Thinfil is working on an all-in-one system that would combine deposition, etch, and thermal processing capabilities in a single unit.

Tempres

Tempres produces diffusion systems, LPCVD products, digital process and temperature controllers, and chemical vapor deposition reactors. In 1987, Tempres was combined with CPA & Ionscan, along with a thinfil development group, to form General Signal Thinfil.

In both the APCVD market and LPCVD market, Tempres has lost share in recent years (see Figures 1 and 2). In APCVD, Tempres' share of the total worldwide market fell from almost 13 percent in 1982 to just slightly more than 8 percent in 1986. In 1982, Tempres had sales of \$2.5 million in a \$19.6 million market (see Table 6). By 1986, Tempres sales had declined to \$2.2 million as the market climbed to \$26.8 million.

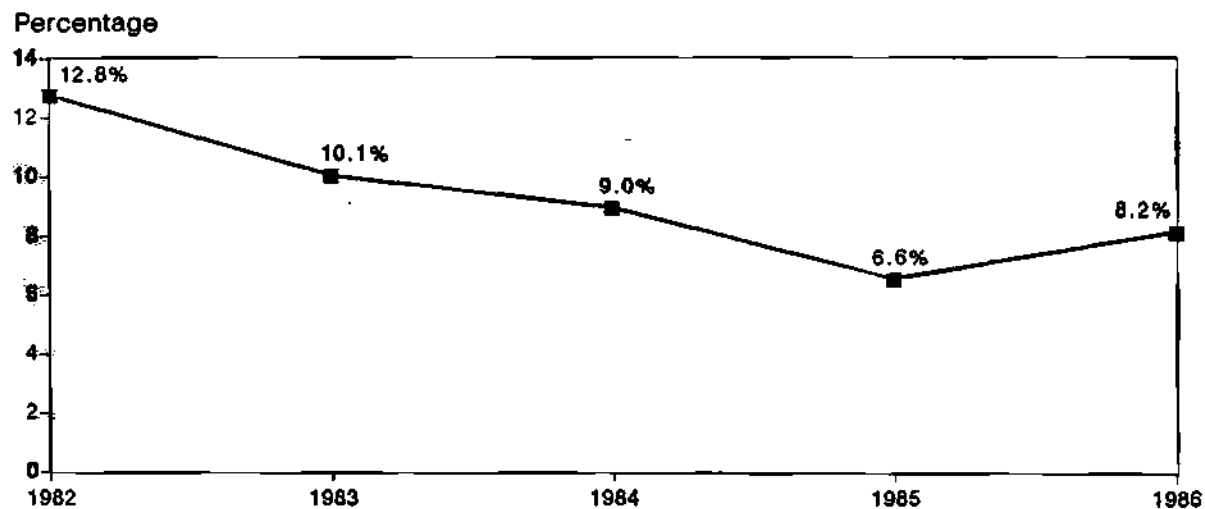
In LPCVD, the Tempres share fell from approximately 9 percent in 1982 to approximately 4 percent in 1986. In 1982, Tempres had sales of \$3.6 million in a \$39.4 million market. By 1986, Tempres sales had risen only slightly to \$3.8 million as the market soared to \$96.6 million.

Although Tempres lost share between 1982 and 1986, its products became more international. In 1982, only approximately 22 percent of Tempres LPCVD revenue was generated outside of the United States; by 1986, this percentage had risen to about 34 percent. In 1982, only 24 percent of Tempres APCVD revenue was generated outside of the United States; by 1986, this percentage had risen to nearly 41 percent (see Figures 3 and 4).

General Signal Corporation

Figure 1

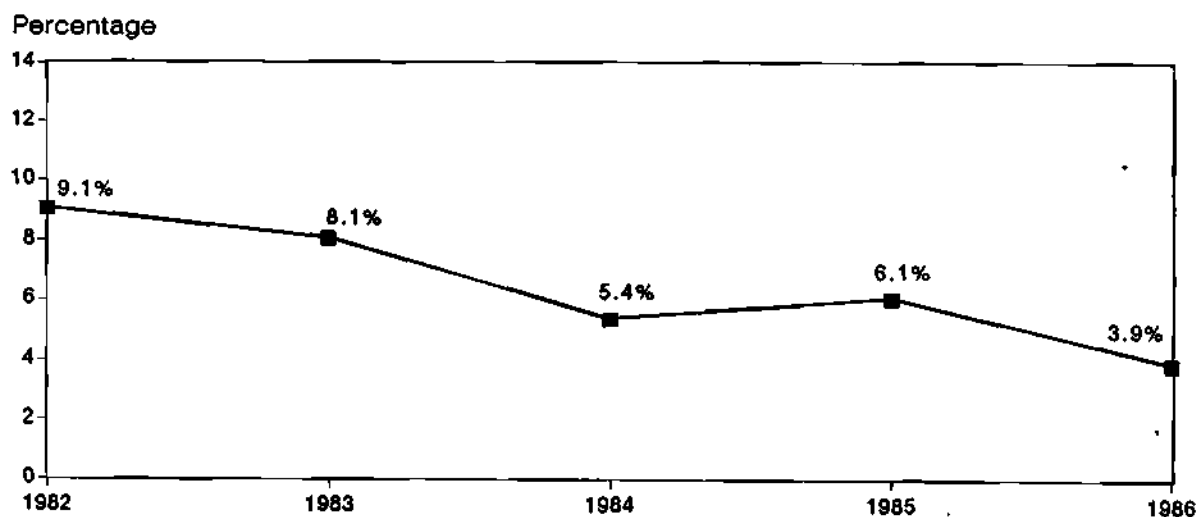
Tempress Share of Worldwide APCVD Market



Source: Dataquest
December 1987

Figure 2

Tempress Share of Worldwide LPCVD Market



Source: Dataquest
December 1987

General Signal Corporation

Table 6

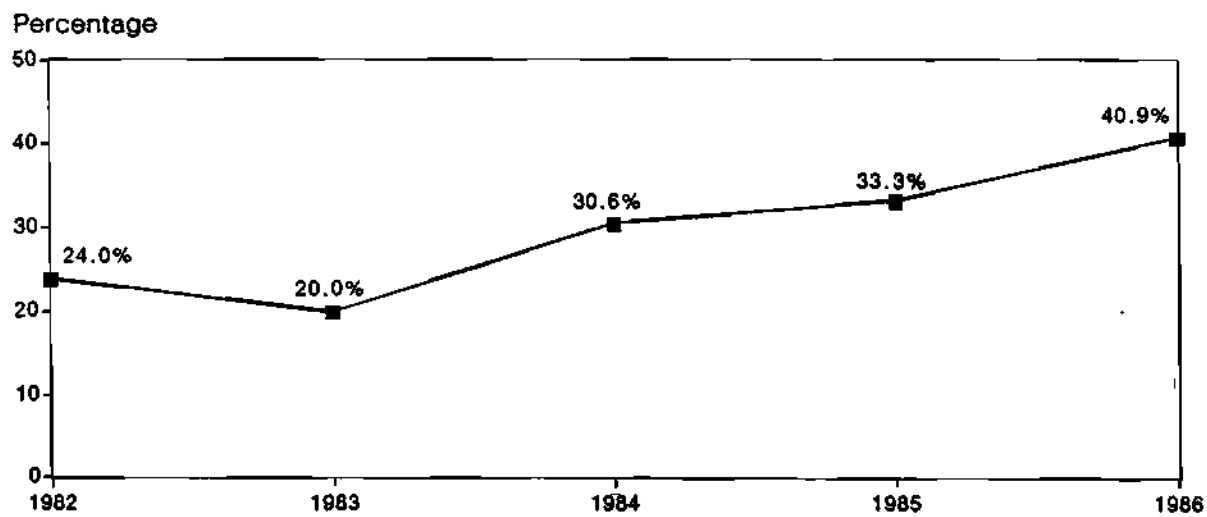
Tempress' APCVD & LPCVD Revenue (Millions of Dollars)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Tempress APCVD	\$ 2.5	\$ 3.0	\$ 3.6	\$ 2.1	\$ 2.2
Total APCVD Market	\$19.6	\$ 29.6	\$ 40.2	\$ 31.8	\$ 26.8
Tempress LPCVD	\$ 3.6	\$ 4.9	\$ 5.9	\$ 7.6	\$ 3.8
Total LPCVD Market	\$39.4	\$ 60.5	\$110.1	\$123.7	\$ 96.6

Source: Dataquest
December 1987

Figure 3

Tempress APCVD International Sales as a Percent of Total Tempress APCVD Sales

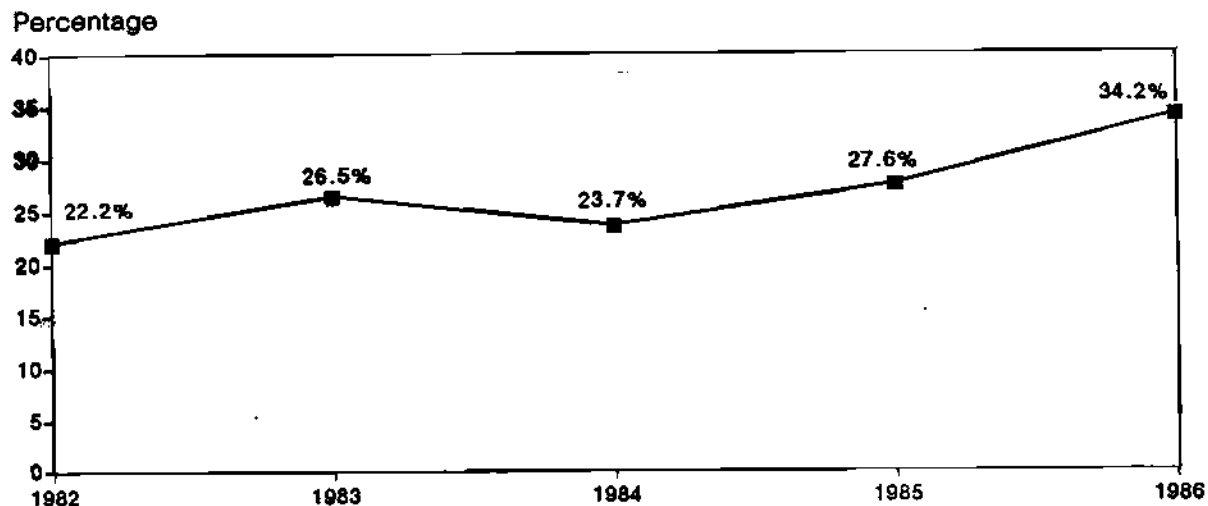


Source: Dataquest
December 1987

General Signal Corporation

Figure 4

Tempress LPCVD International Sales as a Percent of Total Tempress LPCVD Sales



Source: Dataquest
December 1987

Circuits Processing Apparatus

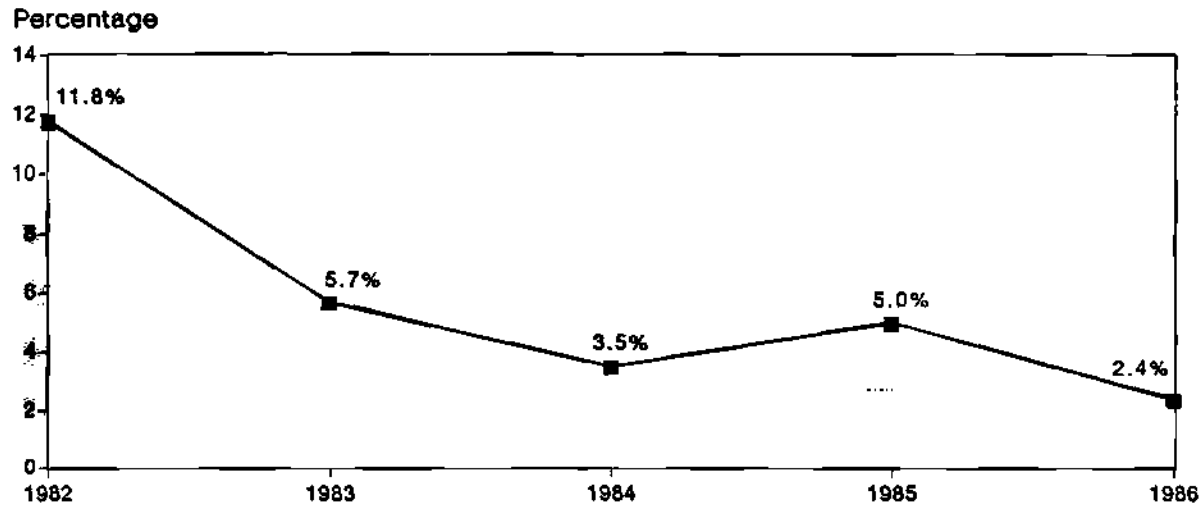
Circuits Processing Apparatus (CPA) manufactures in-line planar magnetron sputtering systems for thinfilm deposition. In 1987, CPA was combined with Tempress & Ionscan, along with a thinfilm development group, to form the Thinfilm Company.

CPA's sales, which have been mainly in the United States, have declined from \$6 million in 1982 to \$2 million in 1986; over this same period, their market share has declined from 6 percent to 2 percent (see Figure 5).

General Signal Corporation

Figure 5

Circuits Processing Share of U.S. Sputtering Market



Source: Dataquest
December 1987

Ionscan

Ionscan produces process equipment monitoring instrumentation for product quality and efficiency improvement, including implantation dose and thinfilm uniformity monitors.

Ultratech Photolytics

Industry sources say that Ultratech Photolytics has been developing for the past two years an excimer laser-based single-wafer, single-chamber CVD system that will be capable of depositing oxides and nitrides on both silicon and gallium arsenide wafers.

Xynetics, Inc.

Xynetics, Inc., consists of Electroglas, Micro Automation, Rucker & Kolls, Ultratech Photomask, Ultraglas, and Xynetics Products.

General Signal Corporation

Electroglas

Electroglas claims to be the world's largest producer of automatic wafer-probing systems designed for locating, marking, and mapping the imperfect die on wafers. They also manufacture X-Y positioning systems. In September 1987, Electroglas signed a \$12 million agreement with Cognex Corporation under which Cognex will supply its machine-vision systems to Electroglas' wafer-prober product lines.

Micro Automation

Micro Automation manufactures automatic dicing saws, microwash cleaning stations, automatic die-separation systems, and dicing blades.

Rucker & Kolls

Rucker & Kolls manufactures test head hardware and fixed-point probe cards for the semiconductor industry.

Ultratech Photomask

Ultratech Photomask claims to be the United States' leading independent photomask supplier. It fabricates the mask from which each wafer will be patterned. Ultratech Photomask has incurred losses in the last two years, and the company attributes these losses to the downturn in the industry and to intense pricing pressure.

Ultraglas

Ultraglas manufactures photo blanks for optical and electron beam photomask production.

Xynetics Products

Xynetics Products is a division of Electroglas and manufactures a complete line of precision linear motors, electronics, and positioning systems for automated equipment in semiconductor and other industrial applications. Xynetics Products also manufactures automatic flatbed plotting systems for the conversion of engineering drawings into precisely rendered circuit master designs.

Advanced Mechanization, Inc.

Advanced Mechanization, Inc. (AMI), manufactures automatic die-attach systems, automatic die-sort systems, second optical wafer-inspection equipment, and wafer-management systems.

General Signal Corporation

Drytek

General Signal acquired Drytek, a privately held manufacturer of plasma etching systems and photoresist strippers in August 1986. In the dry strip market, Drytek's worldwide revenue in 1986 was approximately equal to its 1983 revenue of \$2.0 million (see Table 7). Drytek's share of the total worldwide dry strip market in 1983 and in 1986 was 6 percent.

In the dry etch market, Drytek's revenue was \$7 million in 1982 and had risen to \$16 million in 1986. During this same period, however, Drytek's share of the total worldwide market declined slightly from 8 percent in 1982 to 7 percent in 1986.

Table 7

Drytek's Dry Strip & Dry Etch Revenue (Millions of Dollars)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Drytek Dry Strip	\$ N/A	\$ 2.0	\$ 3.0	\$ 3.0	\$ 2.0
Total Dry Strip Mkt.	\$19.5	\$ 33.9	\$ 44.6	\$ 36.8	\$ 32.1
Drytek Dry Etch	\$ 7.0	\$ 15.0	\$ 24.0	\$ 23.0	\$ 16.0
Total Dry Etch Mkt.	\$93.2	\$185.1	\$314.3	\$298.3	\$236.1

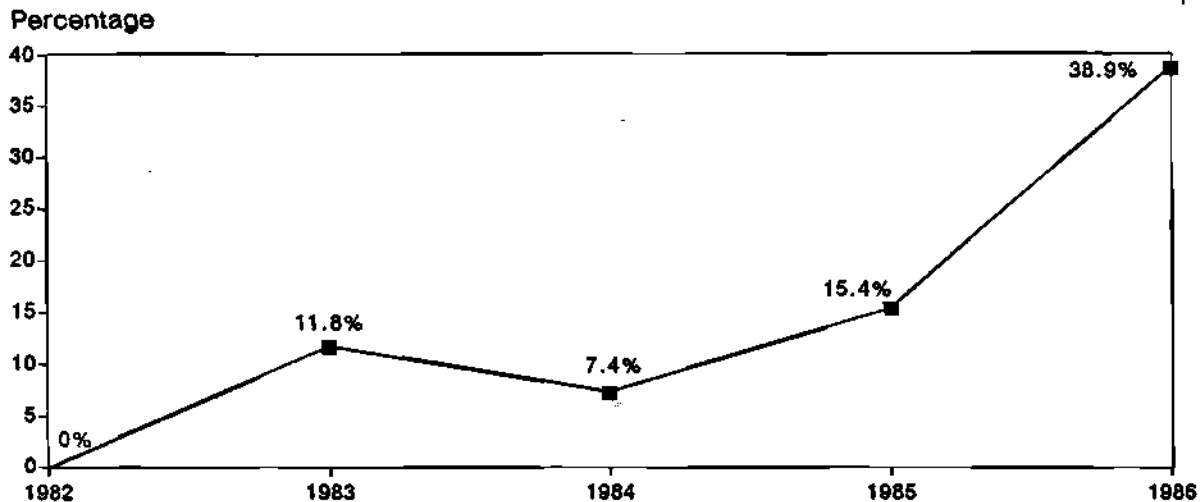
Source: Dataquest
December 1987

International sales have assumed an increasing importance for Drytek since 1982. For dry strip and dry etch combined, international revenue as a percent of Drytek's total revenue rose from zero in 1982 to nearly 39 percent in 1986 (see Figure 6).

General Signal Corporation

Figure 6

Drytek's International Sales as Percent of Total Company Sales



Source: Dataquest
December 1987

Kayex

Kayex, which makes Hamco silicon-ingot-growing furnaces, ingot saws, and wafer grinders and polishers, reports to the president of Drytek.

Semiconductor Systems, Inc.

Semiconductor Systems, Inc. (SSI), produces track equipment (resist processing equipment and spin/bake systems). SSI has made dramatic gains in market share and sales since 1982, especially in the United States (see Table 8 and Figure 7). In 1982, SSI's total sales were \$400,000 in a worldwide market of \$76.5 million. By 1986, SSI's sales had risen to \$8.8 million in a worldwide market of \$143.5 million. SSI's share of the worldwide market in 1986 was 6 percent, and its share of the U.S. market was 13 percent. In 1986, only 10 percent of SSI's revenue came from outside the United States.

General Signal Corporation

Table 8

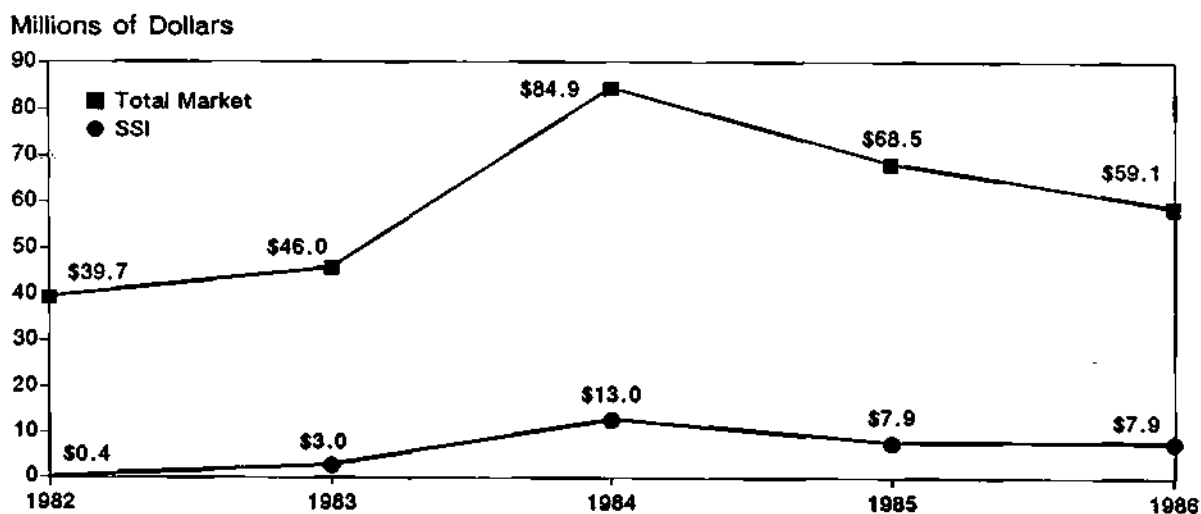
**SSI'S Track Equipment Sales
(Millions of Dollars)**

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
U.S. SSI Sales	\$ 0.4	\$ 3.0	\$ 13.0	\$ 7.9	\$ 7.9
Total U.S. Track Mkt.	\$39.7	\$ 46.0	\$ 84.9	\$ 68.5	\$ 59.1
Worldwide SSI Sales	\$ 0.4	\$ 3.0	\$ 13.0	\$ 8.8	\$ 8.8
Total Worldwide Track Mkt.	\$76.5	\$100.4	\$185.1	\$165.7	\$143.5

Source: Dataquest
December 1987

Figure 7

**SSI U.S. and Total U.S. Track Equipment Sales
(Millions of Dollars)**



Source: Dataquest
December 1987

General Signal Corporation

Ultratech Equipment

Ultratech Equipment manufactures wafer and mask cleaning systems. In June 1987, Ultratech Equipment was combined with SSI to complement SSI's line of spin, bake, and develop equipment.

Ultratech Stepper

Ultratech Stepper offers a 1x stepper. Its strategy is to provide a cost-effective alternative to reduction steppers. Ultratech Stepper plans to do this by offering upgradable systems at a lower cost than reduction steppers. Each model of its stepper family can be retrofitted to state-of-the-art capability because the 1x lens can be changed or upgraded. Ultratech Stepper's most recent product offering, the UltraStep 1100 has submicron capability and, Ultratech Stepper believes, has sufficient pixel capability to fit a 16-megabit DRAM into a single exposure field.

Ultratech Stepper's product line is listed in Table 9.

Although Ultratech Stepper sales declined (along with the rest of the semiconductor capital equipment industry) from 1984 to 1986, its share of the worldwide stepper market increased from 11 percent to 12 percent (see Table 10 and Figure 8).

Table 9

Ultratech Stepper's Product Line

<u>Model Number</u>	<u>Date Introduced</u>	<u>Capabilities</u>
Model 900	1979	1x Lens
UltraStep 1000	1983	1x, 6-Inch Capable
UltraStep 1000	1984	1x, 6-Inch Capable, Wide Field Lens
UltraStep 1100	1986	Submicron Capability, Variable Numerical Aperture

Source: Ultratech
Dataquest
December 1987

General Signal Corporation

Table 10

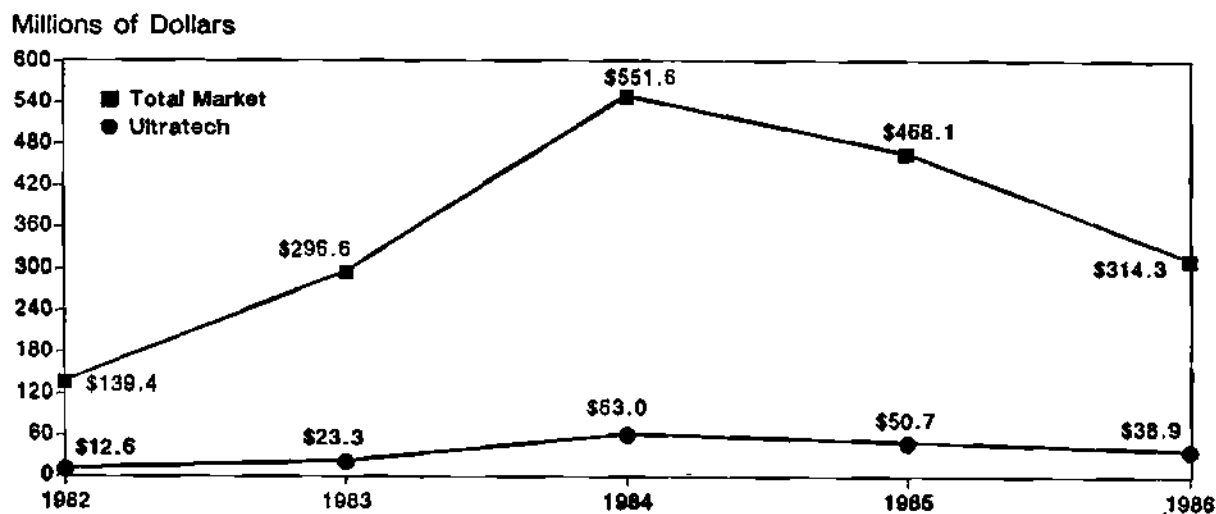
Ultratech Stepper's Stepper Revenue (Millions of Dollars)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Ultratech Stepper U.S. Revenue	\$ 12.3	\$ 21.6	\$ 53.1	\$ 32.4	\$ 27.4
Total U.S. Stepper Mkt.	\$ 70.5	\$121.8	\$214.9	\$137.5	\$151.1
Ultratech Stepper Worldwide Revenue	\$ 12.6	\$ 23.3	\$ 63.0	\$ 50.7	\$ 38.9
Total Worldwide Stepper Mkt.	\$139.4	\$296.6	\$551.6	\$468.1	\$314.3

Source: Dataquest
December 1987

Figure 8

Ultratech Stepper and Total Stepper Worldwide Market Revenue



Source: Dataquest
December 1987

General Signal Corporation

In 1982, almost 100 percent of Ultratech Stepper's sales were in the United States. By 1986, however, international sales had increased in importance to Ultratech Stepper and represented 30 percent of its sales.

Blue M

Blue M manufactures stringent environmental test equipment. Semiconductor devices are subjected to the stress of temperature, humidity, and thermal shock in environmental test chambers, clean room ovens, and burn-in chambers. Blue M's test chambers, ovens, baths, and furnaces also find application in the general laboratory environment.

Kinney Vacuum

Kinney Vacuum manufactures precision vacuum pumps that are required by several stages of semiconductor processing.

Lindberg

Lindberg manufactures heat-processing and induction heating equipment.

EXECUTIVE MANAGEMENT

The chief operating officers of SEG units are listed as follows:

- SEG—Jack Halter, senior vice president of General Signal and president of SEG
- Advanced Mechanization, Inc.—Paul Clugston, president
- Drytek—Arthur W. Zafiropoulo, president
 - Kayex—Elwyn Roberts, president
- General Signal Thinfilm—Ed Dohring, president of General Signal Thinfilm, formerly president of CPA
 - CPA—Randy W. Furr, vice president, finance and human resources, of General Signal Thinfilm and general manager of CPA
 - Ionscan—Dr. James A. Glaze, vice president, engineering and technology for General Signal Thinfilm and general manager of Ionscan

General Signal Corporation

- Tempress—Russ Douglas, director of manufacturing for General Signal Thinfilm and general manager for Tempress, formerly director of operations at Tempress
- Ultratech Photolytics—John Flaagan, general manager of Ultratech Photolytics, formerly vice president of Ultratech Equipment
- SSI—Bill Curren, president
- Ultratech Stepper—George Rutland, president
- Xynetics, Inc.—Neil Bonke, president of Xynetics, Inc., formerly president of Kayex
 - Electroglass—Bill Cornwell, general manager
 - Micro Automation—Neil Woodruff, general manager
 - Rucker & Kolls—Jim McMillen, general manager
 - Ultraglas—Leo DeVos, general manager
 - Ultratech Photomask, Inc.—Conor O'Mahony, vice president and general manager of Ultratech Photomask, Inc., formerly an engineering manager at Ultratech Stepper

The chief operating officers for General Signal's non-SEG semiconductor equipment companies are as follows:

- Blue M—J.A. Lawler, president
- Kinney Vacuum—Kurt Bramer, president
- Lindberg—S. Speltz, president

Air Products and Chemicals, Inc.

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Air Products and Chemicals, Inc.

Air Products and Chemicals, Inc.
P.O. Box 538
Allentown, Pennsylvania 18105
Telephone: (215) 481-4911
(Thousands of Dollars, except Per Share Data)

(Balance Sheet for Year Ending December 31)

	1983	1984	1985	1986
Total Assets	\$2,222	\$2,328	\$2,593	\$2,706
Accounts Receivable	\$ 341	\$ 356	\$ 382	\$ 376
Inventory	\$ 112	\$ 110	\$ 128	\$ 138
Other Current Assets	\$ 77	\$ 98	\$ 129	\$ 191
Total Current Assets	\$ 531	\$ 564	\$ 638	\$ 705
Property, Plant & Equip., Net Depr.	\$1,541	\$1,587	\$1,782	\$1,829
Other Assets	\$ 150	\$ 177	\$ 173	\$ 172
Total Liabilities	\$1,172	\$1,209	\$2,594	\$1,606
Accounts Payable	\$ 219	\$ 231	\$ 262	\$ 260
Other Current Liabilities	\$ 237	\$ 249	\$ 232	\$ 212
Total Current Liabilities	\$ 457	\$ 479	\$ 493	\$ 472
Long-Term Debt	\$ 414	\$ 378	\$ 521	\$ 700
Other Long-Term Liabilities	\$ 302	\$ 351	\$ 416	\$ 434
Total Long-Term Liabilities	\$ 716	\$ 730	\$ 937	\$1,134
Shareholder's Equity	\$1,050	\$1,119	\$1,163	\$1,100

Income Statement

Net Sales	\$1,669	\$1,757	\$1,857	\$2,006
Cost of Goods Sold	\$1,002	\$1,020	\$1,059	\$1,146
Selling & Administrative	\$ 411	\$ 421	\$ 473	\$ 519
R&D	\$ 40	\$ 44	\$ 51	\$ 61
Special Expenses	0	0	0	\$ 199
Income from Operations	\$ 215	\$ 272	\$ 273	\$ 82
Interest Expense	\$ 48	\$ 49	\$ 55	\$ 74
EBT	\$ 167	\$ 223	\$ 218	\$ 8
Income Taxes	\$ 61	\$ 83	\$ 74	\$ 3
Net Income	\$ 106	\$ 141	\$ 144	\$ 5
EPS	\$ 2	\$ 2	\$ 2	0
Shares Outstanding	61,330	61,850	60,400	58,620

Ratios

Profit Margin	6%	8%	8%	0%
Return on Equity	11%	13%	(27%)	0%
Return on Assets	5%	6%	6%	0%
Gross Margin	40%	42%	43%	43%
Current Ratio	1.16	1.18	1.29	1.49
Quick Ratio	0.85	0.87	0.87	1.04

Source: Air Products and Chemical, Inc.
Annual Reports
Dataquest
September 1987

Air Products and Chemicals, Inc.

THE COMPANY

Background

Air Products and Chemicals, Inc., was founded in 1940, using the concept of installing small industrial gas plants on or near the user's site to deliver the product by pipeline. This innovative delivery idea reduced the cost of gas and, as a result, broadened applications for the Company's products. Since then, the Company has expanded its focus to industrial chemicals and equipment/technology services. The Company is organized into three operating segments, Industrial Gases, Chemicals, and Equipment and Technology. For the purposes of this profile, the discussion is focused primarily on the Industrial Gases segment.

Operations

In 1986, Air Products and Chemicals' net sales grew 8 percent from its 1985 level. The industrial gas and chemicals business registered record shipments. Their operating profits increased 6 and 4 percent, respectively. The equipment segment also improved, with sales and profit increases over 1985. Air Products' net income did not reflect an increase similar to sales increases, however. One-time special charges and retroactive loss from investment tax credits under the new tax law caused net income to fall to only \$5 million. Before application of these charges, net income was \$145 million, slightly higher than in 1985.

Research and Development

Air Products increased its research spending in 1986 to \$61 million, \$10 million more than 1985 spending. Its R&D spending continues to grow to provide technical support for existing businesses as well as new products and technologies.

The Company conducts most of its research in Trexlertown, Pennsylvania, and Crewe, Cheshire, England. It works with numerous universities in R&D programs and is also funded by outside sources, including the U.S. government. Air Products focuses a substantial portion of its research activity in cryogenic and noncryogenic gas separation, advanced materials in polymers and ceramics, catalysis, and organic chemicals.

In 1986, the Company made several acquisitions to add new technology its core business, including the Abbott specialty chemicals business, the M&T tin catalyst business, and the Separex membrane gas separation product line.

Also in 1986, Air Products commercialized several of its new technology products. These included the GEMINI-5 system, which is an adsorption process for purifying methane gas, and the COPE oxygen-based process for sulfur recovery plants.

Air Products and Chemicals, Inc.

Strategy and International Competitiveness

Air Products' corporate objective is stable, sustained growth in earnings and a return on equity (ROE) of 16 percent or more. Its strategy for achieving this goal is to continue building in well-established markets and to add new and complementary opportunities in emerging growth markets. The Company's growth comes mainly from internal development and the extension of existing business skills. Small to medium-size acquisitions have been made where complementary technology or markets can be added to existing product lines.

Within the last two years, Air Products has broadened its scope through investment and acquisition, some of which has been mentioned previously. Among its acquisitions are Benzing Technologies, a plasma processing equipment company that uses nitrogen trifluoride (NF₃) to clean CVD reactors; and J.C. Schumacher, a liquid dopant supplier that has developed bubbler delivery systems for the wafer processing environment. (J.C. Schumacher also supplies solid dopant sources.) Benzing provides Air Products with a vehicle for sales of its NF₃ product; J.C. Schumacher gives the Company a strong market position with its proprietary bubbler delivery system for liquid dopants. With reference to investments and ventures, the Company has a minority interest in UTI Instruments Company, an analytical instrumentation firm; and a joint venture with Celltech, Ltd., a leading U.K. biotechnology firm.

Although the Company enjoys a leadership role in North American bulk gas, it is also putting considerable energy into its specialty products, including gas-handling equipment and specialty gases. These specialty areas are enjoying sizable growth in the market, in contrast to the more stable bulk gas market.

Air Products participates in several markets outside the United States. Europe is the Company's next largest market, mainly because the European market is similar to the U.S. industrial gas market. The Company is a major player in both the semiconductor and industrial gas markets in Western Europe.

Air Products has made some headway into the Asian markets. It is a minority owner of Korean Industrial Gases (KIG) in Seoul, Korea. As part of the KIG operations, the Company has a nitrogen pipeline system that services the growing semiconductor and electronics industry situated near Gumi, Korea. Air Products is believed to have sizable market share in Korea. In Japan, it has a joint venture/strategic investment with Daido Sanso. Air Products is also active in the People's Republic of China, where it is building an air separation plant that is expected to be in operation by the end of 1987. The Company's regional sales are shown in Table 1.

Air Products has wholly owned subsidiaries that operate in Belgium, Brazil, Canada, France, Mexico, the Netherlands, Norway, United Kingdom, and West Germany. It maintains less than the controlling interest in companies in Japan, Mexico, South Africa, South Korea, and Spain.

Air Products and Chemicals, Inc.

As mentioned previously, the Company has recently restructured its business into three operating segments. After reevaluating its strengths, it decided to sell its engineering service operation, which had been weak over the last couple of years. Air Products is strengthening its focus in its principal markets: gas, chemicals, and associated equipment.

The Company is also very concerned with safety issues. It advises customers of safety regulations, provides safety classes, and conducts research in the safe use of gases. Air Products is also actively involved in a number of organizations that stress safety.

Table 1

**Air Products and Chemicals, Inc.
Worldwide Sales by Major Geographic Region
(Millions of Dollars)**

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
United States	\$1,249	\$1,309	\$1,434	\$1,513	\$1,596
Europe	291	267	250	251	322
Canada/Latin America	<u>49</u>	<u>52</u>	<u>51</u>	<u>65</u>	<u>64</u>
Total	\$1,589	\$1,628	\$1,735	\$1,829	\$1,982

Source: Air Products and Chemicals, Inc.
Annual Reports
Dataquest
September 1987

Company Management

All the officers listed below have been with the Company for at least five years.

- Dexter F. Baker—chairman of the board, president, and CEO
- P.L. Thibaut Brian—vice president of engineering
- Alexander P. Dyer—Gas group vice president
- Leon C. Holt, Jr.—vice chairman of the board and chief administrative officer
- J. Robert Lovett—European group president

Air Products and Chemicals, Inc.

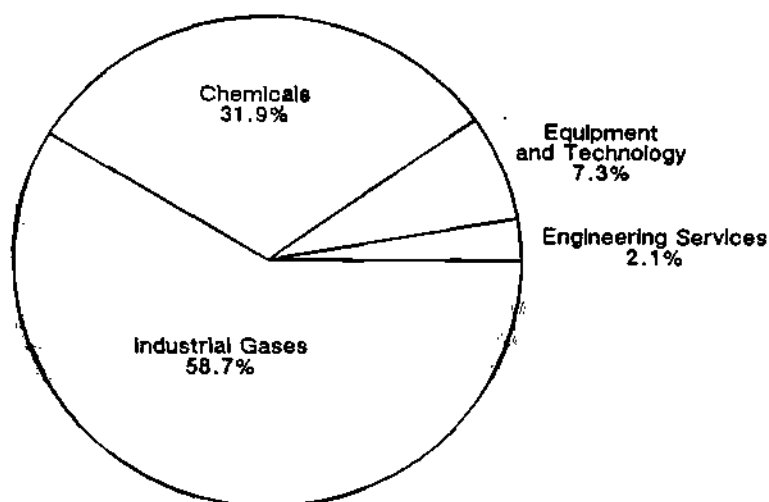
- Brian M. Rushton—Research and Development vice president
- Frank J. Ryan—Chemicals group vice president
- William J. Scharle—Process Systems group vice president

PRODUCTS

Air Products and Chemicals has three basic product segments: Industrial Gases, Chemicals, and Equipment and Technology. The relative size of these segments may be seen in Figure 1. Note that the Company also had an Engineering Service segment, which was recently sold. The revenue attributed to that group, along with revenue of continuing groups, is shown in Figure 1.

Figure 1

Air Products and Chemicals, Inc. Product Segmentation—1986



Source: Air Products
Dataquest
September 1987

Industrial Gases

Industrial gases sold by Air Products include oxygen, nitrogen, argon, hydrogen, carbon monoxide, carbon dioxide, synthetic gas, acetylene, and helium. Medical and specialty gases are also available from the Company. These may be manufactured, blended, or purchased by the Company for resale.

Air Products and Chemicals, Inc.

Industrial gases are distributed to customers in one of two ways: tonnage (or on-site supply) and merchant supply. Tonnage or on-site supply is defined as the tapping of a pipeline that runs through the immediate vicinity of the user company. For those customers with sufficient volume requirements, a dedicated on-site air separation plant is located directly at the customer's facility. This type of purchasing arrangement requires that the user company contract with Air Products for a period of more than five years.

Air Products has five pipeline networks to service its industrial and semiconductor customers. These are located in the Silicon Valley, Santa Clara, California; Houston, Texas; Chandler, Arizona; Central Louisiana; and Rotterdam, the Netherlands. Gases that are distributed by pipeline include carbon monoxide, hydrogen, and nitrogen. The Santa Clara and Chandler pipelines provide high purity nitrogen to more than 50 semiconductor manufacturers in the Silicon Valley and Phoenix areas.

Merchant supply is defined as distribution by tanker truck. The product may be delivered in either liquid or gas form to the user. The customer uses equipment designed and installed by Air Products for storage in its desired state. With this type of distribution, the customer must sign a contract with the Company for a term of three to five years.

Atmospheric gases—oxygen, nitrogen and argon—account for considerably more than 30 percent of Air Products' consolidated sales. The industrial gas segment provides more than 50 percent of the Company's total sales, as shown in Figure 1. Air Products is the leading supplier of bulk gases to the North American semiconductor industry.

In specialty gases, Air Products is committed to new applications. It enjoys a strong U.S. market position in fluorine-based gases, namely etchants, carbon tetrafluoride, and oxygen mixtures. It is also doing a great deal of work with NF_3 , which is attracting a lot of interest from equipment and semiconductor manufacturers. NF_3 is used as an etchant for cleaning in plasma etch, and also, for enhanced deposition. In its cleaning application, NF_3 eliminates the need to remove processing tubes from CVD systems. ASM, to name one company, is retrofitting its plasma etch systems for NF_3 hookup in cleaning. Other companies have also expressed interest in this product application. Air Products is the principal world supplier of NF_3 .

The Company recently decided to exit from the gaseous dopant market, a small market with many competitors. However, its prior purchase of J.C. Schumacher has provided Air Products with a strong liquid and solid dopant product line.

Chemicals

The Company has strong market positions in its chemical businesses. These businesses are grouped into three categories: amines, urethane intermediates and additives, and polymer products. Total sales from the chemical segment amount to more than 30 percent, as shown in Figure 1.

Air Products and Chemicals, Inc.

Equipment and Technology

The Air Products Equipment segment manufactures the equipment used by the industrial gas segment and other users. This includes plant and equipment used for air separation, gas processing, natural gas liquefaction, waste water treatment, hydrogen purification, and nitrogen rejection. Its Technology segment is licensed in the areas of petroleum refining processes, petrochemical processes, and related catalysts.

Engineering Services (Discontinued)

Stearns Catalytic World Corporation, an Air Products subsidiary, provided engineering, design, procurement, and construction services to the petroleum, hydrocarbon processing, utility, chemical, pharmaceutical, electronics, mining, and metallurgical industries. Because the segment had been weak over the last couple of years, Air Products sold the business in the latter half of 1986.

KLA Instruments

KLA Instruments
2501 Mission College Blvd.
P.O. Box 58016
Santa Clara, California 95052
Telephone: (408) 988-6100 Telex: 9103387357
(Thousands of Dollars Except Per Share Data)

Balance Sheet (June 30, 1986)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Current Assets	\$15,977	\$27,961	\$51,959	\$56,745	\$73,331
Current Liabilities	\$ 6,102	\$ 9,555	\$11,812	\$16,509	\$20,477
Current Ratio	2.62	2.93	4.40	3.44	3.58
Working Capital	\$ 9,875	\$18,406	\$40,147	\$40,236	\$52,854
Long-Term Debt	\$ 1,135	\$ 313	\$ 812	0	0
Debt/Equity	11%	1%	2%	0	0
Shareholder's Equity	\$10,671	\$24,811	\$52,439	\$62,641	\$75,596
After-Tax Return on Average Equity	15.27%	16.50%	14.66%	15.30%	14.26%
Capital Expenditures	\$ 742	\$ 1,932	\$ 4,547	\$ 4,452	\$ 2,999

Operating Performance (Fiscal Year Ending June 20, 1986)

Revenue	\$16,162	\$23,396	\$42,873	\$62,878	\$82,526
Gross Margin	46%	51%	51%	54%	47%
Cost of Revenue	\$ 8,800	\$11,483	\$20,818	\$28,981	\$44,008
RD&E Expense	\$ 2,424	\$ 3,067	\$ 6,144	\$10,734	\$10,141
RDE/Revenue	15%	13%	14%	17%	12%
GA&S Expense	\$ 3,227	\$ 5,231	\$ 8,161	\$12,076	\$14,001
G&A/Revenue	20%	22%	19%	19%	17%
Other Expenses (income)	(\$ 699)	(\$ 1,216)	(\$ 1,537)	(\$ 3,355)	(\$ 2,469)
Pretax Income	\$ 2,410	\$ 4,831	\$ 9,287	\$14,442	\$16,845
Pretax Margin	14.91%	20.65%	21.66%	22.97%	20.41%
Effective Tax Rate	32.74%	40.55%	42.11%	42.61%	43.73%
Net Income	\$ 1,510	\$ 2,928	\$ 5,664	\$ 8,802	\$ 9,854
Average Shares Outstanding (Thousands)	9,048	14,613	15,992	17,509	17,702
Per Share Earnings	\$ 0.17	\$ 0.20	\$ 0.35	\$ 0.50	\$ 0.56
Total Employees	230	339	537	545	600

Source: KLA Instruments Corporation
Annual Reports and Forms 10-K
Dataquest
October 1986

KLA Instruments

(The majority of this section is excerpted from the KLA Instruments Corporation Annual Report for the fiscal year ended June 30, 1986. For more detailed information and opinions about KLA Instruments, Dataquest clients are invited to use their inquiry privileges.)

THE COMPANY

Background

KLA is considered a pioneer in the automatic optical photomask inspection market. Established in 1976 specifically to design and manufacture photomask inspection systems, KLA introduced its first product in 1978. Today, KLA offers a broad line of automated photomask and reticle inspection systems and is one of the leaders in this area. In addition to becoming the leader in its original area of concentration and expertise, KLA has become the leading manufacturer of automatic wafer inspection equipment. It has recently begun to broaden its product base to include the assembly segment of the semiconductor equipment market, and reportedly also has plans to enter the market for automated inspection of printed circuit boards.

Its dominant position in its market segments is reflected in KLA's growth: the Company has grown from \$3.2 million in sales in FY 1979 to \$83 million in FY 1986. This represents a 59 percent compound annual growth rate (CAGR) over the last six years. The Company attributes its relative immunity to the downturn of 1985 to its strategy of developing systems that increase yield rather than capacity. KLA plans to continue to adhere to this strategy, and thus maintain its high growth rate, by continuing to develop systems that allow customers to achieve higher levels of design miniaturization and complexity.

KLA believes that over the next two decades, image processing technology will be essential to achieve these higher levels of miniaturization and complexity. The Company believes that image processing will have as large an effect on industrial manufacturing processes as data processing has had on the accounting industry. The field of image processing includes optical image transfer and pickup systems, high-speed image-processing computers, and proprietary image-processing software.

In keeping with this strategy of identifying tasks requiring human visual inspection, KLA today offers products in areas other than its traditional photomask and reticle inspection markets. It is now offering products in such areas as wafer inspection, solder mask inspection, IC device assembly, and device test, and it plans to enter the PCB board inspection market in 1987.

KLA Instruments

Operations

For the fiscal year ended June 30, 1986, KLA's sales increased 31 percent to \$82.5 million. Net income increased 12 percent to \$9.9 million. The Company reports that over the last five years, sales, net income, and earnings per share have grown at CAGRs of 50 percent, 60 percent, and 50 percent, respectively.

Gross margins declined in fiscal 1986 from 54 percent in fiscal 1985 to 47 percent. The Company reports that this change was the result of an increased percentage of sales of products manufactured by others and revenue from research and development contracts, which have lower margins. KLA reports that selling and general and administrative expenses were only 17 percent of sales in fiscal 1986, compared with 19 percent a year earlier.

KLA consists of four divisions and an Advanced Development Group. Its Reticle and Photomask Inspection Division designs and manufactures automated photomask inspection systems. The Wafer Inspection Division was formed in 1983 to develop a fully automated wafer inspection system. The Alignment, Inspection, and Measurement Division was recently established to deliver low-cost, modular image-processing systems to manufacturers of assembly equipment. The Automated Test Systems Division produces automated electrical test equipment using image-processing technology.

KLA also has minority ownership interest in Micrion, a Beverly, Massachusetts, company founded in 1983 to develop focused ion beam mask repair systems. KLA has exclusive marketing rights to Micrion's repair products for photomask and reticle applications.

International Operations

In June of this year, KLA appointed Dan Vilenski as Managing Director of a subsidiary being organized in Israel. The Company reported that KLA-Israel will develop and produce a proprietary optical instrument as part of an overall plan to establish operations in key international arenas.

KLA's gross profit margin on export sales is lower than that realized on domestic sales. Export sales are subject to certain export controls and restrictions; however, the company has not experienced any material difficulties because of these restrictions.

KLA Instruments

KLA's export sales to customers in Europe and the Far East have grown from 22 percent of total in fiscal year 1984 to 28 percent in fiscal 1985 and 32 percent in 1986. The Company credits these increases to its direct sales organization established in Europe in July 1984 and its Technology Center established in Japan in May 1985.

Marketing

KLA markets its systems in the United States and Canada through its own sales organization. In July 1984, the Company established a direct sales organization in Europe. In Japan, the Company's products are sold through an exclusive distributor. Marketing activities for the Company's products are supplemented through advertising in trade journals and exhibits at trade shows.

Research and Development

KLA is actively engaged in significant product improvement and new product development efforts. This research and development is funded in two different ways at KLA: internally and through research and development partnerships. Internally funded research and development expenses for fiscal years 1980 through 1986 are given in Table 1.

Table 1

KLA Instruments
INTERNALLY FUNDED RESEARCH AND DEVELOPMENT EXPENSES
(Thousands of Dollars)

<u>Year</u>	<u>Amount</u>	<u>Percent of Net Sales</u>
1980	\$ 846	11.7%
1981	\$ 1,656	12.6%
1982	\$ 2,424	15.0%
1983	\$ 3,067	13.1%
1984	\$ 6,114	14.3%
1985	\$10,734	17.1%
1986	\$10,141	12.3%

Source: KLA Instruments
Corporation Annual
Reports

KLA Instruments

In addition to internally funded research and development, KLA has also entered into three research and development partnerships. These partnerships which are wholly owned subsidiaries of KLA. The subsidiaries are general partners in the partnerships and have exclusive management control of their businesses.

In 1981, KLA received \$2 million through Partnership No. 1 to develop image processing equipment for assembly operations. This eventually led to the Alignment, Inspection, and Measurement Division. In 1982, the company received another \$3.25 million through Partnership No. 2 to develop the KLA 2020 Wafer Inspection Division.

In February 1985, KLA received \$5.8 million through Partnership No. 3 for an automated image analysis system for printed circuit board inspection. This new system will be KLA's next major product thrust. It is expected to be in production by early 1987.

In September 1985, the Company received a \$710,000 addendum to a Department of the Army contract associated with the VHSIC program. The funding will be used for development and implementation of new image processing concepts to provide further improvement to the performance of KLA's High-Resolution Automatic Data Base Reticle Inspection System (HRADBRIS). The contract for this system now totals \$2,460,000.

Approximately one out of every five KLA employees works in engineering, research, or development, and half of the technical staff has master's or doctor's degrees.

Company Structure

President and Chief Executive Officer of KLA is Kenneth Levy. Other officers include: Chairman of the Board, Robert E. Anderson; Senior Vice President, Robert J. Boehlke; Vice President of Advanced Development, Paul Sandland; Senior Vice President, Kenneth L. Schroeder; and Secretary, Paul Kreutz.

Mr. Levy was a cofounder of KLA in 1975. Prior to founding the Company, Mr. Levy was President of Cobilt, a manufacturer of automated semiconductor manufacturing equipment and a division of Computervision Corporation.

Mr. Anderson also cofounded the Company in 1975. After serving as a Senior Vice President and a director of the Company since its founding, he was elected Chairman in June 1985.

KLA Instruments

Mr. Boehlke joined the Company in April 1983 as Vice President and General Manager of the Reticle and Photomask Inspection Division. From August 1971 to April 1983, Mr. Boehlke was employed by Kidder Peabody & Co., a member of the New York Stock Exchange, and in his last position with that firm was a Vice President and stockholder.

Mr. Sandland joined the Company in April 1979 as Engineering Manager, and was elected Vice President of Engineering in July 1978 and Vice President of Advanced Development in January 1980.

Mr. Schroeder joined the Company in April 1979 as Vice President of Manufacturing, and became Vice President and General Manager of the Reticle and Photomask Inspection Division in July 1982. In April 1983, he became General Manager of the Wafer Inspection Division. From 1973 until March 1979, Mr. Schroeder was employed by Spectra-Physics, Inc., a laser systems manufacturer, where he was Division Manager of the Engineering Laser Systems Division and Manufacturing Manager.

Mr. Kreutz has been Secretary of the Company since December 1981, and has been a practicing attorney for more than five years. He is a member of Ware, Fletcher & Freidenrich, which is general counsel to the Company.

In April 1986, Robert J. Riopel was appointed Vice President of Finance and Administration, reporting to Mr. Levy. Also in April, Howard Gore was promoted to the newly created position of Corporate Controller and Raymond Werner was promoted to Assistant Treasurer. Both Mr. Gore and Mr. Werner will report to Mr. Riopel. The Company also announced in April that Robert Walsh resigned as Treasurer of the Company.

Also this year, Robert Heny was appointed to General Manager of the Wafer Inspection Division (WISARD) and Mike McCarver was appointed as Vice President of Sales for the Reticle and Photomask Inspection Division (RAPID).

Customer service is a vital part of KLA's strategy and structure. The customer support staff comprises more than 20 percent of the company's employees, and more than 95 percent of the customer support employees have technical degrees.

KLA considers its employee relations good. None of its approximately 600 employees are represented by labor unions.

KLA Instruments

OPERATING GROUPS OR DIVISIONS

The Reticle and Photomask Inspection Division

The Reticle and Photomask Inspection Division (RAPID) produces the KLA 200 Series of inspection systems, the KLA 228 Reticle Inspection System, the KLA/Micrion 808 Ion Beam Repair System, and the KLA 302 Solder Mask Inspection System. RAPID generates more revenue than any other of the Company's divisions, although, as the other divisions introduce new products, this share is declining (see Table 2).

Table 2

**KLA Instruments
SALES BY DIVISION
(Millions of Dollars)**

	<u>1985</u>		<u>1986</u>	
	<u>Sales</u>	<u>Percent Share</u>	<u>Sales</u>	<u>Percent Share</u>
RAPID Division	\$46.6	74.1%	\$43.5	52.7%
Wafer Inspection Division	4.7	7.5	19.5	23.6
AIM/ATS Divisions	<u>5.2</u>	<u>8.3</u>	<u>9.5</u>	<u>11.5</u>
Subtotal Systems Revenue	\$56.5	89.8%	\$72.5	87.9%
Service Revenue	6.0	9.5%	7.5	9.1%
Development Revenue	<u>0.4</u>	0.6%	<u>2.5</u>	3.0%
Total Revenue	\$62.9		\$82.5	

Note: Totals may not add due to rounding.

Source: Dataquest
October 1986

KLA Instruments

KLA believes that RAPID will continue to grow because of its large installed base in mask shops and IC manufacturing facilities and because of the growth in application-specific ICs (ASICs), which use three to five masks. The Company also expects RAPID to grow because of increased usage of its systems overseas. RAPID now has field support in 16 countries.

Table 3 lists the division's photomask and reticle inspection products. The KLA 100 was KLA's first product. It was introduced in 1978, and approximately 50 units were shipped before it was discontinued. All the other products listed in the table are currently in production.

Table 3

**KLA Instruments
RETICLE AND PHOTOMASK INSPECTION DIVISION PRODUCTS**

<u>Model</u>	<u>Detection Resolution</u>	<u>ASP</u>	<u>Year Introduced</u>
KLA 100	2 microns	\$ 300,000	1978
KLA 101	0.9 micron	\$ 300,000	1981
KLA 201	0.9 micron	\$ 450,000	1982
KLA 208	0.5 micron	\$ 700,000	1984
KLA 209	0.35 micron	\$ 850,000	1984
KLA 218	0.5 micron	\$ 668,000	1986
KLA 219	0.35 micron	\$ 768,000	1986
KLA 221	0.9 micron	\$ 718,000	1982
KLA 224	0.9 micron	\$ 690,000	1983
KLA 228	0.5 micron	\$1,000,000	1985
KLA 229	0.35 micron	\$1,125,000	1986
KLA/Micrion 808	<1 micron	\$1,000,000	1985
KLA 302		\$ 40,000	1984

Source: Dataquest
October 1986

KLA Instruments

The KLA 100 Series used die-to-die comparison techniques to inspect photomasks and multichip reticles. The KLA Model 221 Inspection System (KLARIS) was the initial product in the KLA 200 Series, and added the capability of die-to-die data base comparison techniques. The first installation for KLARIS was made in early 1985.

The KLA 201 is a "stripped" version of the 221 and only has die-to-die capability, but can be upgraded in the field to add die-to-die data base comparison such that its performance is comparable to that of the 221. The KLA 224 is a dedicated, high-throughput reticle inspection system.

In October 1985, KLA announced the KLA 209, an advanced photomask and reticle inspection system. The 209 can detect defects of 0.35 micron on linewidths as small as 0.75 micron. The Company expects that the 209 will be used for reticle qualification as well as for photomask inspection.

In addition to the 209, the Company's RAPID division has shipped three other new products in fiscal 1986: the KLA 228 Reticle Inspection System, the KLA/Micrion 808 Ion Beam Repair System, and the KLA 229. The 228 is an image-to-data base system that uses proprietary image enhancement techniques to find defects as small as 0.5 micron. The average selling price (ASP) of the 228 is approximately \$1 million.

The KLA/Micrion 808 also has an ASP of \$1 million. The 808 will be the industry's first repair system to use ion beam technology for repairing submicron defects on photomasks and reticles. KLA has minority ownership in Micrion and exclusive marketing rights to the repair products for photomask and reticle applications.

In fiscal 1986, KLA introduced the third generation of KLARIS, the KLA 229, a die-to-die and die-to-data base reticle inspection system which validates the image of the integrated circuit on a photomask or reticle. The KLA 229 has the same optical resolution as the KLA 209.

In August, KLA introduced the first two models of its 210-Series High Speed Automatic Photomask Inspection Systems: the KLA 218 and KLA 219. The 218 and 219 can detect defect densities as small as the 208 and 209 (0.5 micron and 0.35 micron, respectively) but are twice as fast as the 208 and 209.

In August 1984, the division introduced the KLA 302 Solder Mask Inspection System to optically inspect the metal solder masks used in the IC bonding process. Solder masks that have defects can result in poor bonding and low yields. First shipments were made in 1984, and ASP is \$40,000. The products of the Reticle and Photomask Inspection Division accounted for most of KLA's 1984 sales.

KLA Instruments

KLA claimed that it had installed approximately 300 photomask systems worldwide as of October 1985.

The Wafer Inspection Division

The Wafer Inspection Division was formed in 1983, and in 1984 it introduced the KLA 2020, the industry's first fully automated wafer inspection system. First shipments of this product were made in 1985. There are presently no competitors that can deliver completely automated wafer inspection systems.

In May 1985, the Company introduced a major enhancement to the 2020, the Design Reference Generator (DRG). The DRG allows the 2020 to compare a level on the silicon wafer with the design data base of the mask or reticle used to expose the wafer. The average selling price of the DRG is approximately \$270,000. In May of this year, the Company introduced a computer subsystem, the KLAUT, which is used with the 2020 to format wafer inspection data into graphics displays for statistical analysis.

As of April 1986, KLA had received approximately 40 orders for the 2020 and had shipped 20. Approximately one-third of the 2020's installed base is reportedly being used for wafer stepper setup and reticle qualification. Another third is used for process control and full wafer inspection, and the remaining third is used for troubleshooting, yield control, and research and development. The Company is currently devoting one service engineer to every installed 2020. Average selling price of the 2020 is \$1 million.

The Alignment, Inspection, and Measurement Division

The Alignment, Inspection, and Measurement (AIM) Division was established to develop products to automate assembly operations. The division's first product is the KLA Automatic System for Process Control (KLAASP). The KLAASP is an OEM product that provides cost-effective image processing to automate the alignment, measurement, and inspection tasks that occur during assembly and test operations. The KLAASP has an ASP of \$15,000.

KLA has OEM contracts for its KLAASP image processing system with two Japanese equipment manufacturers.

KLA Instruments

The Automated Test Systems Division

The Automated Test Systems (ATS) Division was established to provide products to automate test operations. First shipments for the division's first product, the KLA 1007 Automated Wafer Prober, began in late 1984. The KLA 1007 combines state-of-the-art image processing technology with a proven precision wafer handling and positioning system supplied by a semiconductor equipment manufacturer. It is the first prober to combine electrical test with visual inspection.

May 21, 1985

**SEMICONDUCTOR EQUIPMENT AND MATERIALS SERVICE
FILING INSTRUCTIONS**

Title: KLA Instruments

Location: Industry Econometrics

Pages: 8

Author: George Burns

Filing Instructions: The enclosed company profile dated
15 May 1985, should be inserted into
your binder behind the K tab section.

KLA Instruments

KLA Instruments Corporation
2051 Mission Boulevard
Santa Clara, California 95054
Telephone: (408) 988-6100 Telex: 9103387357
(Thousands of Dollars Except Per Share Data)

Balance sheet (June 30, 1984)

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>
Working Capital	\$2,188	\$ 8,521	\$ 9,875	\$18,406	\$40,147
Long-Term Debt	\$1,597	\$ 898	\$ 1,135	\$ 313	\$ 812
Shareholder's Equity	\$ 985	\$ 9,100	\$10,671	\$24,811	\$52,439
After-Tax Return on Average Equity (%)	N/A	22.13%	15.27%	16.50%	14.66%

Operating Performance (Fiscal Year Ending July 31, 1984)

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>
Revenue*	\$7,249	\$13,568	\$17,003	\$24,682	\$44,410
Cost of Revenue	\$3,744	\$ 7,128	\$ 8,800	\$11,483	\$20,818
R&D Expense	\$ 846	\$ 1,656	\$ 2,424	\$ 3,067	\$ 6,144
G&A Expense*	\$1,551	\$ 2,724	\$ 3,369	\$ 5,301	\$ 8,161
Pretex Income	\$1,108	\$ 2,060	\$ 2,410	\$ 4,831	\$ 9,287
Pretex Margin (%)	15.28%	15.18%	14.17%	19.57%	20.91%
Effective Tax Rate (%)	43.86%	45.83%	37.34%	39.39%	39.01%
Net Income**	\$ 622	\$ 1,116	\$ 1,510	\$ 2,928	\$ 5,664
Average Shares Outstanding (Thousands)	\$1,818	\$ 4,336	\$ 9,048	\$ 9,742	\$10,661
Per Share					
Earnings	\$ 0.37	\$ 0.26	\$ 0.17	\$ 0.30	\$ 0.53
Book Value	\$ 0.54	\$ 2.10	\$ 1.18	\$ 2.55	\$ 4.92
Price Range	N/A	\$ 18.00-	\$ 7.25-	\$ 4.00-	\$ 18.15-
		38.50	14.12	26.50	26.50
Total Employees†	147	170	230	339	517

*Includes international

**Does not include \$297,000 extraordinary credit

†End of calendar year

N/A = Not Available

Source: KLA Instruments Corporation
Annual Reports and Forms 10-K
DATAQUEST

KLA Instruments

(The majority of this section is excerpted from the KLA Instruments Corporation Annual Report for the fiscal year ended June 30, 1984. For more detailed information and opinions about KLA Instruments, DATAQUEST clients are invited to use their inquiry privileges.)

THE COMPANY

Background

KLA is considered a pioneer in the automatic optical photomask inspection market. Established in 1976 specifically to design and manufacture photomask inspection systems, KLA introduced its first photomask inspection system in 1978. KLA now offers a broad line of automated photomask and reticle inspection systems.

KLA has grown from \$3.2 million in sales in fiscal year 1979 to \$43 million in fiscal year 1984. This represents a 67 percent compound annual growth rate (CAGR) over the last five years. KLA's goal is to achieve growth rates of 50 percent or more in both sales and income each year, and appears to be on target. First half results for fiscal year 1985 were \$30 million in sales.

KLA has emerged as a leader in the field of image processing technology, which includes optical image transfer and pick-up systems, high-speed image processing computers, and proprietary image processing software. KLA's strategy is to be first in the market with revolutionary products, and to establish the market for itself before the competition moves in.

KLA believes that over the next two decades, image processing technology will impact industrial manufacturing processes in much the same manner that data processing revolutionized the accounting industry. Through the use of image processing on the factory floor, KLA believes that industry will be able to either eliminate or perform many of the inspection tasks that are now being performed by humans.

As a result of its expertise in image processing technology, KLA's business focus has broadened to include identifying new optical tasks that have not yet been automated, then automating these tasks through application of the company's image processing technology. In keeping with its present strategy, KLA offers products in areas other than its traditional photomask and reticle inspection markets such as wafer inspection, solder mask inspection, IC device assembly, and device test.

KLA Instruments

In 1983 and 1984, KLA introduced five major new products, and only one of the five was in the company's traditional photomask and reticle inspection market. In 1985, KLA plans to announce a product for use outside the semiconductor industry.

Operations

KLA consists of four divisions and an Advanced Development Group. The Reticle and Photomask Inspection Division designs and manufactures automated photomask inspection systems. The Wafer Inspection Division was formed in 1983 to develop a fully automated wafer inspection system. The Alignment, Inspection, and Measurement Division was recently established to deliver low-cost modular image-processing systems to manufacturers of assembly equipment. The Automated Test Systems Division produces automated electrical test equipment using image processing technology.

It is apparent that KLA plans to get into the mask repair business, since the Company recently entered into a marketing agreement with Micrion, a Beverly, Massachusetts, company founded in 1983 to develop focused ion beam mask repair systems. The Micrion mask repair system will be capable of focusing ions into an area as small as 0.1 micron, and will be able to repair both clear and opaque defects.

International Operations

Export sales to customers in Europe and in the Far East contributed approximately 18 percent (fiscal year 1980), 19 percent (1981), 21 percent (1982), 31 percent (1983), and 22 percent (1984) of net sales.

KLA's gross profit margin on export sales is lower than its profit margin on domestic sales, because export sales are subject to certain export controls and restrictions. However, the Company has not experienced any material difficulties because of these restrictions.

Marketing

KLA markets its systems in the United States and Canada through its own sales organization, which at August 31, 1984, included 42 sales and marketing people. Marketing activities for the Company's products are supplemented through advertising in trade journals and through exhibits at trade shows.

KLA Instruments

KLA's products are sold in Europe through an independent sales representative and in Japan through an exclusive distributor. The Company has established its own European marketing and service capability in support of its European sales representative.

Research and Development

KLA is actively engaged in significant product improvement and new product development efforts. Research and development expenses for fiscal years 1980 through 1984 are given in Table 1.

Table 1
ENGINEERING, RESEARCH, AND DEVELOPMENT
(Thousands of Dollars)

<u>Fiscal Year</u>	<u>Total Revenue</u>	<u>Percent of Net Sales</u>
1980	\$ 846	11.7%
1981	\$1,656	12.6%
1982	\$2,524	15.0%
1983	\$3,067	13.1%
1984	\$6,114	14.3%

Source: KLA Instruments Corporation
Annual Reports

KLA Instruments

KLA's commitment to being a leader in image processing technology is reflected in its aggressive technology development programs. Through both internally funded programs and research contracts from R&D limited partnerships, KLA spent 19.4 percent of its sales on R&D in 1983 and spent 22 percent of sales on R&D in 1984. One out of every five KLA employees works in engineering, research, or development.

In 1981, KLA raised \$2 million through an R&D limited partnership to develop image processing equipment for assembly operations. This eventually led to the Alignment, Inspection, and Measurement Division. In 1982, the Company raised another \$3.25 million through another R&D partnership to develop the KLA-2020 Wafer Inspection Division. As of February 1985, KLA is seeking to raise \$6.5 million through a third R&D partnership to develop an inspection system for printed circuit boards. KLA intends to form a fifth division around these 1985 research and development efforts. In addition, KLA raised \$11 million in 1983 and \$21 million in 1984 through public offerings of common stock.

Employees and Company Structure

As of June 30, 1984, KLA had approximately 517 full-time employees, of whom approximately 74 were engaged in engineering, research, and development activities. KLA considers its employee relations good. None of its employees are represented by a labor union.

PRODUCTS

Reticle and Photomask Inspection Division

The Reticle and Photomask Inspection Division produces the KLA-100 and KLA-200 Series of inspection systems. The KLA-100 Series uses die-to-die comparison techniques to inspect photomasks and multi-die reticles. The KLA Model 221 Inspection System (KLARIS) was the initial product in the KLA-200 Series and added the capability of die-to-die base comparison techniques. The first installation for KLARIS was made in early 1985.

Table 2 lists the reticle and photomask inspection products of the Reticle and Photomask Inspection Division. KLA's first product, the KLA-100, was introduced in 1978, and approximately 50 units were shipped before it was discontinued. All the other products listed in the table are currently in production.

KLA Instruments

Table 2

RETICLE AND PHOTOMASK INSPECTION DIVISION PRODUCTS

<u>Model</u>	<u>Detection Resolution</u>	<u>ASP</u>	<u>Comparison Die-to-Die</u>	<u>Technology Die-to-Die Base</u>	<u>Introduced</u>
KLA-100*	2 microns	200,000	X	-	1978
KLA-101	0.9 microns	300,000	X	-	1981
KLA-221 (KLARIS)	0.9 microns	718,000	X	X	1982
KLA-201	0.9 microns	415,000	X	Optional	1983
KLA-224	0.9 microns	718,000	X	X	1983
KLA-208	0.5 microns	700,000	X	-	1984

ASP = Average Selling Price

*Discontinued

Source: DATAQUEST

The KLA-201 is a stripped version of the 221 and only has die-to-die capability, but can be upgraded in the field to add die-to-die data base comparison. The KLA-224 is a dedicated, high-throughput reticle inspection system.

In 1984, KLA introduced the KLA208 Image Processing System. This system is capable of finding defects as small as 20 millionths of an inch. This system will allow photomask tooling to be produced for circuits for 256K and 1 megabit memories.

In August 1984, the division introduced the KLA-302 Solder Mask Inspection System to optically inspect the metal solder masks used in the IC bonding process. Solder masks that have defects can result in poor bonding and low yields. First shipments were made in 1984, and the average selling price (ASP) is \$40,000. The products of the Reticle and Photomask Inspection Division accounted for most of KLA's 1984 sales.

KLA Instruments

WAFER INSPECTION DIVISION

The Wafer Inspection Division was formed in 1983 to develop a wafer inspection system. In 1984, KLA introduced the KLA-2020--the first fully automated wafer inspection system. First shipments of this product will be made in first quarter 1985 at a sale price of \$895,000. This is the only product of this division.

ALIGNMENT, INSPECTION, AND MEASUREMENT DIVISION

The Alignment, Inspection, and Measurement Division was recently established to develop products to automate assembly operations. The division's first product, the KLA Automatic System for Process Control (KLAASP), is an OEM product that provides cost-effective image processing to automate the alignment, measurement, and inspection tasks that occur during assembly and test operations. KLA announced a \$5 million OEM order for KLAASP, and first shipments were made in the first half of 1984 under this contract. At a \$15,000 ASP, this OEM order represents approximately 333 units.

AUTOMATED TEST SYSTEMS DIVISION

The Automated Test Systems Division, was recently established to provide products to automate test operations. Initial shipments for the division's first product, the KLA-1007 Automated Wafer Prober, began in late 1984. The KLA-1007 combines state-of-the-art image processing technology with a precision wafer handling and positioning system. It is the first prober to combine electrical test with visual inspection.

The Perkin-Elmer Corporation

Perkin-Elmer Corporation
Main Avenue
Norwalk, Connecticut 06856
Telephone: (202) 762-1000 Telex: 965-5954
(Millions of Dollars Except Per Share Data)

Balance Sheet (as of July 31)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Current Assets	\$ 650	\$ 657	\$ 678	\$ 761	\$ 846
Current Liabilities	\$ 251	\$ 238	\$ 270	\$ 340	\$ 389
Current Ratio	2.58	2.76	2.51	2.24	2.18
Working Capital	\$ 398	\$ 418	\$ 405	\$ 760	\$ 846
Long-Term Debt*	\$ 138	\$ 144	\$ 102	\$ 122	\$ 122
Debt/Equity	31.35%	29.89%	19.79%	21.76%	19.74%
Shareholders' Equity	\$ 440	\$ 483	\$ 515	\$ 563	\$ 619
After-Tax Return on Average Equity	20.06%	13.59%	10.07%	12.26%	13.89%
Capital Expenditures	\$ 52	\$ 46	\$ 47	\$ 59	\$ 68

Operating Performance (Fiscal Year Ending July 31)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Revenue	\$1,116	\$1,037	\$1,015	\$1,182	\$1,305
Gross Margin	44%	43%	42%	42%	44%
Cost of Revenue	\$ 623	\$ 591	\$ 587	\$ 688	\$ 733
RD&E Expense	\$ 83	\$ 81	\$ 80	\$ 92	\$ 114
RD&E/Revenue	7%	8%	8%	8%	9%
SG&A Expense	\$ 257	\$ 262	\$ 270	\$ 305	\$ 323
SG&A/Revenue	23%	25%	27%	26%	25%
Interest Expense**	\$ 4 (\$ 4)	(\$ 10)	\$ 5 (\$ 2)		
Pretax Income	\$ 149	\$ 107	\$ 88	\$ 93	\$ 136
Pretax Margin	13.34%	10.36%	8.63%	7.83%	10.42%
Effective Tax Rate	44.50%	41.65%	42.69%	28.65%	39.61%
Net Income	\$ 83	\$ 63	\$ 50	\$ 66	\$ 82
Average Shares Outstanding (Thousands)	43,150	43,250	43,671	44,466	44,650
Per Share Earnings	\$ 1.91	\$ 1.45	\$ 1.15	\$ 1.49	\$ 1.84
Total Employees	15,402	14,100	14,372	15,480	15,515

*Includes long-term debt and other long-term liabilities.

**Stated as a net figure including interest expense and income, also other income, patent infringement settlement, and provisions for restructuring.

Source: Perkin-Elmer, Annual Reports
and Forms 10-K
DATAQUEST
January 1986

The Perkin-Elmer Corporation

(The majority of this section is excerpted from the Perkin-Elmer Report Form 10-K to the Securities and Exchange Commission and the Perkin-Elmer Annual Report for the fiscal year ending July 31, 1985. For more detailed information and opinions about Perkin-Elmer, DATAQUEST clients are invited to use their inquiry privileges.)

THE COMPANY

Background

The Perkin-Elmer Corporation was incorporated in 1939 under the laws of the state of New York. Perkin-Elmer develops, manufactures, and sells products in the following six industry segments: Analytical Instrumentation, Avionic Instrumentation, Electronic Data Systems, Electro-Optical Systems and Precision Optics, Semiconductor Production Equipment, and Thermal Spray Equipment and Supplies.

Perkin-Elmer consists of six operating groups: the Semiconductor Equipment Group, the Materials and Surface Technology Group, the Instrument Group, the Concurrent Computer Corporation, the Optical Group, and Bodenseewerk Geraetetechnik (BGT).

In May 1984, Perkin-Elmer's Semiconductor Production Equipment Group acquired Censor, a Liechtenstein producer of step-and-repeat alignment systems. The same month it also acquired Qualitron as a wholly owned subsidiary. Qualitron manufactures masks for the production of semiconductor devices. In July 1984, Qualitron's printed circuit division was sold to Hadco Corporation.

In September 1985, the Company combined the Physical Electronics Division of the Instruments Group and the METCO group to form the Materials and Surface Technology Group. In November 1985, the Company formed the Concurrent Computer Corporation from its Data Systems Group. By March 1986, 82 percent of Concurrent's equity was owned by Perkin-Elmer.

Fiscal 1985 operating profits increased 38 percent from 1984, while sales increased 10 percent. In a period of generally tight market conditions in the electronics industry, Perkin-Elmer's net sales for the first 6 months of fiscal 1986 (ending January 31) were up slightly from the same period in 1984, from \$614.6 million to \$620 million. Operating profits for the 6 months ending January 31, 1986 were stable at \$268.9 million, compared to \$266.1 million for the 6 months ending January 31, 1985.

The Perkin-Elmer Corporation

In fiscal 1985, Perkin-Elmer reduced the number of management levels in most of its operations and reduced the number of corporate officer positions. A total of 200 employees took a voluntary retirement in fiscal 1984 and fiscal 1985. This involved a substantial one-time cost of \$11 million that was charged against income in fiscal 1984 and fiscal 1985. Annual direct savings from this action are calculated to be approximately \$11 million.

OPERATIONS

The Semiconductor Equipment Group produces and sells capital goods for the semiconductor industry, specifically Micralign full-field scanning projection mask alignment lithography systems and Censor step-and-repeat alignment lithography systems; electron beam lithography systems (sold under the trademark MEBES); a direct-write electron beam system (AEBLE 150) sputtering equipment; and a plasma processing system sold under the trademark Omni-Etch. These markets traditionally have relatively few customers.

The Materials and Surface Technology Group was formed in September 1985 from Perkin-Elmer's METCO group and the Physical Electronics Division of the Instruments Group. This group will concentrate on materials science and surface technology markets.

The Instrument Group produces and sells analytical instruments that determine the composition and molecular structure of organic and inorganic chemical substances and measure the concentration of materials in a sample.

Concurrent Computer Corporation was formed on November 13, 1985. It assumed the activities and net assets of Perkin-Elmer's Data Systems Group which developed and produced 32-bit superminicomputers. Although the Data Systems Group was profitable, Perkin-Elmer felt that it did not always receive the attention it deserved. Concurrent was formed in response to this perceived lack of attention. It was hoped that as a separate corporation it would increase its visibility, achieve recognition from the financial community, and would be able to attract and maintain a strong management team. It is 82 percent-owned by Perkin-Elmer.

The Optical Group produces and sells electro-optical systems and precision optical components that are specially developed to meet the needs of the U.S. government's space and national security programs. The Optical Group also produces and sells commercial products, such as medical and industrial gas analyzers; microdesitometers; automatic document inspection systems; and ground-based astronomical telescopes and spectrographs.

The Perkin-Elmer Corporation

Bodenseewerk Geraetetechnik (BGT) is a West German affiliate that produces and sells avionic instrumentation including flight guidance and control instruments for missiles and military and commercial aircraft. BGT's principal customer is West Germany's Federal Office of Military Technology and Procurement, which BGT serves both as a prime contractor and as a subcontractor.

Net sales for the year ending July 31, 1985, exceeded those of the previous fiscal year by 10 percent. Gross margin as a percent of sales for fiscal 1985 was up to 43.8 percent, from fiscal 1984's 41.8 percent. The Company attributes this to several causes. First, commercial business segments represented a growing share of its business, while the lower-margined government contracting segments represented a shrinking share. Second, the Company noted a growing acceptance of some of its newest, most advanced, and highest-margined products in the marketplace; this was especially evident in Concurrent Computer Corporation. Finally, the Company was able to raise prices on selected products, allowing it to offset the negative impact of the strong U.S. dollar.

Perkin-Elmer's strategy is to be technology-driven in order to respond to the changing needs of its markets. Horace C. McDonell, president and chief executive officer, wants to "maximize the Company's firepower at the front." To do this, Perkin-Elmer has been actively engaged in minimizing administration and overhead expenses, in improving productivity, while simultaneously increasing R&D expenses 24 percent in fiscal 1985.

INTERNATIONAL OPERATIONS

Perkin-Elmer's consolidated net sales abroad for the fiscal years ending July 31, 1983, 1984, and 1985 were approximately \$463 million, \$476 million, and \$533 million or 46 percent, 40 percent, and 41 percent, respectively, of the Company's consolidated net sales. The profitability of such sales, which included products exported from the United States as well as those manufactured abroad, did not differ significantly from similar sales in the United States.

On January 10, 1986, Perkin-Elmer and Citizen Watch Company, Ltd. of Tokyo signed a final agreement, forming a joint venture company to manufacture the Company's products in Japan. Initial capitalization was \$500,000. Perkin-Elmer will own 60 percent of the new company; Citizen Watch will own 40 percent.

Under the terms of the joint venture, Perkin-Elmer Japan will have worldwide sales and marketing responsibility for products manufactured in Japan. Initially, the joint venture will manufacture Perkin-Elmer's SRA series of steppers and its Omni-Etch line of dry processing systems.

The Perkin-Elmer Corporation

Citizen's Precision Machinery Division in Japan will be responsible for the actual production of the Company's equipment. Perkin-Elmer Japan will initially perform final test on the products, then test and assembly, and finally complete manufacture.

MARKETING

In the United States, Perkin-Elmer markets most of its products directly through its own sales organizations, although some lower-priced instruments produced by the Instrument Group are marketed through independent distributors and sales representatives. Sales to major markets outside the United States are generally made by foreign sales subsidiaries, although some sales are made directly to the foreign customers. In countries where the sales potential does not warrant the establishment of a sales subsidiary, sales are made through various representative and distributorship arrangements.

Perkin-Elmer leases sales and service offices in principal industrial cities in the United States, and in foreign countries through its sales subsidiaries. None of Perkin-Elmer's products is distributed through retail outlets.

RESEARCH AND DEVELOPMENT

Perkin-Elmer's R&D spending for fiscal 1985 was 24 percent higher than the previous year. R&D was 8.8 percent of sales for the company as a whole. This was due, primarily, to continued heavy spending for new product development in the Semiconductor Equipment Group (such as for X-ray lithography) and in the Data Systems Group (now Concurrent Computers).

EMPLOYEES

As of July 31, 1985, Perkin-Elmer employed 15,480 persons, 10,679 in the United States. None of the Company's U.S. employees is subject to collective bargaining agreements.

The Perkin-Elmer Corporation

SEMICONDUCTOR EQUIPMENT GROUP

Perkin-Elmer's Semiconductor Equipment Group is the world's largest producer of semiconductor processing equipment. It is committed to meeting the semiconductor industry's production requirements for the next generation of semiconductor devices with efficient and productive tools and effective customer support.

In fiscal 1985, the Semiconductor Equipment Group reported sales of \$315.9 million (see Table 1), up 22 percent from 1984. The Company attributed this strong growth to the demand early in the fiscal year for its latest Micralign projection mask aligners and to continuing demand for its electron beam exposure systems. However, sales for the 6 months ending January 31 were hurt by the semiconductor recession of 1985. Sales for the first six months of FY1986 were \$121.7 million, down 17 percent from the same period a year earlier (see Table 2). Orders were \$114.8 million, down 34 percent from the period a year earlier (see Table 3). The Company notes optimistically that orders for the quarter ending January 31, 1986, were higher than in the previous three quarters.

Table 1

OPERATING GROUP FINANCIAL DATA FISCAL YEAR ENDING JULY 31 (Millions of Dollars)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
NET ORDERS					
Instrument Group	\$ 327.7	\$323.7	\$ 306.4	\$ 358.4	\$ 390.7
Semiconductor Equipment Group	177.6	125.1	174.4	310.2	294.3
Data Systems Group	228.1	222.1	202.0	244.6	273.9
Optical Group	173.2	130.3	155.4	208.0	181.8
Bodenseewerk Geraetetechnik	189.5	93.6	112.5	119.7	100.1
Metco	<u>100.8</u>	<u>92.9</u>	<u>78.9</u>	<u>83.4</u>	<u>88.6</u>
Subtotal	\$1,196.9	\$987.7	\$1,029.6	\$1,324.3	\$1,329.4
Intersegment	<u>(5.4)</u>	<u>(4.7)</u>	<u>(11.8)</u>	<u>(18.5)</u>	<u>(15.8)</u>
Total	\$1,191.5	\$983.0	\$1,017.8	\$1,305.8	\$1,313.6

(Continued)

The Perkin-Elmer Corporation

Table 1 (Continued)

OPERATING GROUP FINANCIAL DATA
FISCAL YEAR ENDING JULY 31
(Millions of Dollars)

NET SALES

Instrument Group	\$ 328.7	\$ 323.8	\$ 311.5	\$ 342.5	\$ 371.0
Semiconductor Equipment Group	193.8	165.0	170.0	257.8	315.9
Data Systems Group	225.3	210.6	214.0	233.1	259.2
Optical Group	162.3	144.8	145.4	183.3	190.6
Bodenseewerk Geraetetechnik	111.5	111.7	107.0	100.3	96.0
Metco	<u>100.9</u>	<u>86.7</u>	<u>78.1</u>	<u>81.4</u>	<u>88.2</u>
Subtotal	\$1,122.5	\$1,042.6	\$1,026.0	\$1,198.4	\$1,320.9
Intersegment	<u>(6.7)</u>	<u>(5.8)</u>	<u>(10.6)</u>	<u>(16.1)</u>	<u>(16.3)</u>
Total	\$1,115.8	\$1,036.8	\$1,015.4	\$1,182.3	\$1,304.6

INCOME BEFORE TAXES

Operating Profit					
Instrument Group	\$ 49.2	\$ 43.9	\$ 32.8	\$ 31.5	\$ 46.3
Semiconductor Equipment Group	47.5	20.9	19.1	34.7	47.1
Data Systems Group	20.8	19.0	15.1	15.6	24.4
Optical Group	17.6	13.5	13.1	17.7	18.3
Bodenseewerk Geraetetechnik	11.7	12.5	13.8	14.7	15.0
Metco	<u>19.4</u>	<u>11.2</u>	<u>7.9</u>	<u>9.4</u>	<u>8.9</u>
Subtotal	\$166.2	\$121.0	\$101.8	\$123.6	\$160.0
Intersegment	<u>-</u>	<u>(0.2)</u>	<u>(0.2)</u>	<u>(0.7)</u>	<u>(1.1)</u>
Total	\$166.2	\$120.8	\$101.6	\$122.9	\$158.9
Interest Income (Expense) Net	(0.8)	4.1	3.4	0.3	(3.4)
General Corporate Expenses	<u>(16.6)</u>	<u>(17.5)</u>	<u>(17.3)</u>	<u>(30.6)</u>	<u>(19.5)</u>
	\$148.8	\$107.4	\$87.7	\$92.6	\$136.0

Source: Perkin-Elmer, Annual Reports
and Forms 10-K

The Perkin-Elmer Corporation

Table 2

SALES BY BUSINESS SEGMENT
UNAUDITED
(Millions of Dollars)

	<u>6 Months Ending January 31</u>	
	<u>1985</u>	<u>1986</u>
Instrument Group	\$146.2*	\$163.4
Semiconductor Equipment Group	146.2	121.7
Concurrent Computer Corporation	127.1**	132.2**
Optical Group	97.4	92.2
Materials and Surface Technology Group	63.4	70.4
Bodenseewerk Geraetetechnik	<u>44.0</u>	<u>54.8</u>
Subtotal	\$624.3	\$634.7
Intersegment	<u>(9.7)**</u>	<u>(14.7)**</u>
Total	\$614.6	\$620.0

*Restated to reflect the transfer of Physical Electronics Division from Materials and Surface Technology Group which was established in fiscal 1986. This group also reflects the previous reported results of Metco.

**Amounts for the first quarter have been restated to reflect the formation of Concurrent Computer Corporation on November 13, 1985.

Source: Perkin-Elmer, Second-Quarter
and Six-Month Report

The Perkin-Elmer Corporation

Table 3.

ORDERS BY BUSINESS SEGMENT
UNAUDITED
(Millions of Dollars)

	<u>6 Months Ending January 31</u>	
	<u>1985</u>	<u>1986</u>
Instrument Group	\$157.6*	\$170.5
Semiconductor Equipment Group	172.9	114.8
Concurrent Computer Corporation	137.8	144.9**
Optical Group	103.1	95.4
Materials and Surface Technology Group	63.4*	69.9
Bodenseewerk Geraetetechnik	<u>40.6</u>	<u>25.4</u>
Subtotal	\$675.4	\$620.9
Intersegment	<u>(8.4)</u>	<u>(15.1)**</u>
Total	\$667.0	\$605.8

*Restated to reflect the transfer of Physical Electronics Division from Materials and Surface Technology Group which was established in fiscal 1986. This group also reflects the previous reported results of Metco.

**Amounts for the first quarter have been restated to reflect the formation of Concurrent Computer Corporation on November 13, 1985.

Source: Perkin-Elmer, Second-Quarter
and Six-Month Report

In fiscal 1985, the Group increased its capital spending to \$20 million (see Table 4), an increase of 104 percent from 1984. Capital spending in 1985 was slightly over 6 percent of the Group's sales.

The Semiconductor Equipment Group offers a broad range of semiconductor equipment; especially equipment that serves the industry's most advanced technologies, such as submicron geometries. It also offers a full line of lithography products, including the MEBES III, an E-beam exposure system used in maskmaking. DATAQUEST estimates that Perkin-Elmer has shipped 95 MEBES systems from its introduction in 1977 through 1985, giving it the world's largest installed base of maskmaking equipment.

The Perkin-Elmer Corporation

Table 4

SEMICONDUCTOR EQUIPMENT GROUP FINANCIAL DATA
FISCAL YEAR ENDING JULY 31
(Millions of Dollars)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Net Orders	\$177.6	\$125.1	\$174.4	\$310.2	\$294.3
Net Sales	\$193.8	\$165.0	\$170.0	\$257.8	\$315.9
Income before Taxes	\$ 47.5	\$ 20.9	\$ 19.1	\$ 34.7	\$47.1
Capital Spending	\$ 9.3	\$ 8.2	\$ 12.3	\$ 9.8	\$20.0

Source: Perkin-Elmer, Annual Reports
and Forms 10-K

In the lithography field, the Company also manufactures and markets the AEBLE 150, a direct-write E-beam system; the SRA 9000 stepper system; and the Micralign aligners.

The Micralign product line of projection mask aligners includes the Micralign 660 HT system, which is capable of processing six-inch wafers at a very high throughput of 120 wafers per hour.

The AEBLE 150, one of Perkin-Elmer's leading products in submicron lithography, can direct-write features on wafers of sizes down to one-half micron. AEBLE 150 is a commercial version of a prototype developed in conjunction with the Department of Defense's VHSIC program.

The Semiconductor Equipment Group believes that it is well positioned in plasma systems technology to offer submicron etching with its Omni-Etch 10000 and 20000 dry processing systems.

It has also added the Model 4480 to its sputter deposition systems, which, along with the Omni-Etch 20000, offer plasma processing of six-inch wafers at high throughput rates.

Average selling prices for the group's semiconductor equipment are shown in Table 5.

The Perkin-Elmer Corporation

Table 5

AVERAGE SELLING PRICES (Thousands of Dollars)

<u>Product</u>	<u>Average Selling Price</u>
AEBLE 150	\$3,500
MEBES III	\$2,700
MICRALIGN 600	
(6" capability)	\$ 800
OMNI-ETCH	\$ 475
SRA 9000	\$ 900

Source: DATAQUEST
April 1986

MATERIALS AND SURFACE TECHNOLOGY GROUP

The Materials and Surface Technology Group was formed in September 1985 from the slow-growing METCO (the world leader in thermal spray products) and the Physical Electronics Division of the Company's Instrument Group. The Company estimates the market for surface and materials technology to be \$1 billion.

Both sales and orders for the six-month period ending January 31, 1986, were up from the period a year earlier; sales were up 11 percent to \$70.4 million, and orders were up 10 percent (see Tables 2 & 3).

Products offered by the Materials Group to the semiconductor industry include a molecular beam epitaxy system (MBE) used in the fabrication of gallium arsenide wafers, sputtering equipment, CVD equipment, and auger microprobes.

INSTRUMENT GROUP

Perkin-Elmer is the world's largest manufacturer of chemical and materials research and analytical instruments. Its instruments are used in almost every type of industry, as well as in education and the government.

The Perkin-Elmer Corporation

The Instrument Group was a pioneer in the development of Computer Aided Chemistry. This is a major concept to computerize laboratories by integrating analytical instruments with computers through specially developed software. The group has recently introduced robotics systems.

The Instrument Group boasted of a 1985 growth in sales of 8 percent, to \$371 million (see Table 1), and a growth in orders of 9 percent, to \$391 million.

For the six months that ended January 31, 1986, the Instruments Group's orders were \$170.5 million (see Table 3), up 8 percent from the same six-month period the previous year. Sales for the six months that ended January 31, 1986, were \$163.4 million, up 12 percent from a year earlier.

Because of its focus on specific growth markets, and because of increased expenditures on research and development, the Company believes that the rest of 1986 will see continued growth.

In January 1986, the Company announced the formation of a partnership with Cetus Corporation to develop instrument systems and related reagents for use by industries engaged in biotechnology research and development. Perkin-Elmer will have a 51 percent ownership in the partnership.

In September of 1985, the Physical Electronic Division of the Instruments Group has been transferred to the newly formed Materials and Surface Technology Group.

CONCURRENT COMPUTER CORPORATION

Although it had been profitable in recent years, Perkin-Elmer's computer group did not receive the attention, recognition, and credibility that the Company believed it deserved from the financial community, the computer industry, and its own markets. Consequently, the Company formed the Concurrent Computer Corporation in November 1985 from its Data Systems Group. Over the counter trading officially began on January 24, 1986. In March 1986, 82 percent of Concurrent was owned by Perkin-Elmer.

The Perkin-Elmer Corporation

OPTICAL GROUP

Perkin-Elmer's Optical Group is a leader in the production of advanced electro-optical systems and precision optics for use in a wide range of high-technology programs, such as space science, astronomy, remote sensing, laser defense, and atmospheric and hazardous gas monitoring.

The Optical Group recently finished building the Optical Telescope Assembly for NASA's Hubble Space Telescope. The Optical Group is now increasingly involved in military programs, including the Strategic Defense Initiative (SDI).

Fiscal 1985 sales increased by 4 percent, from \$183 million in 1984 to \$191 million in 1985 (see Table 1). Orders, however, declined 13 percent from \$208 million to \$182 million. For the six months that ended January 31, 1986, both orders and sales had declined from the same period a year earlier; orders had declined 7 percent, from \$103.1 million to \$95.4 million; sales had declined 5 percent, from \$97.4 million to \$92.2 million. The Company believes that these declines represented the completion of major portions of the Hubble Space Contract, and it had expected that contracts for SDI, Advanced Short-Range Air-to-Air Missiles (ASRAAM), and the Solar Optical Telescope (SOT) would take up the slack. However, in March 1986 the Group announced a 75-person layoff due to substantially reduced activity in the SOT program and reduced NASA business in general.

BODENSEWERK GERÄTETECHNIK (BGT)

BGT has an excellent reputation in Europe for its work in the development and production of avionic instrumentation and missile systems. It is known as a strong systems company for air-to-air missiles and has an excellent technological background in advanced seeker heads and in control and navigation systems. It participates in such programs as the Tornado multirole combat aircraft, the European Airbus commercial wide-body jet aircraft, the AIM 9L air-to-air missile and, most recently, the ASRAAM (Advanced Short Range Air-to-Air Missile).

Sales declined slightly for BGT in 1984 to \$100 million (see Table 1), 6 percent less than the previous year. Orders, however, grew by 7 percent, to \$120 million. For fiscal 1985, sales declined again, by 4 percent, to \$96 million. Orders declined by 17 percent, to \$100 million. Because of the strength of the West German mark, however, sales were up by 9 percent. For the six months ending January 31, 1986, the Group's sales increased 25 percent from the same six-month period a year earlier, to \$54.8 million. At the same time, however, orders declined 60 percent, to \$25.4 million.

GCA Corporation

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GCA Corporation

GCA Corporation
209 Burlington Road
Bedford, Massachusetts 01730
Telephone: (617) 975-0000
(Thousands of Dollars except Per Share Data)

Balance Sheet (December 31)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Current Assets	\$131,614	\$153,738	\$213,207	\$133,530	\$ 88,049
Current Liabilities	\$ 35,180	\$ 49,755	\$ 71,804	\$202,933	\$165,806
Current Ratio (%)	374.1	309.0	296.9	65.8	53.1
Working Capital	\$ 96,434	\$103,983	\$141,403	(\$ 69,403)	(\$ 77,757)
Long-Term Debt	\$ 62,055	\$ 65,104	\$ 89,187	\$ 7,049	\$ 6,920
Debt/Equity (%)	75.3	72.0	69.8	(50.3)	(18.4)
Shareholders' Equity	\$ 82,366	\$ 90,458	\$127,685	(\$ 14,027)	(\$ 37,534)
After-Tax Return on Average Equity (%)	(35.9)	1.6	26.2	(256.0)	96.7
Capital Expenditures	\$ 15,395	\$ 7,339	\$ 17,286	\$ 38,077	\$ 2,137

Operating Performance (Fiscal Year Ending December 31)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Revenue	\$ 69,260	\$136,520	\$240,097	\$156,484	\$123,147
Gross Margin (%)	N/A	40.9	50.8	15.4	21.8
Cost of Revenue	N/A	\$ 80,685	\$118,127	\$132,318	\$ 96,255
R&D Expense	\$ 18,890	\$ 21,683	\$ 33,633	\$ 38,077	\$ 18,228
R&D/Revenue (%)	27.3	15.9	14.0	24.3	14.8
SG&A Expense	N/A	\$ 22,400	\$ 30,712	\$ 36,228	\$ 27,245
SG&A/Revenue (%)	N/A	16.4	12.8	23.2	22.1
Other Expenses*	\$ 6,209	\$ 6,808	\$ 8,633	\$ 58,213	\$ 13,115
Pretax Income	(\$ 41,902)	\$ 4,963	\$ 48,992	(\$108,352)	(\$ 31,696)
Pretax Margin (%)	(60.5)	3.6	20.4	(69.2)	(25.7)
Effective Tax Rate (%)	64.7	72.2	41.7	(34.3)	21.4
Net Income	(\$ 14,775)	\$ 1,378	\$ 28,569	(\$145,472)	(\$ 24,920)
Average Shares Outstanding (Thousands)	12,521	13,304	13,584	13,899	14,077
Per Share Earnings	(\$ 1.18)	\$ 0.10	\$ 2.10	(\$ 10.47)	(\$ 1.77)
Total Employees	2,200	2,700	3,300	2,200	1,050

*In 1985, the Company incurred an expense of \$46.6 million relating to its realignment of operations.

Source: GCA Corporation Annual Report
and 10K
Dataquest
June 1987

GCA Corporation

THE COMPANY

Background

GCA Corporation was founded in 1958 and incorporated in Delaware in 1960. The Company manufactures wafer steppers, wafertrack systems, photo-repeater systems, pattern generators, autosort systems, waferetch systems, and industrial lenses.

Poor business conditions in the semiconductor equipment market and the Company's weak financial situation made it necessary for it to take some strong measures in 1986. The Company discontinued operations in areas that did not relate directly to its main line of business--semiconductor manufacturing equipment. The discontinued groups included Scientific and Analytical Equipment, Factory Automation, and the GCA Technology Division, which focused on environmental waste. Two new members were brought into senior management in 1986, a new chairman of the board/chief executive officer/president and a new chief financial officer. Three divisional managers were also promoted to corporate executive positions, and the board of directors experienced a total turnover. The new management implemented several strategies intended to reduce costs and restore profits to company operations.

OPERATIONS

In 1986, GCA operated under the threat of bankruptcy. However, GCA has recently been recapitalized under the direction of the Hallwood Group and the Company is no longer in that danger.

GCA believes that its competitive advantages--having the world's largest wafer stepper installed base, technological leadership, quality of products, and extensive service capabilities--will more than offset its recent financial difficulties.

In 1986, sales for continuing operations declined 21 percent, from \$156 million to \$123 million. The Company's backlog also decreased from \$63 million in December 1985 to \$18.2 million in December 1986.

PRODUCTS

Table 1 lists the steppers and track systems that GCA manufactures and sells.

GCA Corporation

Table 1

GCA Corporation PRODUCT LIST

<u>Product</u>	<u>Intro. Date</u>	<u>Linewidth</u>	<u>Price</u>
Wafer Stepper Systems:			
DSW 4800	1978	1.25 micron	N/A
DSW 6300	1983	1.1 micron	N/A
DSW 6700	Late 1986	1.0-1.1 micron	\$ 700,000
DSW 8000	Late 1985	0.9 micron	\$ 900,000
DSW 8500 I	Nov. 1986	0.7 micron	\$1,200,000
Wafertrac System			
(full system)	N/A	Not Applicable	\$ 170,000

N/A = Not Available

Source: GCA 10K
Dataquest
June 1987

GCA's revenue by product is shown in Table 2.

Table 2

GCA Corporation PRODUCT REVENUE (Millions of Dollars)

<u>Product</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Wafer Steppers	\$45.8	\$111.3	\$201.2	\$118.0	\$ 71.5
Track Equipment	18.0	18.0	25.5	15.0	12.3
Dry Etchers	0.0	0.0	0.0	1.2	2.8
Other Products	<u>5.5</u>	<u>7.2</u>	<u>13.4</u>	<u>22.3</u>	<u>30.0</u>
Total Equipment	\$69.3	\$136.5	\$240.1	\$156.5	\$116.6

Source: Dataquest
June 1987

GCA Corporation

STRATEGY AND INTERNATIONAL COMPETITION

In all its product areas, GCA competes with companies that belong to organizations with much larger resources. Several of its competitors also have more diverse businesses, which means that they are less subject to business cyclicality. GCA depends upon its reputation for technical know-how, excellence, and new product enhancements for its sales.

Internationally, GCA's competitors are Nippon Kogaku KK (Nikon) and Canon. These companies are increasing their penetration in the wafer stepper market, mainly in Japan. In the domestic market, GCA is encountering Perkin-Elmer Corporation and General Signal Corporation's Ultratech Stepper.

GCA is focusing on finer resolution of lithography and compatibility with 8-inch lines. The Company has recently sold its advanced DSW 8500 stepper to Rockwell and IBM.

GCA's domestic marketing organization consists of direct sales forces and 175 service representatives stationed throughout the United States. There are 18 additional locations for direct sales and customer support.

Internationally, GCA has a series of marketing arrangements. Direct sales forces have established a presence in the Pacific Rim outside Japan, and GCA has signed a contract with the PRC Ministry of Electronics to open a sales and service center in Beijing.

The Japanese market is served through a 50/50 joint venture arrangement with Sumitomo Corporation of Japan. The venture employs about 45 service engineers who are trained in the United States by GCA. This arrangement has evolved to include final assembly operations, quality assurance, installation, warranty service, and demonstration and technical applications support. Development and engineering responsibility also aids GCA in its global product development strategy.

In the European market, GCA had a joint venture with Matra SA of France. While the venture has not been profitable financially, it is perceived as a major inroad to market share penetration in Europe. Under the company restructuring, this joint venture became a wholly owned subsidiary of GCA.

Table 3 gives GCA's sales by region.

GCA Corporation

Table 3

GCA Corporation
WORLDWIDE SALES BY MAJOR GEOGRAPHICAL REGION
(Millions of Dollars)

	<u>1982*</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Foreign Sales					
Far East**	\$11,082	\$ 33,225	\$ 70,742	\$ 45,615	\$ 10,234
West. Europe	6,233	8,635	21,183	17,710	24,636
Rest of World	<u>4,848</u>	<u>112</u>	<u>1,620</u>	<u>2,913</u>	<u>1,172</u>
Subtotal	\$22,163	\$ 41,972	\$ 93,545	\$ 66,238	\$ 36,042
U.S./Canada	\$47,097	\$ 94,548	\$146,552	\$ 90,246	\$ 87,105
Total Sales	\$69,260	\$136,520	\$240,097	\$156,484	\$123,147

*Dataquest estimates

**Far East includes Japan, PRC, Korea, Taiwan, Hong Kong, Singapore, Thailand, and Maylasia.

Source: GCA Corporation Annual Report
and 10K
Dataquest
June 1987

RESEARCH AND DEVELOPMENT

In 1986, GCA spent \$18.2 million on R&D, with a research staff of about 180; 125 of which were engineers. GCA concentrates its research activity in the areas of optics, high-resolution wide field imagery, and advanced alignment systems. The Company continually focuses on productivity increases to the DSW Wafer Stepper, Wafertrac, Waferetch, optical maskmaking, and other systems.

During 1986, several product enhancements were made. These included new "I" line lenses capable of 0.7-micron lithography; a new "G" line lens called the 2035, which will retrofit DSW systems in the field to 1.0-micron capabilities; a new Maximus 2000 light source, which provides a 3x increase in exposure energy on the DSW; improvements in the alignment system; and a new backside contact wafer handler, which reduces contamination.

GCA Corporation

GCA's strategy is to reach better than 0.5-micron lithography capability. The Company has recently introduced an excimer laser stepper, which was developed under a VHSIC contract. With the use of excimer laser sources, resolutions of 0.5 microns or better can be obtained.

Other areas of research focus include increased automation in the front end of the manufacturing process, prevention of microcontamination, and environmental control.

COMPANY MANAGEMENT

A new chairman and CEO has just been appointed to the company. A veteran of the industry, the new CEO joins the Company in July 1987, with the termination of the restructuring.

Peter Simone, GCA's president and director, has held various operating and management positions in the Company. He recently served as senior vice president of the Commercial and Product Operations and has also served as a director of Sumitomo GCA Corporation since 1983 and of Matra GCA SA since May 1986. Mr. Simone joined the Company in 1975.

In April 1986, Philip Ablove was named senior vice president and chief financial officer of the Company. He has been a director of the Company since March 1986. Previously, he served as president and CEO of Distributed Control Systems, Inc., a designer and manufacturer of microprocessor-based building automation and lighting control systems.

GCA's senior vice president is Dr. John Bruning, who also holds the positions of chief technical officer and president of GCA/Tropel Division. His previous experience includes working with GCA and AT&T Bell Laboratories, where he worked for 15 years, as the Manager of New Lithographic Systems. Dr. Bruning joined the Company in 1984.

Focus Semiconductor Systems

Focus Semiconductor Systems
570 Maude Court
Sunnyvale, California 94086
Telephone: (408) 738-0600
(Thousands of Dollars)

Balance Sheet (Fiscal year ending 12/31)

	<u>1984</u>	<u>1985</u>
Working Capital	\$1,745	\$1,633
Long-Term Debt	\$ 23	\$ 483
Net Worth	\$1,822	\$3,438
Current Liability		
to Net Worth	0	20%
Current Liability		
to Inventory	N/A	240%
Total Liability		
to Net Worth	2%	34%
Fixed Assets		
to Net Worth	3%	57%

Operating Performance (Fiscal year ending 12/31)

Net Profit after Taxes	(\$ 103)	(\$3,454)
Total Employees	N/A	34

N/A = Not Available

Source: Dun & Bradstreet

Focus Semiconductor Systems

THE COMPANY

Background

Focus Semiconductor Systems, Inc., founded in 1984, manufactures low-pressure chemical vapor deposition (LPCVD) systems for the semiconductor production equipment industry.

Products and Operations

Focus is targeting high-throughput, multilevel, submicron-geometry LPCVD processing for the new generation of ULSI (ultralarge-scale integrated circuits). Focus' LPCVD system, the F1000, employs a new, single-wafer chamber technology, which combined with patented heating methods, is expected to provide film uniformity of ± 2 percent, low defect density, excellent step coverage, and throughput of 70 wafers per hour. It employs a high degree of automation that allows simultaneous deposition in multiple chambers capable of handling wafers up to 8 inches in diameter.

The F1000 is designed with interchangeable, process-specific reactor modules, enabling the system to produce the entire range of CVD films from low temperature oxides to silicon epitaxy. The F1000's selling price is approximately \$400,000.

As of April 1987, the Company had shipped beta site units, and it expects to begin volume production later this year. It has added 20,000 square feet of manufacturing capacity that is scheduled to come on-line in 1987, bringing its total capacity to 40,000 square feet.

Strategy and International Competitiveness

The Company is building an international organization and directing efforts toward cooperation with its customers in process development and customization.

It has established a wholly owned subsidiary in Japan, Focus Japan, KKK, that comprises a marketing office, a technology center, and an applications engineering group.

The Company is also launching European operations with the formation of a Netherlands-based subsidiary, to be called Focus Europe B.V. In January 1987, Focus announced that it had received \$5 million in funding from MIP Equity Fund, a Dutch venture capital firm. This gave MIP approximately a 13 percent interest in Focus, and will enable Focus to establish its European operations. This recent round of financing brings the Company's total capitalization to \$17.2 million since its founding in 1984.

Focus Semiconductor Systems

Research and Development

Focus Semiconductor's Sunnyvale, California, facility is equipped with a Class 10 clean room. The Company offers customers deposition and evaluation before system purchase.

Focus Europe will establish a laboratory for development of advanced thin-film deposition methods that are of specific interest to the European market. Focus Japan also offers process development and applications engineering support for Far Eastern customers.

Company Management

Dr. Imad Mahawili is President of Focus. His background includes 15 years of working in chemical reactor technology. His experience in reactor design, transport processes, and fluid dynamics are fundamental to the design of the next generation of CVD products.

Richard Tetschlag is Vice President of Marketing and Sales. He brings to Focus a combination of marketing, quality control, technical, and general management skills and an orientation toward customer service and quality. He has more than 15 years of management experience in related semiconductor markets.

James Hansell is Vice President of Operations. His background includes 20 years of acquiring industry knowledge and operations skills as president of a public company, as well as material management and financial management responsibilities in the semiconductor equipment area.

Eaton Corporation

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Eaton Corporation

Eaton Corporation
Eaton Center
Cleveland, Ohio 44114
Telephone: (216) 523-5000
(Millions of Dollars, Except Per Share Data)

Balance Sheet (Calendar Year Ending December 31)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Total Assets	\$2,030	\$2,279	\$2,612	\$2,814	\$3,025
Total Current Assets	\$ 970	\$1,339	\$1,685	\$1,843	\$1,677
Total Liabilities	\$1,228	\$1,292	\$1,410	\$1,419	\$1,770
Total Current Liabilities	\$ 575	\$ 596	\$ 630	\$ 572	\$ 646
Shareholders Equity	\$ 803	\$ 987	\$1,202	\$1,395	\$1,256

Income Statement

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Net Sales	\$2,453	\$2,674	\$3,510	\$3,675	\$3,812
COGS	\$1,870	\$1,986	\$2,517	\$2,703	\$2,871
Selling and Administrative	\$ 408	\$ 420	\$ 475	\$ 482	\$ 498
R&D	\$ 100	\$ 94	\$ 113	\$ 124	\$ 134
Special Expenses	0	0	0	0	\$ 75
Income from Operations	\$ 74	\$ 174	\$ 406	\$ 366	\$ 235
Other Income Expenses	(\$ 213)	(\$ 85)	\$ 11	\$ 42	(\$ 29)
EBIT	(\$ 213)	\$ 116	\$ 411	\$ 387	\$ 220
Income Taxes	(\$ 52)	\$ 23	\$ 157	\$ 156	\$ 83
Net Income	(\$ 190)	\$ 93	\$ 254	\$ 231	\$ 138
EPS	(\$ 6.74)	\$ 2.95	\$ 7.50	\$ 6.72	\$ 4.17
DPS	\$ 1.72	\$ 0.80	\$ 1.10	\$ 1.35	\$ 1.60
Shares Outstanding (Thousands)	28,263	31,723	34,371	34,869	33,797
Ratios					
Profit Margin (%)	(0.08)	0.03	0.07	0.06	0.04
Return on Equity (%)	(0.25)	0.10	0.22	0.17	0.11
Return on Assets (%)	(0.09)	0.04	0.10	0.08	0.05
Gross Margin (%)	0.24	0.26	0.28	0.26	0.25

Source: Eaton Corporation
Annual Reports
Dataquest
July 1987

Eaton Corporation

THE COMPANY

Background

Eaton Corporation, which was incorporated in 1916, manufactures more than 5,000 products and employs more than 43,000 people worldwide. Its products serve the following markets:

- Truck powertrain components
- Automotive components
- Controls and electrical equipment
- Defense systems
- Semiconductor capital equipment

The Company divides its business into two segments:

- Electronic and electrical
- Vehicle components

In 1986, Eaton decided to concentrate its resources on its core businesses and to exit those businesses that have been unprofitable or have lacked strategic links to its core businesses. The Company has identified its control operations as the foundation on which it wishes to build. In addition to the controls business, Eaton believes that its automotive and truck powertrain businesses will continue to be strong markets.

Eaton's decision to exit unprofitable businesses or strategically marginal businesses caused it to discontinue its stepper operations and test operations in 1986. The Company no longer manufactures or markets the Waferspec product line, although it does maintain support for this product.

The Company continues, however, to reaffirm its commitment to the ion implant, automatic photoresist, rapid optical annealer, and thin-film products. Semiconductor equipment is manufactured and marketed by the Semiconductor Equipment Division (SED).

Operations

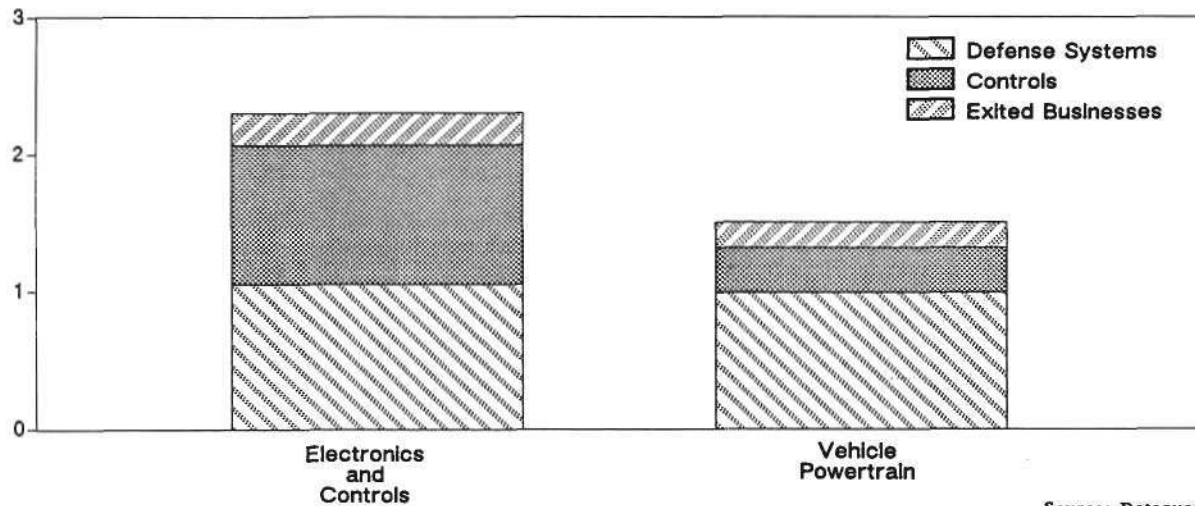
Total sales for Eaton Corporation were \$3,812 million in 1986, 4 percent higher than in 1985. Electronics and controls accounted for 60 percent of these sales, or \$2,308 million (See Figure 1). Vehicle powertrains, however, accounted for a much larger share of operating profits (See Figure 2).

Eaton Corporation

Figure 1

NET SALES BY MAJOR PRODUCT CATEGORY

Millions of Dollars

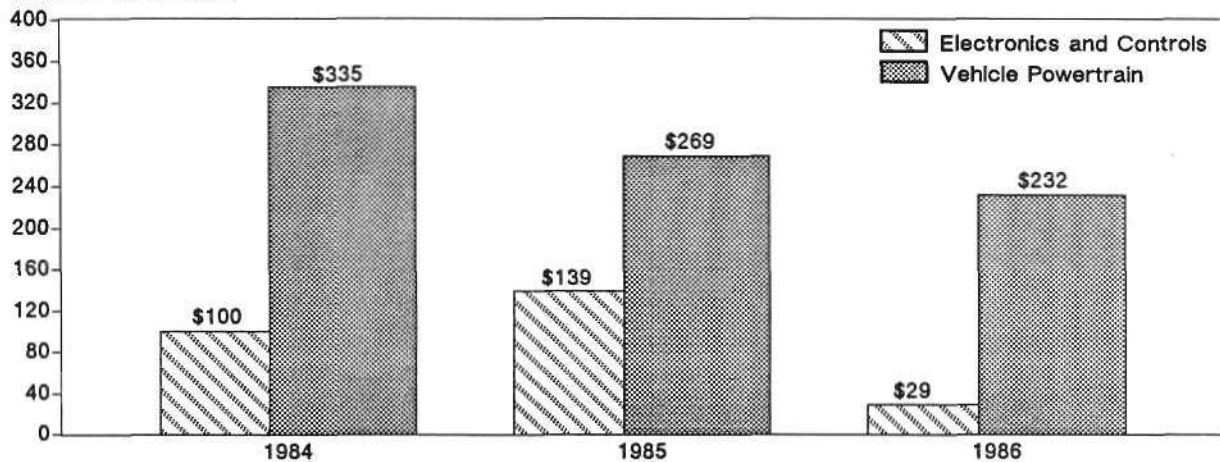


Source: Dataquest
July 1987

Figure 2

OPERATING PROFIT

Millions of Dollars



Source: Dataquest
July 1987

Eaton Corporation

Gross margin for the Company was 25 percent of sales in 1986, compared with 26 percent in 1985. The Company attributes this decrease to a general change in sales mix between business segments and to operating losses in its semiconductor businesses.

As a result of the Company's decision to discontinue production of wafer steppers, in-process testers, automatic test equipment, and microwave instrumentation, the Company took a write-down of \$74.7 million in 1986.

Table 1 lists SED's major manufacturing locations.

Table 1

SED MANUFACTURING LOCATIONS

<u>Location</u>	<u>Products</u>
Beverly, Massachusetts	High-current implanters High-voltage implanters
Austin, Texas	Medium-current implanters
Danders, Massachusetts	Thin film
San Jose, California	Track equipment
Japan	High-Current Implanters

Source: Dataquest
July, 1987

Strategy and International Competitiveness

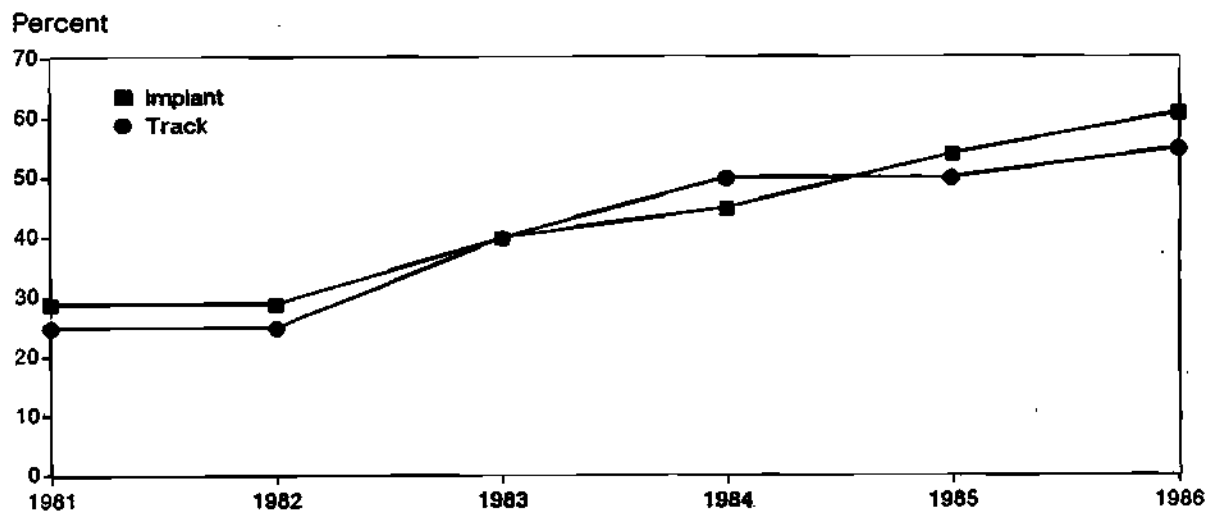
More than 50 percent of the SED's sales were outside the United States. Figure 3 shows the international sales as a percentage of the total for implant and track equipment, Eaton's two major semiconductor equipment product lines.

Track equipment sales by region are shown in Table 2. Eaton has yet to establish a market in Japan. European sales, on the other hand, were 51 percent of total track sales in 1986.

Eaton Corporation

Figure 3

INTERNATIONAL SALES AS PERCENT OF TOTAL TRACK AND IMPLANT EQUIPMENT



Source: Dataquest
July 1987

Table 2

REGIONAL SHARE OF EATON'S TRACK EQUIPMENT SALES (Millions of Dollars)

	1980	1981	1982	1983	1984	1985	1986
United States	\$18.0	\$13.5	\$ 9.0	\$ 6.0	\$ 7.2	\$ 6.0	\$ 5.4
Europe	6.0	4.5	3.0	4.0	6.1	5.0	6.1
ROW	0	0	0	0	1.2	1.0	0.5
Total Sales	\$24.0	\$18.0	\$12.0	\$10.0	\$14.5	\$12.0	\$12.0

(Percent)

United States	75%	75%	75%	60%	50%	50%	45%
Europe	25%	25%	25%	40%	42%	42%	51%
ROW	0	0	0	0	8%	8%	4%
International	25%	25%	25%	40%	50%	50%	55%

Source: Dataquest
July 1987

Eaton Corporation

Implant equipment sales by region are shown in Table 3. European sales of implanters almost equaled sales into the U.S. market in 1986. ROW has become an important market for Eaton's implanters, accounting for 12 percent and 17 percent of total implant sales in 1985 and 1986, respectively. In Japan, Eaton's total implant sales fell rather sharply in 1986, from 23 percent of total sales in 1985 to 12 percent in 1986. This decline is partly due to the severe recession in semiconductor equipment in Japan and partly to an increase of share by Japanese companies in their home market. Nissan, Hitachi, Tel/Varian, and Ulvac have all experienced large gains in market share recently.

Table 3

REGIONAL SHARE OF EATON'S IMPLANT EQUIPMENT SALES (Millions of Dollars)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
United States	\$15.0	\$26.0	\$38.0	\$ 63.0	\$ 50.0	\$ 17.0
Japan	5.3	7.7	17.6	33.3	24.9	5.4
Europe	1.7	3.3	7.0	14.6	22.1	15.3
ROW	0	0	1.0	3.2	12.9	7.8
Total Sales	\$22.0	\$37.0	\$64.0	\$114.0	\$110.0	\$ 46.0

(Percent)

United States	68%	70%	60%	55%	45%	38%
Japan	24%	21%	28%	29%	23%	12%
Europe	8%	9%	11%	13%	20%	33%
ROW	0	0	2%	3%	12%	17%
International	32%	30%	41%	45%	55%	62%

Source: Dataquest
July 1987

Eaton has a joint manufacturing and marketing venture in Japan with Sumitomo Heavy Industries for Eaton's high-current implanters.

SED is now building a service support organization in Korea and Taiwan. Worldwide, Eaton employs 150 to 200 people in its service organization.

International sales account for more than 50 percent of Eaton's rapid optical annealing (ROA) sales, as shown in Table 4.

Eaton Corporation

Table 4

RAPID OPTICAL ANNEALING PRODUCT SALES (Thousands of Dollars)

	<u>1986</u>	<u>1985</u>	<u>1984</u>
North America	\$200	\$ 700	\$ 700
Japan	200	0	0
Europe	300	500	800
ROW	<u>0</u>	<u>200</u>	<u>0</u>
Total	\$700	\$1,400	\$1,500

Source: Dataquest
July 1987

Semiconductor Equipment Division

Eaton's SED executive management team consists of:

- Peter Rose, General Manager, (and one of the founders of Eaton's implanter business), has been with the Company since 1978.
- Geoffry Ryding, Vice President of Marketing (also one of the founders of Eaton's implanter business), has been with the company since 1978.
- Peter Young, Operations Manager, has been with SED since 1982.
- David Schmitz, Controller, has been with SED since 1983.
- Patrick Collins is Human Resources Manager.

Research and Development

Automation, particulate control, and equipment reliability are the main targets of SED's research and development. Dataquest estimates that the SED spent 20 percent (\$12 million to \$15 million) of its 1986 revenue on research and development.

Eaton Corporation

Eaton had scheduled introduction of a sputtering system for spring 1986. In March, however, the Company announced that it was postponing its introduction due to weak demand in the sputtering market and due to weak sales in its implanter product line.

Eaton remains committed to the product it is designing for the production of 4Mb devices.

PRODUCTS

Eaton's market share for rapid optical annealers is shown in Table 5.

Table 5

EATON ROA SHARE

	<u>1986</u>	<u>1985</u>	<u>1984</u>
Eaton	\$ 700	\$ 1,400	\$ 1,500
Total ROA Market	\$16,000	\$14,500	\$10,200
Eaton Share	4%	10%	15%

Source: Dataquest
July 1987

Eaton introduced the ROA-500 at Semicon/West in May 1987. The ROA-500 has a footprint that is almost one-half the size of an earlier model, the ROA-400. The price of the ROA-500 is \$240,000. First deliveries are expected to begin at the end of 1987.

Eaton's track product offerings are shown in Table 6.

Eaton Corporation

Table 6

AUTOMATIC PHOTORESIST PRODUCTS

6000XL Series

<u>Model</u>	<u>Type</u>	<u>Features</u>
System 6000XL	Bake	Hot/cool or hot/ hot 3"-6" wafers, cassette-cassette
	Coater	Coat and spray prime 3"-6" wafers, cassette- cassette
	Develop	Negative and positive, 3"-6" wafers, cassette- cassette
	Scrubber	Brush or high-pressure 3"-6" wafers, cassette- cassette
	Spin-on-Glass	Variable temperature, teflon tub bowl, 3"-6" wafers, cassette- cassette

Note: Eaton also makes a 6000 series of track equipment that is quite similar to the XL Series. The major differences are that the XL has optical sensors and has oven exhaust.

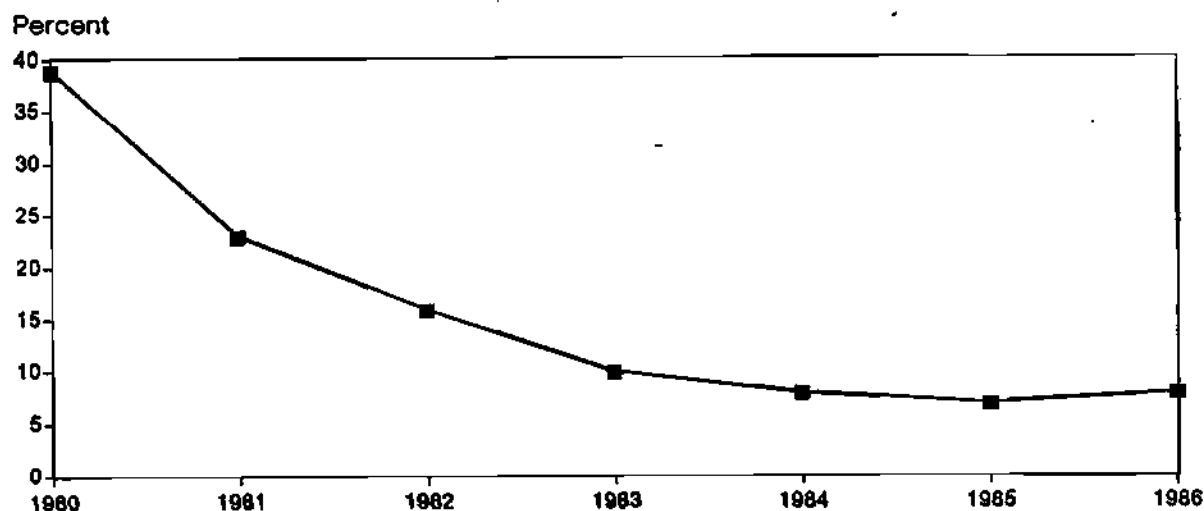
Source: Dataquest
July 1987

Eaton's market share for automatic photoresist processing equipment (track) has declined from 39 percent in 1980 to 7 percent in 1985. However, in 1986, Eaton's share of the track market increased to 8 percent (see Figure 4). The Company was able to increase share by keeping its sales constant while the total track market declined in 1986. The Company's goal is to regain its lead in the track equipment market.

Eaton Corporation

Figure 4

TRACK EQUIPMENT MARKET SHARE



Source: Dataquest
July 1987

Eaton's track product offerings are shown in Table 7.

Table 7

IMPLANTER PRODUCT OFFERINGS

Type	Model	Introductory Date	KeV	(microamps) Beam Current	ASP	Wafer Size
MC	NV-6208	1986	200	3,000	\$ 890	4"-8"
MC	NV-6200	1984	200	3,000	\$ 685	3"-6"
MC	GA-4204	1985	200	3,000	\$ 555	2"-4" GaAs wafers
MC	NV-4206	1985	200	3,000	\$ 555	3"-6"
MC	NV-3200	1980	200	3,000	\$ 450	2"-4"
HC	NV-10-80	1979	80	12,500	\$ 825	3"-6"
HC	NV-10-160	1982	160	10,000	\$1,100	3"-6"
HC	NV-20-200	1985	200	20,000	\$1,400	4"-8"
OXYGEN	NV-200	1985	200	8,500	\$2,400	3"-6"
HV	NV-1000	1986	1,500	1,000	\$2,500	4"-8"

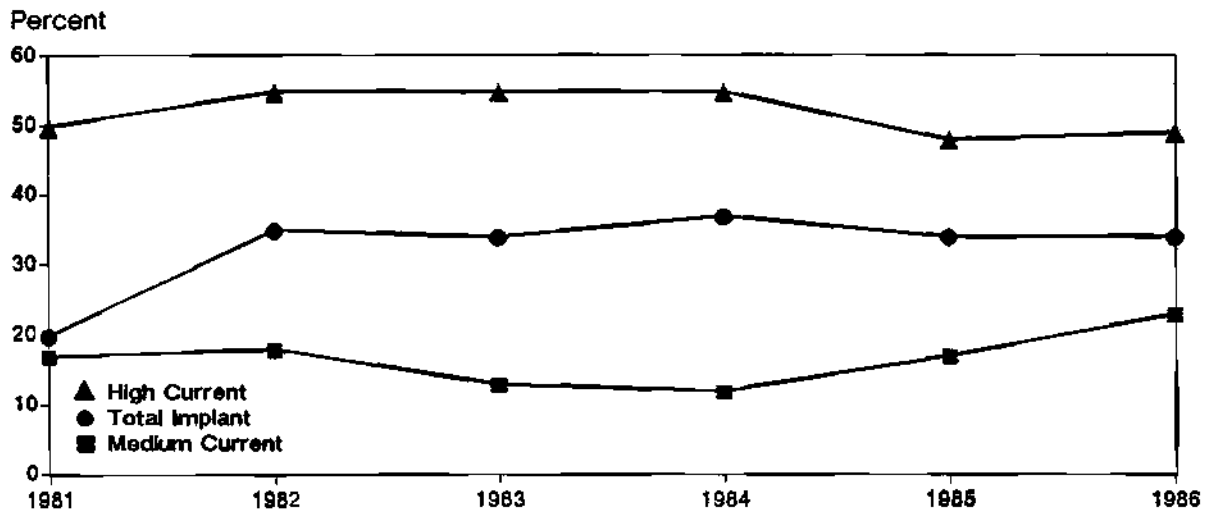
Source: Dataquest
July 1987

Eaton Corporation

Eaton's share of the implanter market is shown in Figure 5. Eaton gained substantial share in 1982. Since then, however, Eaton's share has fluctuated around the 35 percent level. Eaton has had a dominant position in the high-current market with a share of 55 percent until 1985, when its share fell rather sharply to 48 percent. Coincident with this drop in high-current share was a rise in medium-current share from 12 percent to 17 percent in 1985. Eaton's share of the medium-current market rose substantially again in 1986 to 23 percent.

Figure 5

IMPLANTER EQUIPMENT MARKET SHARE



Source: Dataquest
July 1987

Solitec, Inc.

Solitec, Inc., and Subsidiary Companies
1715 Wyatt Drive
Santa Clara, California 95054
Telephone: (408) 980-1355 Telex: 371-7520
(Thousands of Dollars except Per Share Data)

Balance Sheet (September 30)

	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>Q1 87</u>	<u>Q2 87</u>
Current Assets:					
Cash and Cash Equivalents	N/A	\$1,799	\$ 463	\$ 470	\$ 404
Restricted Cash Collateral- ized for Certain					
Short-Term Indebtedness	N/A	0	\$ 2,500	\$ 2,500	\$ 2,147
Accounts Receivable (Net of Allowance for Doubtful Accounts of \$218 in 1986 and \$57 in 1985)	N/A	\$1,212	\$ 2,780	\$ 3,571	\$ 2,165
Refundable Income Taxes	N/A	\$ 203	\$ 576	\$ 786	\$ 141
Inventories	N/A	\$1,216	\$ 2,467	\$ 1,992	\$ 1,930
Prepaid Expenses	N/A	\$ 54	\$ 32	\$ 18	\$ 19
Total Current Assets	N/A	\$4,484	\$ 8,818	\$ 9,337	\$ 6,806
Property and Equipment, Net	N/A	\$ 564	\$ 1,505	\$ 1,294	\$ 1,113
Investment in Affiliate	N/A	\$ 10	\$ 574	\$ 601	\$ 319
Cost in Excess of Net Assets of Acquired Businesses, Net	N/A	\$2,498	\$ 3,075	\$ 3,151	\$ 3,131
Other Assets, Principally Intangible Assets	N/A	\$1,082	\$ 165	\$ 156	\$ 363
	N/A	\$8,638	\$14,137	\$14,539	\$11,732
Liabilities and Shareholders' Equity					
Current Liabilities:					
Notes Payable	N/A	N/A	N/A	\$ 3,658	N/A
Banks	N/A	N/A	\$ 2,875	N/A	\$ 2,848
Other	N/A	0	\$ 356	N/A	N/A
Accounts Payable	N/A	\$ 211	\$ 2,041	\$ 1,506	\$ 1,183
Accrued Liabilities	N/A	\$ 567	\$ 1,517	\$ 1,435	\$ 949
Contract Advance Payment	N/A	\$ 0	\$ 2,721	\$ 2,792	\$ 2,147
Income Taxes Payable	N/A	N/A	N/A	\$ 328	\$ 224
Long-Term Debt Due within One Year	N/A	\$ 147	\$ 644	\$ 613	\$ 892
Total Current Liabilities	N/A	\$ 925	\$10,154	\$10,332	\$ 8,243
Long-Term Debt Due after One Year	N/A	\$1,889	\$ 3,768	\$ 3,826	\$3,314
Deferred Income Taxes	N/A	N/A	N/A	N/A	\$ 298

(Continued)

Solitec, Inc.

Solitec, Inc., and Subsidiary Companies
 1715 Wyatt Drive
 Santa Clara, California 95054
 Telephone: (408) 980-1355 Telex: 371-7520
 (Thousands of Dollars except Per Share Data)
 (Continued)

Balance Sheet (September 30)

	1984	1985	1986	Q1 87	Q2 87
Shareholders' Equity					
Common Stock	N/A	\$4,021	\$ 4,897	\$ 5,397	\$ 5,397
Notes Receivable from Officer	N/A	N/A	N/A	(\$ 500)	(\$ 500)
Retained Earnings (Deficit)	N/A	\$1,803	(\$ 4,682)	(\$ 4,516)	(\$ 4,500)
Total Shareholders' Equity	N/A	\$5,824	\$ 215	\$ 381	\$ 397
Total Liabilities and Shareholders' Equity	N/A	\$8,638	\$14,137	\$14,539	\$12,252
Working Capital	N/A	\$3,559	(\$ 1,336)	(\$ 995)	(\$ 1,437)
After-Tax Return on Average Equity (%)	N/A	4	(3,016)	N/A	N/A

Operating Performance (Fiscal Year Ending September 30)

Revenue	\$4,202	\$7,457	\$13,237	\$ 4,540	\$ 2,283
Cost of Revenue	\$1,338	\$3,600	\$ 9,079	\$ 2,651	\$ 1,499
R&D Expense	\$ 408	\$ 880	\$ 1,542	\$ 235	\$ 113
G&A Expense	\$ 976	\$2,403	\$ 5,078	\$ 1,347	\$ 864
Other Expense (Income)	(\$ 188)	\$ 31	(\$ 192)	\$ 20	(\$ 35)
Writeoff of Intangible Assets	N/A	N/A	\$ 5,005	N/A	N/A
Pretax Income	\$1,668	\$ 543	(\$ 7,275)	\$ 287	(\$ 158)
Gross Margin (%)	68	52	31	42	34
Pretax Margin (%)	40	7	(55)	6	(7)
R&D/Revenue (%)	10	12	12	5	5
Income Taxes (Credits)	\$ 796	\$ 289	(\$ 790)	\$ 168	(\$ 46)
Net Income before Extraordinary Items	\$ 872	\$ 254	(\$ 6,485)	\$ 119	(\$ 112)
Income Tax Reduction from Utilization of Loss Carry Forwards	N/A	N/A	N/A	(\$ 47)	\$ 51
Gain on Debt Restructuring					\$ 77
Net Income (Loss)	\$ 872	\$ 254	(\$ 6,485)	\$ 72	\$ 16
Common Shares Outstanding Per Share	1,957	2,309	2,680	3,004	3,177
Earnings	\$ 0.45	\$ 0.11	(\$ 2.42)	\$ 0.04	(\$ 0.04)
Book Value	N/A	\$ 2.52	\$ 0.08	\$ 0.13	\$ 0.12

N/A = Not Available

Source: Solitec Annual Report
 and Forms 10-Q
 Dataquest
 June 1987

Solitec, Inc.

THE COMPANY

Background

Solitec, Inc., (formerly Reid-Ashman, Inc.) was formed in January 1980. The Company's initial products were proprietary accessories to assist in the testing of semiconductor IC testers. Solitec completed its initial public offering in January 1984. In 1985, the Company began an aggressive diversification program and has since divested itself of its original tester accessory business. In December 1985, Prudential Bache funded Solitec with \$5.3 million for R&D.

Solitec does business under four names in four separate semiconductor markets, as shown in Table 1.

Table 1

SOLITEC'S PRODUCT LINES

<u>Brand Name</u>	<u>Markets</u>
Advanced Crystal Sciences	CVD, diffusion furnaces
Hybrid Technology Group (HTG)	Mask aligners, DUV exposures equipment
Solitec	Track equipment
Advent Systems	Quartz cleaning equipment

Source: Solitec Company Literature
Dataquest
June 1987

Solitec owns about 35 percent of DSP Technology, Inc., of Fremont, California. DSP is a electronic instrumentation manufacturer with revenue of about \$5.5 million. (This revenue is not included in the Solitec financial statement.) DSP also markets burn-in systems for the semiconductor industry under the brand name Life Test Systems.

Solitec also owns approximately 86 percent of Laser Dynamics, Inc. Laser Dynamics is seeking to develop a new family of data storage products that, through proprietary techniques, will allow mass storage peripherals to operate at substantially greater speeds.

Solitec, Inc.

A history of the Company's acquisitions is shown in Table 2.

Table 2

SOLITEC'S ACQUISITIONS

<u>Date</u>	<u>Company Acquired</u>
January 1985	Solitec, Inc.
October 1985	Rome-Union Corp. Paolo S. DiCicco, Inc. dba Advent Systems
March 28, 1986	Hybrid Technology Group, Inc.
April 28, 1986	Advanced Crystal Sciences, Inc.

Source: Reid-Ashman, Inc., Forms 10-K

Operations

Due to significant losses in 1986 and to market uncertainties, Solitec elected to write off a significant amount of the good will that accompanied its 1985 and 1986 acquisitions. A loss of \$6.5 million after provision for an income tax credit of \$790,000 was recorded for 1986, \$5.0 million of which was the result of its write-off of intangible assets, including good will. During 1986, the Company believes that it made significant progress in consolidating the operations of the acquired companies, even though losses were still reported in each quarter of fiscal 1986. The Company reports, however, that it was able to lower its break-even point to \$4.2 million per quarter.

In 1985 and 1986, net sales increased 77 percent and 78 percent, respectively. The Company reports that these increases were due entirely to the inclusion of sales from the companies it acquired during those years.

Cost of sales in 1986 increased to 69 percent of net sales, from 48 percent in 1985 and 32 percent in 1984. The increased cost of sales, the Company believes, was a result of sharply lower sales without a corresponding reduction in fixed cost of the acquired companies, a shift in the sales mix to lower-margin products, and higher sales discounts.

Solitec, Inc.

Marketing, general, and administrative expenses increased from 23 percent of net sales in 1984 to 32 percent in 1985 and 38 percent in 1986. The Company attributes this rise in expenses to sales decline and constant fixed-overhead expenses.

In 1986, Solitec received a qualified auditor's opinion stating, among other things, that "the Company's continuation as a going concern is dependent upon achieving and maintaining profitable results of operations and maintaining adequate sources of financing." The Company points out the opinion says "maintain" adequate financing, not "obtain" adequate financing.

The Company reports that it achieved a profit in Q1 and Q2, ending in December 1986 and March 1987.

Strategy

Solitec's corporate objective is to supply process, not equipment; the Company believes that equipment is only a means to deliver the process. Solitec has identified photolithography and CVD as its two main areas of process strength.

Its goal in photolithography processing is to have the most advanced track systems in the market. Solitec's strategy for its aligners, formerly manufactured under the HTG name, is to target the low end of the market. Its target markets for aligners are university R&D centers, Korea, and the People's Republic of China.

In CVD, its strategy is to extend the life of the horizontal tube by delivering uniformities of plus or minus 3 percent from run to run.

Solitec's ultimate goal is to merge track and CVD technology.

Solitec, Inc.

R&D

Solitec-sponsored R&D expenses are shown in Table 3.

Table 3

R&D EXPENSES
(Thousands of Dollars)

<u>Year</u>	<u>Amount</u>	<u>Percent of Sales</u>
1984	\$ 408	10%
1985	\$ 880	12%
1986	\$1,542	12%

Source: Solitec, Forms 10-K

In December 1985, Solitec entered into an agreement with PruTech under which the Company is developing new semiconductor products in the areas of photolithography and CVD equipment. Under the contract, Solitec will receive \$5.3 million.

In addition to providing the most advanced photolithographic track systems on the market with these R&D funds, Solitec hopes to extend the life of the horizontal diffusion/deposition tube and ultimately, Solitec wants to merge track and CVD technology.

Solitec is looking forward to meaningful results in 1987 from its product development efforts at its Laser Dynamics subsidiary.

Solitec, Inc.

PRODUCTS

Table 4 lists the products that Solitec currently markets.

Table 4

LIST OF PRODUCTS

<u>Product Type</u>	<u>Name</u>	<u>Description</u>	<u>Year Introduced</u>
Track	820	Coat/bake with Auto-Coat	1987
	820	Develop/bake with Optimist (positive resist)	1987
	820	Negative developer	1983
	820	Positive developer (pressurized)	1984
	820	Scrubber	1984
	820	Hot plate bake	1986
	840	Vapor prime/coat/bake	1984
	840	Post exposure bake/develop	1986
Manual Spinners	5000 Series	Coat, develop (positive & negative, scrub, jet clean)	1970s
	3000 Series	E-Beam mask developer	1980
	7000 Series	Large substrate coat, develop, scrub, jet clean	1984
Contact/ Proximity Aligners	3A	Mask aligner (hybrids)	1980-1985
	3HR	Mask aligner (high resolution)	1980-1985
	3HRIR	Infalign (IR high resolution)	1980-1985
UV/DUV Exposure Systems	System 5	Flood exposure systems	1984
	Series	crosslink 5000 stabilization UV/DUV light sources	1985

Source: Solitec Product Literature

Solitec, Inc.

Regional Sales History

Solitec's sales by region are given in Table 5.

Table 5

REGIONAL SALES FOR CVD AND TRACK EQUIPMENT (Millions of Dollars)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
North America	\$1.5	\$6.8	\$10.6	\$13.5	\$15.7	\$10.6
Europe	0	0.5	0.6	0.8	1.5	0.8
ROW	<u>0</u>	<u>0.1</u>	<u>0.2</u>	<u>0.2</u>	<u>0.7</u>	<u>0.7</u>
Total	\$1.5	\$7.4	\$11.4	\$14.5	\$17.9	\$12.1

Source: Dataquest
June 1987

Sales History by Product

Solitec's sales by product line are given in Table 6.

Table 6

SALES BY PRODUCT LINE--TRACK, CVD, AND DIFFUSION (Millions of Dollars)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Track	\$1.5	\$1.5	\$ 2.7	\$ 4.5	\$ 5.0	\$ 6.5
CVD	0	5.5	8.1	9.4	12.9	5.3
Diffusion	<u>0</u>	<u>0.4</u>	<u>0.6</u>	<u>0.6</u>	<u>0</u>	<u>0.3</u>
Total	\$1.5	\$7.4	\$11.4	\$14.5	\$17.9	\$12.1

Source: Dataquest
June 1987

Solitec, Inc.

EXECUTIVE MANAGEMENT

Solitec's chairman, director, and president is Joseph J. McDowell. Mr. McDowell is one of the founders of Monolithic Memories. He was formerly chairman, president, chief executive officer, and chief financial officer of E-H International, a manufacturer of automated test equipment; and general manager of the Microprocessor and Memory Division of American Microsystems, Inc. Mr. McDowell has been with Solitec since 1983.

J. Scott Kamsler is Solitec's vice president and chief financial officer. He was formerly vice president and chief financial officer of E-H International. Prior to that, Mr. Kamsler held various financial positions at Intel Corporation. Mr. Kamsler has been with Solitec since 1984.

Victor Monia is a director at Solitec. He is also a cofounder and vice president of Visa Technologies, Inc., a company that develops and markets polyethylene-coated packaging materials. Mr. Monia has been with Solitec since 1983.

John Sullivan, a director at Solitec, was previously vice president of finance at Interdyne Company, a manufacturer of electromechanical magnetic tape products. Prior to Interdyne, he served as vice president of finance at Standard Engineering Corporation. Mr. Sullivan has been with Solitec since 1983.

December 18, 1985

SEMICONDUCTOR EQUIPMENT AND MATERIALS SERVICE

ERRATA

Dear Client:

In our 21 November issue of the Union Carbide service section, SEMS Industry Econometrics, page 10, our estimate of 1985 bulk gas sales was reported to be \$40 million rather than \$37 million due to an inadvertent error. Please substitute the enclosed page 9 and revised page 10 for the original pages 9 and 10, which should now be discarded.

We apologize for any confusion this may have caused.

Sincerely,

George Burns
Research Analyst

Union Carbide Corporation

Union Carbide Corporation
Old Ridgebury Road
Danbury, CT 06617
Telephone: (203) 794-2000 Telex: 126-019
(Millions of Dollars Except Per Share Data)

Balance Sheet as of December 31, 1986

	<u>1984</u>	<u>1985*</u>	<u>1986</u>
Current Assets	\$3,306	\$4,426	\$2,414
Current Liabilities	\$1,758	\$2,382	\$1,881
Current Ratio	1.88	1.86	1.28
Working Capital	\$1,548	\$2,044	\$ 533
Long-Term Debt	\$2,362	\$1,713	\$3,057
Debt/Equity	48%	43%	304%
Shareholder's Equity	\$4,924	\$4,019	\$1,005
After-Tax Return On Average Equity (%)	6.92%	(13.40%)	27.83%
Capital Expenditures*	\$ 502	\$ 501	\$ 524

Operating Performance (Fiscal Year Ending December 31, 1986)

	<u>1984</u>	<u>1985*</u>	<u>1986</u>
Net Sales	\$6,808	\$6,390	\$6,343
Gross Margin	27%	28%	32%
Cost of Sales Exclusive of Depreciation	\$4,954	\$4,597	\$4,343
RD&E Expense	\$ 178	\$ 181	\$ 148
RDE/Revenue	3%	3%	2%
GA&S Expense	\$ 689	\$ 735	\$ 740
G&A/Revenue	10%	12%	12%
Other Expenses (Income)	(\$ 81)	\$ 176	(\$ 96)
Pretax Income	\$ 389	(\$ 906)	\$ 212
Pretax Margin (%)	6%	(14%)	3%
Effective Tax Rate (%)	12%	34%	(230%)
Income (Loss) before Extraordinary Items and Cumulative Effect of Change in Accounting Principle	\$ 341	(\$ 599)	\$ 699
Cumulative Effect of Change in Accounting Principle for Reversion of Surplus Pension Funds	N/A	N/A	\$ 270
Extraordinary Items**	(\$ 18)	\$ 18	(\$ 473)
Weighted Average Shares Outstanding (Thousands)***	211,436	209,632	103,777
Dividends Declared per Share***	\$ 1.13	\$ 1.13	\$ 1.50
Total Employees	55,180	52,117	50,292

N/A = Not Applicable

*Restated to account for discontinued operations and certain reclassifications to conform to 1986 presentation

**Extraordinary charge for accident at Bhopal, India

***Amounts for 1985 and 1984 are adjusted to reflect the 3 for 1 stock split effected as a 2 for 1 stock dividend in March 1986

Source: Union Carbide Corporation
Annual Reports and Forms 10K
Dataquest
June 1987

Union Carbide Corporation

(Material in this profile has been compiled from Union Carbide Corporation's 1986 annual report, reports in the business press, and Dataquest's data base. For further information on aspects of Union Carbide's semiconductor-related operations, clients are invited to use their inquiry privilege.)

THE COMPANY

Background

Union Carbide Corporation is a multinational company dealing in chemicals, industrial gases, petroleum, and related products and services. In 1986, the Company restructured its many areas of operations around four business groups--Chemicals and Plastics, Linde Industrial Gases, Carbon Products, and Specialties and Services. The businesses of the fourth group, Specialties and Services, are being incorporated into the other three major business groups during 1987. In addition to gases and related services, Union Carbide is a major supplier of polycrystalline silicon, and owns KTI Chemical, Inc., a photoresist company that also supplies pellicles to the semiconductor industry.

Executive Management

The executive management of Union Carbide is as follows:

- Robert Kennedy, chairman of the board, CEO
- Robert Krass, vice president and president of Carbon Products Group
- H. William Lichtenberger, vice president and president of Chemicals and Plastics Group
- Murdoch Rand, vice president, Purchasing
- John MacLean, vice president and president of Linde Industrial Gases Group
- John Powers, vice president
- Cornelius Smith, Jr., vice president, Community and Employee Health, Safety and Environmental Protection
- John Stichnoth, vice president and general counsel

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- J. Clayton Stephenson, vice chairman of the board, chief financial and administrative officer
- John Clerico, vice president and treasurer
- Louis Peloubet, vice president and controller
- O. Jules Romary, vice president and secretary
- Robert Welty, vice president, Human Resources
- Ronald Wishart, vice president, Public Affairs

Corporate Operations

During 1986, Union Carbide Corporation defeated a takeover attempt, commenced a recapitalization program to ease the Company's debt burden, and began implementing a broad restructuring program that includes several major divestments. The restructuring program simplifies and focuses the corporate structure.

Union Carbide recapitalized twice during 1986, the first time in January, when the Company took on substantial new debt to finance an exchange offer designed to turn back a takeover and break-up attempt. The second recapitalization took place in December of the same year, when the Company bought back most of that long-term, high-interest debt. The purchase was financed with proceeds from divestitures, lower-interest-rate debt, and a public offering of 30 million share common stock. Proceeds from divestitures and the common stock sale allowed Union Carbide to reduce its debt-to-capitalization ratio in 1986 from more than 78 percent at the end of the first quarter to 72 percent at the end of the year.

Sales in 1986 totaled \$6.34 billion, down 1 percent from 1985. Sales from domestic operations were down 3 percent. Domestic sales of chemicals and plastics were 3 percent lower, being adversely affected by a 5 percent reduction in average selling price (ASP). Domestic sales of carbon products declined 4 percent as a result of lower-volume production in the U.S. steel industry.

Union Carbide posted gains in operating performance in all business segments. Gross margin of \$2 billion was up 12 percent from 1985, and operating profit rose 31 percent to \$791 million from \$605 million in 1985 (after adjustment of the 1985 total for unusual charges). The 1985 operating results, including unusual charges, were a loss of \$253 million.

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Cost of sales in 1986 decreased 6.0 percent, while sales decreased only 1.0 percent, resulting in another increase in the gross margin ratio to the highest level in the past five years. The gross margin ratio of 31.5 percent marks an increase of 3.4 percent over 1985, and the fourth yearly increase in a row.

International Sales

Sales from international operations, translated into U.S. dollars, were up 5 percent in 1986, due mainly to the effect of the weaker U.S. dollar. As shown in Table 1, sales were up in all but one segment, with Europe showing the largest gains at an increase of 16 percent over 1986. Canadian sales declined 23 percent as a result of suspended polyethylene operations and the divestment of the welding and cutting systems business late in 1985.

Table 1

SALES BY GEOGRAPHIC SEGMENT* (Millions of Dollars)

<u>Segment</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Total International Operations	\$1,752	\$1,699	\$1,788
Canada	344	313	241
Europe	664	646	747
Latin America	456	476	519
Other	288	264	281
United States and Puerto Rico	<u>\$5,056</u>	<u>\$4,691</u>	<u>\$4,555</u>
Total UCC Consolidated	\$6,808	\$6,390	\$6,343
International Sales as Percentage of UCC Consolidated	26%	27%	28%

*Includes sales to discontinued businesses of \$99 million in 1986, \$192 million in 1985, and \$214 million in 1984.

Source: Union Carbide Corporation

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Union Carbide's international sales (excluding export sales of domestic operations) contributed to 28 percent of the Company's consolidated sales of 1986. This shows a steady rise from 26 percent of consolidated sales in 1984.

The Company saw an improvement in its foreign trade in 1986. Export sales of \$528 million, which are included in the domestic total, increased 8 percent. Export sales in 1985 had decreased 10 percent from 1984.

Research and Development

Research and development (R&D) spending of \$148 million in 1986 was down 18 percent from 1985 spending levels. In spite of the decline, selected strategic areas within specialty chemicals, polyolefins, and industrial gases received actual increases in R&D support. The R&D needs of the electronics business declined with the commercialization of the polysilicon R&D program. R&D funding is expected to increase in 1987, with the additional funds largely focused on new business opportunities. In 1985, R&D spending rose slightly, to \$181 million, from the 1984 figure of \$178 million, due especially to increased expenditures for industrial gases and sales support of technology and catalysts.

Semiconductor Products

Union Carbide supplies the semiconductor industry with polysilicon for production of silicon wafers. Polysilicon operations fall within the Chemicals and Plastics Business Group. Manufacturing is conducted at the Company's Moses Lake, Washington, plant, built in 1984. The plant was expanded and, as of 1986, had polysilicon capacity of 1,000 metric tons per year. The Moses Lake plant also produces silane, for which it has a manufacturing capacity of 3,000 metric tons per year. Polysilicon is also produced at the Company's Washougal, Washington plant. The Washougal plant is a self-contained operation and produces sufficient silane for production of 100 metric tons of polysilicon.

KTI Chemicals, Inc.

KTI Chemicals, Inc., a supplier of photoresist and other process materials to the semiconductor industry, was founded in 1972 and acquired by Union Carbide in 1977. KTI operates within the Chemicals and Plastics Business Group.

KTI claims to have originated prefiltered, prediluted (to a specified viscosity), prepackaged photoresist. KTI is a major supplier of customer-specific formulations of process materials from OEM suppliers such as AZ Photoresist and Shipley. Its products include positive and negative photoresists, developers, strippers, aluminum etches, oxide etches, boeffer

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oxide etches, chrome and passivation layer etches, and HMDS (an adhesion promoter). It markets optical, X-ray, electron beam, and deep UV photoresist, and PMMA (polymethylmethacrylate). KTI is also an agent distributor for polyimides manufactured by Toray in Japan. KTI supplies polyimide products used for dielectric isolation layers, overcoat for finished die, and alpha particle protection.

In May 1987, Union Carbide announced the purchase of Eastman Kodak's photoresist operations. The Kodak resist products will be customized, packaged, and distributed by KTI.

KTI operates four regional facilities in the United States. These are in Sunnyvale, California; Tempe, Arizona; Carrollton, Texas; and Wallingford, Connecticut. Each facility has its own manufacturing, sales, and customer service department. The Sunnyvale facility also houses company headquarters. In addition, KTI is planning a Korean facility.

One of KTI's major strategies is to maintain its customer base by providing in-depth supporting technical services. Its Technical Services Group works out of the regional offices to be close to the customers and is completely separate from the sales organization.

Linde Industrial Gases

Linde Industrial Gases is recognized as a world leader in the development of semiconductor process technology for applications requiring the use of bulk gases such as nitrogen, oxygen, argon, hydrogen, and helium, and a wide range of specialty gases and gas mixtures. Linde supplies five specialty gas categories to the semiconductor industry: silicon-precursors (silane, dichlorosilane, etc.), dopants (arsine, phosphine, etc.), plasma echants (tetrafluoromethane, etc.), reactant gases (ammonia, hydrogen chloride, etc.), and atmospheric/purge gases.

Linde focuses its operations on the electronic industry, in particular, the semiconductor industry, and is the second largest supplier of bulk and specialty gases to the U.S. semiconductor market. Linde operates production plants in 119 cities throughout North America for bulk gases; it has on-site separation plants at 19 customer locations and has announced plans to build 4 more. The new plants are being built for Sandia Labs, Albuquerque, New Mexico; Intel, Rio Rancho, New Mexico; Analog Device, Wilmington, Massachusetts; and Honeywell, Colorado Springs, Colorado.

Union Carbide is the only U.S. company with primary manufacturing capability for silane, dichlorosilane, trichlorosilane, and silicon tetrachloride. Linde claims to have the capacity to supply 85 percent of the semiconductor industry's demand for silane through the Union Carbide's Moses Lake, Washington, plant. As mentioned previously, the Moses Lake plant has an estimated yearly silane production capacity of 3,000 metric tons. Linde

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also produces silane at Union Carbide's Washougal, Washington, plant. All silane produced at Washougal is used for on-site polysilicon production. Linde's silane is made through a continuous process that was developed by Union Carbide under a contract with Jet Propulsion Laboratory and NASA.

The dichlorosilane plant, operated by the Silicones and Urethane Intermediates Division in Sisterville, West Virginia, is also the world's largest. With these plants in operation, Linde supplies more silane and dichlorosilane to the semiconductor industry worldwide than any other company. Linde Specialty Gases has an estimated total silane capacity of 3,200 metric tons per year.

The Linde Division brought a stainless steel nitrogen pipeline on line in San Jose, California, in May 1985. Ultra-high purity nitrogen flows from the manufacturing plant through the pipeline to semiconductor manufacturers situated along its three-mile length in the International Business Park. Both the plant, equipped with state-of-the-art distillation trays, submicron filters, and computer controls, and the stainless steel pipeline are designed to ensure Linde's customers a continuous supply of high-purity, low-particulate nitrogen to meet today's high fabrication standards. The pipeline will be expanded as demand in the area increases. This expansion will be made to serve the Crystal Lake and Century Research Parks and other areas to be developed in the East Bay corridor.

New product development is conducted at Linde's laboratories in Tarrytown and Tonawanda, New York, and in Keasbey, New Jersey. Expansion dedicated to electronics gases has been made at the Keasbey facility.

Linde has introduced a reactor analysis system designed to monitor gas purity inside process reactors. The system has proven effective for customers in the diagnosis and correction of process and atmosphere problems. In a joint development program conducted with a major semiconductor manufacturer, Linde's reactor analysis system was employed to test the effects of gas purity on device performance in a gate oxidation process. In another program, the system was used to help a manufacturer obtain an atmosphere conducive to annealing refractory metal silicides.

Union Carbide purchased Phoenix Research, a primary manufacturer of arsine, phosphine, and gaseous hydrogen chloride. Phoenix Research operates within the Linde Industrial Gases Business Group. Phoenix is one of only three companies that has primary arsine manufacturing capability; it is a supplier of dopants and high-purity hydrogen chloride to electronics manufacturers worldwide.

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OPERATIONS BY BUSINESS GROUP

The following section discusses Union Carbide's operations by business group. As part of the 1986 consolidation and restructuring effort, the Corporation sold businesses in the following areas: films-packaging; specialty polymers and composites; chromium, tungsten and vanadium metals; agriculture; battery products; and home and automotive products.

Linde Industrial Gases

Linde, founded in 1907, is a leader in sales of specialty gases to the semiconductor industry. As the Industrial Gases Group of Union Carbide, Linde's gas operation is one of the three largest worldwide, and the largest in North and South America.

The principal bulk gas products of this group are oxygen, nitrogen, hydrogen, and argon, which are separated and purified. Gases are sold from on-site plants and in distributable form. Demand is primarily from the chemicals, metal fabrication, food-freezing, medical, electronics, oil and gas, and steel industries. Acetylene, hydrogen, helium, and specialty gases are produced from the Company's own or purchased materials.

Segment sales in 1986, adjusted for the 1985 divestiture of the welding and cutting systems business, increased 4 percent over 1985 (see Table 2). Domestic sales were virtually steady, and international sales were higher because of the strength of demand in Latin America and Europe, and the favorable impact of the lower U.S. dollar.

Table 2

**SALES BY BUSINESS GROUP:
INDUSTRIAL GASES
(Millions of Dollars)**

	<u>1984</u>	<u>1985</u>	<u>1986</u>
Industrial Gases Sales	\$1,521	\$1,580	\$1,560
Percentage of UCC Consolidated	22%	25%	25%

Source: Union Carbide Corporation
Dataquest
June 1987

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Union Carbide has invested more than \$325 million in the United States to modernize and expand production facilities and improve its distribution network. During 1986, the Company announced plans to build new air separation plants for atmospheric gases in Camden, South Carolina, and Memphis, Tennessee. The Camden plant will produce 600 tons of nitrogen, oxygen, and argon per day. The Memphis plant capacity for the same gases is estimated to be 375 tons per day. Expansion projects were completed at the Wilmington, Massachusetts, and Pittsburg, California, plants. The plants will have an added capacity of 700 tons per day of nitrogen for the electronics industry. Ten smaller, self-contained, on-site nitrogen plants were contracted for or built during 1986. Six are for electronic industry customers, two for the metals industry, one for a chemicals manufacturer, and one in the glass industry.

Union Carbide has major gas operations in Europe. The Company does not use the Linde name for its European gas operations because the West German gas company, Linde AG, has rights to worldwide use of the Linde name outside North America.

In addition to its other international facilities, Union Carbide owns UCAR Specialty Gases N.V. (formerly Matheson), headquartered in Belgium. Union Carbide has a joint venture with Enichem, a sector of ENI, the Italian state energy group, to market, distribute, and produce industrial and specialty gases in Italy.

In the past two years, Union Carbide has launched a joint venture in Italy, invested in a major Japanese gas company, installed a new specialty gas facility in South Korea, and, through acquisition and expansion, has increased its specialty gas business in Europe.

Chemicals and Plastics

The Chemicals and Plastics segment businesses include a variety of basic petrochemicals and hundreds of specialty chemicals, many tailored to specific customer needs in markets ranging from automotive to personal care, and from paints and oil production to the electronics and semiconductor industries. In 1986, all divisions of Chemicals and Plastics were combined into one worldwide organization. About 30 percent of its sales are to customers located outside North America, operating in a wide variety of business areas.

The strategy for Chemicals and Plastics is to focus on products and market segments where the Corporation holds strong or leading market share. Key objectives are to protect existing market positions in basic chemicals, emphasize growth through development or acquisition of new products, and develop additional applications and markets for existing basic products.

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Union Carbide buys LPG and naphtha and makes ethylene and propylene. These, plus purchased materials, are used to make the following products for use by the Company and its customers: polyethylene for films, pipe, electrical insulation, wrap, bags and other products; ethylene oxide/glycol and derivatives for antifreeze, polyester fiber, petroleum processing, coatings, lubricants, cosmetics and other uses; and alcohols and oxo-alcohols for coating, preservatives, detergents, and cosmetics. The Company also makes and buys other materials to produce vinyl acetate, acrylates, and acetic esters for coatings, latexes, packaging, and other products. For resale, Union Carbide also purchases chemicals and polyethylene produced by others. Petrochemical products are sold directly and through distributors worldwide.

The following specialty chemicals are produced from manufactured or purchased chemicals: specialty glycol ethers, alkyl alkanolamines, acrolein, water-soluble polymers, Ucon fluids, polyvinyl acetate, and systems of these and other chemicals. They are used in the cosmetics, electronics, automotive, aerospace, oil and gas, and industrial lubricants industries. Silicones are used in the manufacture of lubricants, electronics, pharmaceuticals, glass fiber, and personal care products; urethane intermediates are used in automotive, furniture, and other products. Specialty chemicals are sold worldwide directly through specialized sales organizations and through distributors.

Polycrystalline silicon, crystal products, circuit substrates, laser rods, and proprietary processing chemicals and materials are sold to the electronics industry for use in computers, television receivers, communications systems, and automobiles.

In 1986, Chemicals and Plastics segment sales declined 2 percent from 1985 (see Table 3). Domestic sales were 3 percent lower, and international sales increased 4 percent. Average selling prices (ASPs) in the United States declined 5 percent as a result of decreases in virtually all major businesses. The price decline reflected lower hydrocarbon feedstock costs, which declined with oil prices.

Carbon Products

Union Carbide is the largest producer of carbon and graphite electrodes in the world. The Corporation has cut costs and capacity in response to reduced steel production in the United States and increased Japanese electrode imports. The Corporation's Carbon Products business is the most globally dispersed, having fully integrated production facilities in nine countries that produce products sold in most major worldwide markets.

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Table 3

**SALES BY BUSINESS GROUP:
CHEMICALS AND PLASTICS
(Millions of Dollars)**

	<u>1984</u>	<u>1985</u>	<u>1986</u>
Chemicals and Plastics Sales	\$3,821	\$3,507	\$3,441
Percentage of UCC Consolidated	56%	55%	54%

Source: Union Carbide Corporation

Union Carbide buys anthracite coal, premium-grade petroleum coke, coal-tar pitch, and petroleum pitch to make electrodes, refractory linings, metallurgical specialties, and other carbon and graphite forms. These are sold to the steel, ferroalloys, aluminum, chemicals, aerospace, and transportation industries.

Segment sales in 1986 were level with 1985 (see Table 4). A 4 percent decline in domestic operations due to reduced production levels in the U.S. steel industry was offset by an increase of 3 percent in international sales. Europe, where sales increased by 11 percent, comprised Union Carbide's largest sales area for electrodes.

The Company is continuing a program of facility rationalization. In 1986, Union Carbide closed the carbon and graphite operation at Niagara Falls, New York, and the graphite electrode plant at Trollhattan, Sweden. Also in 1986, the Company formed a new business development group in a joint development and sales program with Norton Company, using Union Carbide and Norton Technology. Nu-Block ceramic, a product for electric arc and blast furnaces in the steel industry, is being manufactured and sold. The Company has also developed and made available to the steel industry new water-cooled furnace components.

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Table 4

**SALES BY BUSINESS GROUP:
CARBON PRODUCTS
(Millions of Dollars)**

	<u>1984</u>	<u>1985</u>	<u>1986</u>
Carbon Products Sales	\$667	\$571	\$570
Percentage of UCC Consolidated	10%	9%	9%

Source: Union Carbide Corporation

Specialties and Services

The product and service operations of Specialties and Services include the technologies of catalysis, chemical vapor deposition, high-temperature processing, advanced materials systems, inorganic syntheses and processes, and solid-state physics. All these businesses, with the exception of the electronic components business, are being incorporated into other business groups during 1987. The electronic components business has been offered for sale.

The Company sells technology and engineering services, catalysts and adsorbents, specialized process equipment, and manufacturing and training services to the chemicals, plastics, petroleum, gas, and other process industries.

In 1986, Specialties and Services sales were up 5 percent over the previous year (see Table 5). The majority of the businesses in the segment recorded increases over the prior year as a result of increased demand, acquisitions, or continued development of new businesses. The polysilicon business supplied high-purity polycrystalline silicon, a key raw material for the silicon wafer industry.

Union Carbide closed four facilities in its electronic processing materials business in 1986 because of the downturn in the electronics industry.

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Table 5

**SALES BY BUSINESS GROUP:
SPECIALTIES AND SERVICES
(Millions of Dollars)**

	<u>1984</u>	<u>1985</u>	<u>1986</u>
Specialties and Services Sales	\$799	\$732	\$772
Percentage of UCC Consolidated	12%	11%	12%

Source: Union Carbide Corporation

Table 6 shows the major products of Union Carbide, by business group.

Table 6

**UNION CARBIDE
PRODUCTS BY BUSINESS GROUP**

<u>Business Group</u>	<u>Business</u>	<u>Products</u>
Carbon Products	Electrode systems	Graphite electrodes
	Carbon products	Carbon electrodes, refractories
	Graphite specialties	Anodes, specialty graphite
	Specialty products	Boron nitride, flexible graphite
Chemicals and Plastics	Industrial chemicals	Ethylene oxide/glycol
		Ethylene oxide derivatives
		Polycrystalline silicon/crystal products
		Polyethylene
	Polyolefins	Specialty polyolefins
		UNIPOL licensing
		UNISON Transformer Services

(Continued)

Union Carbide Corporation

Table 6 (Continued)

UNION CARBIDE PRODUCTS BY BUSINESS GROUP

<u>Business Group</u>	<u>Business</u>	<u>Products</u>
Chemicals and Plastics (Continued)	Solvents and coating materials	Alcohols Glycol ethers Ketones Esters Coatings resins Latexes Vinyl acetate and acrylic monomers Electronic chemicals Various specialized chemicals
	International petrochemicals Specialty chemicals	Biocides Solvents Silicones Polyester modifiers Urethane foam ingredients Hydraulic fluids Synthetic lubricants Catalysts Adsorbents Process systems
Industrial Gases	Industrial gases	Oxygen Nitrogen Argon Acetylene Hydrogen Helium Specialty gases Coatings Service Linde Homecare Medical Systems Energy Systems and Services Membrane Systems

Source: Union Carbide Corporation
Dataquest
June 1987

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Semiconductor Equipment, Manufacturing, and Materials

Company Backgrounders

Company	Fiscal Year-End
Air Products and Chemicals, Inc.	September
Anelva Corporation	October
Applied Materials, Inc.	December
ASM International N.V.	December
Canon Incorporated	December
E.I. du Pont de Nemours and Company	December
Hitachi Ltd.	March
Hoechst AG	December
KLA Instruments Corporation	June
Lam Research Corporation	June
Nippon Kogaku K.K. (Nikon)	March
Nippon Sanso	-
Olin Corporation	December
Osaka Titanium Co. Ltd.	March
Shin-Etsu Chemical Co. Ltd.	March
Shipley Company, Inc.	-
Silicon Valley Group Inc.	September
Tokyo Electron Ltd.	-
Tokyo Ohka Kogyo	-
Union Carbide Corporation	December
Varian Associates Inc.	September

If you are interested in purchasing additional *Company Backgrounder by Dataquest* documents, an order form is included for your convenience.

Air Products and Chemicals, Inc.

7201 Hamilton Boulevard
Allentown, Pennsylvania 18195-1501
Telephone: (215) 481-4911
Fax: (215) 481-5800
Dun's Number: 00-300-1070

Date Founded: 1940

CORPORATE STRATEGIC DIRECTION

Air Products and Chemicals, Inc., consists of four segments: industrial gases, chemicals, environmental and energy, and equipment and technology. The industrial gases segment produces and distributes industrial gases such as oxygen, nitrogen, argon, and hydrogen, and a variety of medical and specialty gases. Air Products is the fourth largest industrial gas manufacturer in the world. The chemicals segment produces industrial and specialty chemicals used in adhesives, coatings, polyurethane, herbicides, pesticides, and water treatment chemicals. The environmental and energy segment includes activities in cogeneration, flue gas desulfurization, and waste-to-energy conversion, as well as landfill gas recovery and wastewater treatment. The equipment and technology segment supplies cryogenic process equipment, including air separation equipment and liquid natural gas heat exchange equipment.

The Company's total revenue increased 8.6 percent to \$2.6 billion* in fiscal year 1989, from \$2.4 billion in fiscal year 1988. Air Products attributed the rise in revenue to the strengthened demand for industrial gases and strategic chemicals, resulting in record shipments in most major product lines. Net income reached \$222.1 million for fiscal 1989, resulting in a growth rate of 3.9 percent over fiscal 1988. Air Products employs 14,100 people.

Air Products' sales are concentrated in the North American region. Revenue from North American sales accounted for 78.0, 76.0, and 76.4 percent for fiscal year 1987, 1988, and 1989. Revenue from international sales accounted for 23.6 percent during fiscal 1989, of which 85.4 percent was from European sales.

*All dollar amounts are in US dollars.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Industrial Gases

The principal industrial gases sold by Air Products are oxygen, nitrogen, argon, hydrogen, carbon monoxide, and helium. All these gases are used heavily in the fabrication of semiconductors, steel, and chemicals. Medical and specialty gases are manufactured or blended by Air Products or purchased for resale. This segment accounts for 60 percent of the Company's sales and 80 percent of its profits.

Chemicals

Air Products' strategic chemical business can be grouped into three categories: polymer products (emulsions and polyvinyl alcohol), polyurethane intermediates and additives (dinitrotoluene, toluene diamine, catalysts, surfactants, and mold release agents), and amines and specialty additives (alkylamines and a line of amines used principally in crop protection and water treatment). The total sales from these three businesses constituted approximately 28 percent of the Company's consolidated sales in fiscal 1989. Other chemical businesses that contributed to 9 percent of the Company's consolidated sales over the past three years are acetic acid, ammonia, and ammonia products, methanol, and polyvinyl chloride resins.

Environmental and Energy

Air Products' environmental and energy segment consists of two joint ventures. American Ref-Fuel, established through a joint venture with Browning-Ferris, builds, owns, and operates trash-to-energy facilities. Pure Air, formed through a joint venture with Mitsubishi, designs and operates facilities to remove sulfur emissions from coal-fired utilities flue gas. Air Products also has an energy system component that builds, runs, and operates cogeneration facilities.

Equipment and Technology

Air Products' equipment and technology segment designs, manufactures, and supplies cryogenic process equipment used for air separation, gas processing, natural gas liquefaction, wastewater treatment, hydrogen purification, and nitrogen rejection.

Further Information

For more information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Thousands of U.S. Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$1,829,600.0	\$1,941,500.0	\$2,132,200.0	\$2,431,900.0	\$2,641,800.0
Percent Change	-	6.12	9.82	14.06	8.63
Capital Expenditure	\$399,000.0	\$407,000.0	\$367,700.0	\$556,400.0	\$562,000.0
Percent of Revenue	21.81	20.96	17.25	22.88	21.27
R&D Expenditure	\$51,107.0	\$61,091.0	\$56,530.0	\$71,797.0	\$71,403.0
Percent of Revenue	2.79	3.15	2.65	2.95	2.70
Number of Employees	12,500	12,700	12,100	13,300	14,100
Revenue (\$K)/Employee	\$146	\$153	\$176	\$183	\$187
Net Income	\$143,484.0	\$4,735.0	\$155,587.0	\$213,747.0	\$222,137.0
Percent Change	-	(96.70)	3,185.89	37.38	3.93
1989 Calendar Year (US\$M)	Q1	Q2	Q3	Q4	
Quarterly Revenue	\$668.94	\$663.71	\$668.62	\$652.50	
Quarterly Profit	\$56.65	\$53.36	\$51.01	\$49.40	

Source: Air Products and Chemicals, Inc.
 Annual Reports and Forms 10-K
 Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	86.28	80.41	77.97	76.03	76.43
International	13.72	19.59	22.03	23.97	23.57*

*For 1989, Europe contributed 85.4 percent and Canada and Latin America 14.6 percent of the international revenue.

Source: Air Products and Chemicals, Inc.
 Annual Reports and Forms 10-K
 Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	90.00	90.00
Indirect Sales	10.00	10.00

Source: Air Products and Chemicals, Inc.
 Annual Reports and Forms 10-K
 Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—66
Japan—3
Europe—19
Asia/Pacific—9
ROW—1

MANUFACTURING LOCATIONS

North America

United States

Alabama—Chunchula, Decatur, Flomaton,
Irontdale, Lowndesboro, Monroeville, Muscle
Shoals
Arizona—Chandler, Phoenix
Arkansas—Ashdown
California—City of Industry, El Segundo, Galt,
Hesperia, Lathrop, Long Beach, Mountain View,
Sacramento, Santa Clara, Stockton, Golden
Colorado—Colorado Springs
District of Columbia—Washington
Florida—Fort Walton Beach, Jacksonville, Jay,
Largo, Orlando, Pensacola
Georgia—Conyers
Illinois—Brookfield, Chicago, Granite City,
Hennepin, LaSalle, Mount Zion
Indiana—Chesterton, South Bend
Iowa—Bettendorf, Cedar Rapids, Davenport, Des
Moines, Sioux City
Kansas—Lenexa, Wichita
Kentucky—Ashland, Calvert City, Louisville,
Russellville
Louisiana—Geismar, Luling, New Orleans,
Plaquemine, Sorrento, St. Gabriel
Maryland—Elkton, Sparrows Point
Massachusetts—Hopkinton, Marlborough
Michigan—Detroit, Saginaw
Minnesota—Shakopee
Mississippi—Greenwood, Pass Christian
Missouri—Earth City
Nebraska—Lincoln, Omaha
New Jersey—Camden, Dayton, Iselin, Manalapan,
Paulsboro, Wharton
New York—Fishkill, Glenmont, Lackawanna,
Latham, Oswego, Rochester

North Carolina—Charlotte, Greensboro,
Laurinburg, Reidsville, Research Triangle Park,
Wilmington
Ohio—Cleveland, Middletown, North Baltimore
Oklahoma—Oklahoma City, Pryor
Oregon—Albany, Tualatin
Pennsylvania—Allentown, Butler, Creighton,
Dravosburg, Lancaster, Lehigh Valley,
Manchester, Marcus Hook, Meadville, Mt. Holly
Springs, Tamaqua, Wilkes-Barre
South Carolina—Florence, Piedmont
South Dakota—Rapid City
Tennessee—Alcoa, Huntingdon, Kingsport,
Memphis, Nashville, New Johnsonville
Texas—Arlington, Austin, Baytown, Conroe,
Corpus Christi, Dallas, Deer Park, Garland,
Gruver, La Porte, Lubbock, Midlothian,
Pasadena, Wichita Falls
Utah—Centerville
Virginia—Hampton, Richmond
Washington—Puyallup
West Virginia—Apple Grove, Ceredo, Nitro,
Proctor, Weirton
Wisconsin—Oak Creek
Wyoming—Evanston

Canada

Alberta—Calgary
British Columbia—Richmond
Manitoba—Winnipeg
Ontario—Brampton, Kanata, Nanticoke, Sarnia
Quebec—LaSalle

Europe

Belgium
Ghent, Vilvoorde
Netherlands
Terneuzen

Asia/Pacific

Australia
Fitzroy, Victoria
Korea
Seoul

ROW

Brazil
Casa Verde
Mexico
Estado De Mexico
Puerto Rico
Ponce

SUBSIDIARIES

North America

Air Products Canada Ltd.
 Air Products Inc.
 Air Products Manufacturing Corp.
 Air Products Pacific, Inc.
 Air Products Refuel Holdings Corp.
 Cambria Co. Gen. (I), Inc.
 Cambria Co. Gen. (II), Inc.
 GSF Energy Inc.
 Prodair Corp.
 Pure Air on the Lake (I), Inc.
 Pure Air on the Lake (II), Inc.
 Stockton Co. Gen. (I), Inc.

Europe

Air Products (GB) Ltd.
 Air Products (UK) Ltd.
 Air Products GmbH
 Air Products Gases Industrialis Ltda.
 Air Products Gesellschaft m.b.H.
 Air Products Ireland Limited
 Air Products Italia S.p.A.
 Air Products Netherlands B.V.
 Air Products PLC
 Air Products S.A.
 Anchor Chemical Group PLC
 Gardner Cryogenics A/S
 Gardner Cryogenics Limited
 Prodair S.A.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1988

Akzo, NV

The companies undertook a joint venture to design and develop membrane systems for air separation. Air Products is to have exclusive worldwide rights to market all membrane systems resulting from this joint venture.

Super Oxygen Sdn. Bhd.

The companies undertook a joint venture to produce and market industrial gases in Malaysia.

Bangkok Industrial Gas Co., Ltd.

The companies have a joint venture for producing and marketing industrial gases in Thailand.

San Fu Chemical Co., Ltd.

The companies have a joint venture for producing and marketing industrial gases in Taiwan.

Athens Corporation

Under an agreement, Air Products is to market Athens' chemical purification systems for semiconductor wafer cleaning and other applications.

1987

Chun Wang Industrial Gases

The companies undertook a joint venture to supply industrial gases in China and Hong Kong.

Mitsubishi Heavy Industries America, Inc.

The companies have a joint venture establishing Pure Air to market a technology that reduces sulfur emissions from coal-fired utilities.

MERGERS AND ACQUISITIONS

1989

Dow Corning

Air Products acquired Dow Corning's polyurethane silicone surfactant business.

Athens Corporation

Air Products acquired an equity interest in Athens, a firm with proprietary systems for processing chemicals used in manufacturing semiconductor wafers.

Trimont Chemicals

Air Products acquired Trimont Chemicals, which provides Air Products with new epoxy additives and increased manufacturing capacity.

1988

Valchem

Air Products acquired Valchem to add high-performance products to Air Products' polymer chemicals technology base. Valchem is to provide a line of water-based acrylic products.

Anchor Chemical Group

Air products acquired 70.5 percent of Anchor Chemical Group, giving Air Products a 100 percent holding. Air Products acquired 29.5 percent of Anchor in November 1987.

L'Oxygene Liquide

Air products acquired 65 percent interest in L'Oxygene Liquide, an important regional gas supplier in France.

1987

Anchor Chemical Group

Air products acquired 29.5 percent of Anchor Chemical.

KEY OFFICERS

Dexter F. Baker

Chairman of the board and chief executive officer

Leon C. Holt, Jr.

Vice chairman and chief administrative officer

Frank J. Ryan

President and chief operating officer

PRINCIPAL INVESTORS

Lazard Freres & Co.—5.30 percent

Oppenheimer & Co., L.P.—5.04 percent

Wellington Management Company—5.04 percent

Table 4
Comprehensive Financial Statement
Fiscal Year Ending September
(Thousands of U.S. Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$638,130.0	\$581,629.0	\$577,917.0	\$626,271.0	\$756,784.0
Cash	32,463.0	34,657.0	54,871.0	32,696.0	45,236.0
Receivables	381,516.0	273,598.0	289,917.0	344,707.0	377,295.0
Marketable Securities	13,762.0	81,998.0	41,764.0	3,518.0	4,266.0
Inventory	128,049.0	133,234.0	127,017.0	175,399.0	215,107.0
Other Current Assets	82,340.0	58,142.0	64,348.0	69,951.0	114,880.0
Net Property, Plants	\$1,782,267.0	\$1,818,158.0	\$1,920,520.0	\$2,061,642.0	\$2,217,594.0
Other Assets	\$173,058.0	\$261,241.0	\$206,694.0	\$311,597.0	\$391,330.0
Total Assets	\$2,593,455.0	\$2,661,028.0	\$2,705,131.0	\$2,999,510.0	\$3,365,708.0
Total Current Liabilities	\$493,179.0	\$401,521.0	\$433,411.0	\$516,759.0	\$494,477.0
Long-Term Debt	\$520,839.0	\$698,857.0	\$616,389.0	\$667,937.0	\$853,710.0
Other Liabilities	\$416,459.0	\$460,509.0	\$508,700.0	\$542,572.0	\$572,622.0
Total Liabilities	\$1,430,477.0	\$1,560,887.0	\$1,558,500.0	\$1,727,268.0	\$1,920,809.0
Total Shareholders' Equity	\$1,162,978.0	\$1,100,141.0	\$1,146,631.0	\$1,272,242.0	\$1,444,899.0
Converted Preferred Stock	NA	NA	NA	NA	NA
Common Stock	31,182.0	62,364.0	62,364.0	62,364.0	62,364.0
Other Equity	103,169.0	49,547.0	(9,048.0)	(36,873.0)	(17,086.0)
Retained Earnings	1,028,627.0	988,230.0	1,093,315.0	1,246,751.0	1,399,621.0
Total Liabilities and Shareholders' Equity	\$2,593,455.0	\$2,661,028.0	\$2,705,131.0	\$2,999,510.0	\$3,365,708.0
Income Statement	1985	1986	1987	1988	1989
Revenue	\$1,829,600.0	\$1,941,500.0	\$2,132,200.0	\$2,431,900.0	\$2,641,800.0
U.S. Revenue	1,578,500.0	1,561,100.0	1,662,400.0	1,849,000.0	2,019,200.0
Non-U.S. Revenue	251,100.0	380,400.0	469,800.0	582,900.0	622,600.0
Cost of Sales	\$1,059,220.0	\$1,146,089.0	\$1,275,499.0	\$1,451,508.0	\$1,600,832.0
R&D Expense	\$51,107.0	\$61,091.0	\$56,530.0	\$71,797.0	\$71,403.0
SG&A Expense	\$472,972.0	\$467,658.0	\$486,732.0	\$545,403.0	\$609,997.0
Capital Expense	\$399,000.0	\$407,000.0	\$367,700.0	\$556,400.0	\$562,000.0
Pretax Income	\$217,693.0	\$152,319.0	\$242,859.0	\$303,666.0	\$321,495.0
Pretax Margin (%)	11.90	7.85	11.39	12.49	12.17
Effective Tax Rate (%)	33.50	29.80	34.30	29.60	30.90
Net Income	\$143,484.0	\$4,735.0	\$155,587.0	\$213,747.0	\$222,137.0
Shares Outstanding, Millions	60,402.3	58,623.0	56,366.7	54,857.8	54,941.4
Per Share Data					
Earnings	\$2.38	\$0.08	\$2.76	\$3.90	\$4.04
Dividend	\$0.63	\$0.77	\$0.90	\$1.10	\$1.26
Book Value	\$19.25	\$18.77	\$20.34	\$23.19	\$26.30

Table 4 (Continued)
 Comprehensive Financial Statement
 Fiscal Year Ending September
 (Thousands of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	1.29	1.45	1.33	1.21	1.53
Quick (Times)	1.03	1.12	1.04	0.87	1.10
Fixed Assets/Equity (%)	153.25	165.27	167.49	162.05	153.48
Current Liabilities/Equity (%)	42.41	36.50	37.80	40.62	34.22
Total Liabilities/Equity (%)	123.00	141.88	135.92	135.77	132.94
<i>Profitability (%)</i>					
Return on Assets	-	0.18	5.80	7.49	6.98
Return on Equity	-	0.42	13.85	17.67	16.35
Profit Margin	7.84	0.24	7.30	8.79	8.41
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	2.79	3.15	2.65	2.95	2.70
Capital Spending % of Revenue	21.81	20.96	17.25	22.88	21.27
Employees	12,500	12,700	12,100	13,300	14,100
Revenue (\$K)/Employee	\$106.00	\$152.90	\$176.20	\$182.80	\$187.40
Capital Spending % of Assets	15.38	15.29	13.59	18.55	16.70

NA = Not available

Source: Air Products and Chemicals, Inc.
 Annual Reports and Forms 10-K
 Dataquest (1990)

Anelva Corporation

8-1, Yotsuya 5-chome
Fuchu-shi, Tokyo 183, Japan

Telephone: 0423-64-2111

Telex: 2832558

Fax: Not Available

Dun's Number: 69-084-8478

Date Founded: 1967

CORPORATE STRATEGIC DIRECTION

Anelva Corporation is an experienced international specialist in vacuum technology, which is essential to semiconductor and electronic device production. Anelva stands for ANalysis, ELectionics, and VACuum, which are the Company's main areas of concentration and innovation.

Anelva is focusing its R&D on thin-film manufacturing systems, peripheral equipment, and software. Beam technology and plasma technology have demanded continuous R&D support.

Because Anelva is a privately held company, no financial statements are included.

BUSINESS SEGMENT STRATEGIC DIRECTION

Anelva has two business segments: thin-film producing systems and analyzing systems. The thin-film producing systems consist of a wide range of products. They are suitable for a number of applications including small, experimental batch use, cassette-to-cassette fully automated systems, and on-line systems for mass production. These systems include the following:

- Sputtering systems, which produce high-quality metallic films, oxide films, and magnetic films by magnetron high-rate sputtering
- Reactive ion etching systems, which perform fine-line etching of films such as Al, Al-alloy, Al-oxide, and poly-Si

- Plasma-chemical vapor deposition (CVD) systems, which produce amorphous silicon films for solar batteries and silicon nitride films for thin-film transistors
- Molecular beam epitaxy (MBE) systems, which perform compound semiconductor MBE, Si-MBE, and a combination of multichamber and sample transport mechanisms
- Vacuum evaporators, which are a combination of an electronic beam gun and a planetary motion substrate holder

Analyzing systems are used at pure research centers for analysis and at commercial production facilities for quality control. These systems include the following:

- Gas analyzers, which include trace gas analyzers, which perform high-sensitivity and continuous analysis by a quadrupole mass spectrometer
- Surface analyzers, which include an Auger Electron Spectrometer (AES) and a Secondary Ion Mass Spectrometer (SIMS)
- Vacuum pumps, which include cryo pumps, sputter ion pumps, oil diffusion pumps, and mechanical rotary pumps
- Vacuum components, which include ICF flanges and gaskets, valve viewing ports, electrical and motion feed-through components, fittings, and ion bombardment and electron-beam guns
- Gauges and controllers, which include vacuum gauges (low vacuum to UHV), film thickness monitors and deposition controllers, residual gas analyzers, and leak detectors
- Materials, which include sputtering targets and pump oil

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—1
Asia/Pacific—2

MANUFACTURING LOCATIONS

North America

San Jose, California
Testing equipment, sputtering systems, and gas and surface analyzers

Asia/Pacific

Fuchu Factory, Japan
All products
Fuchu Higashi (East) Factory, Japan
All products
Fuji Plant, Japan
Sputtering systems, REI systems, and vacuum pumps

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

J. Osawa
Chairman

Y. Morisada
President

Z. Oda
Executive director

Y. Sato
Director

S. Tsuneki
Director

R. W. Kane
Director

H. Kobayashi
Director

T. Inoue
Director

K. Takada
Director

R. Yamamoto
Director

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Applied Materials, Inc.

3050 Bowers Avenue
Santa Clara, California 95054-3299

Telephone: (408) 727-5555

Fax: (408) 748-9943

Dun's Number: 04-272-8840

Date Founded: 1967

CORPORATE STRATEGIC DIRECTION

Applied Materials, Inc., develops, manufactures, and markets semiconductor wafer fabrication equipment and related parts throughout the world. It produces systems for chemical vapor deposition (CVD) and epitaxial silicon deposition, dry plasma etching, and ion implantation.

The Company's total revenue increased 38.3 percent to \$501.8 million* in fiscal year 1989, from \$362.8 million in fiscal 1988. Applied Materials attributes this growth to the increasing demand for its products and its well-balanced geographic position. The Company's strategy is sales penetration of all global markets. For fiscal 1989, international sales revenue accounted for 65.2 percent of total revenue. Net income reached \$51.5 million in fiscal 1989, up 28.7 percent from fiscal 1988. Applied Materials employs 2,651 full-time people.

Applied Materials' research and development efforts are aimed toward the development of new wafer processing systems and new process applications for existing products. Applied Materials commits itself to working closely with its customers worldwide to design its systems to meet the customers' planned technical and production requirements. The R&D facilities are located in the United States, England, and Japan. Applied Materials allocated \$31.2 million, \$43.5 million, and \$72.3 million to R&D in the respective fiscal years 1987, 1988, and 1989. These amounts accounted for 17.9, 12.0, and 14.4 percent of the Company's total revenue those years.

In fiscal 1989, Applied Materials saw a 56 percent revenue growth in European sales. The Company anticipates another 30 percent increase in 1990.

*All dollar amounts are in U.S. dollars.

During fiscal 1989, European sales amounted to \$75 million, and the European work force increased by more than 500 people. For 1990, Applied Materials plans to expand its operations in Italy to supply service and support for SGS-Thomson and Texas Instruments. It also plans to add Japanese-speaking sales and service representatives to work with Japanese companies that have announced wafer fab facilities in Europe. In March 1990, Applied Materials announced a new service center in Japan, representing the fourth to open there in the past year. Over the past two years, Applied Materials has increased sales to Japan by more than 400 percent.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Deposition

One of the fundamental steps in fabricating a device is deposition, a process in which a layer of either electrically insulating (dielectric) or electrically conductive material is deposited on the wafer. Applied Materials manufactures CVD and epitaxial silicon deposition systems. The CVD product line consists of film applications based on the Precision 5000 architecture, with capabilities in such areas as interlayer dielectrics (ILD), intermetal dielectrics (IMD), passivation nitrides, and tungsten CVDs (WCVDs). Epitaxial deposition involves depositing a

layer of high-quality, single crystal silicon on the surface of an existing silicon wafer to change its electrical properties and form the base on which an integrated circuit is built. In May 1989, Applied Materials announced the Precision 7700 epi system for advanced silicon deposition. According to Dataquest estimates, Applied Materials held 31.7 percent of the nontube CVD worldwide market and 55.9 percent of the silicon epitaxy worldwide market in 1988.

Dry Etch

The Precision 5000 Etch system, an extension of the Precision 5000 architecture, is designed specifically for low-pressure, magnetically enhanced reactive ion etching (MERIE) of submicron features in films such as single-crystal silicon, polysilicon, and oxide. In May 1989, Applied Materials unveiled a new critical oxide etch process for its Precision 5000 Etch system, enabling the extension of Applied Materials' MERIE technology to sub-halfmicron oxide contacts.

Dataquest estimates that Applied Materials captured 36 percent of the dry etch worldwide market in 1988.

Implant

In 1985, Applied Materials entered the high-current portion of the implant market. The Precision Implant 9200 was introduced in April 1988. It has been upgraded with the new option of enabling automated selection of implant angles and new hardware/software options allowing customers to perform remote monitoring and diagnostics, as well as down-load process recipes, from outside the fab. In 1988, Applied Materials had 10 percent of the high-current ion implant worldwide market, according to Dataquest's 1988 figures.

Further Information

For more information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Thousands of U.S. Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$174,595.0	\$149,261.0	\$174,444.0	\$362,758.0	\$501,846.0
Percent Change	-	(14.51)	16.87	107.95	38.34
Capital Expenditure	\$12,930.0	\$11,541.0	\$11,491.0	\$19,821.0	\$42,944.0
Percent of Revenue	7.41	7.73	6.59	5.46	8.56
R&D Expenditure	\$31,519.0	\$24,621.0	\$31,204.0	\$43,477.0	\$72,296.0
Percent of Revenue	18.05	16.50	17.89	11.99	14.41
Number of Employees	1,359	1,415	1,406	1,765	2,651
Revenue (\$K)/Employee	\$128.50	\$105.50	\$124.10	\$205.50	\$189.30
Net Income	\$9,270.0	\$1,860.0	\$336.0	\$40,020.0	\$51,484.0
Percent Change	-	(79.94)	(81.94)	11,810.71	28.65
1989 Calendar Year (US\$M)*	Q1	Q2	Q3	Q4	
Quarterly Revenue	\$106.71	\$122.77	\$130.19	\$142.18	
Quarterly Profit	\$13.50	\$13.92	\$12.53	\$11.54	

*Based on fiscal year rather than calendar year.

Source: Applied Materials, Inc.
 Annual Reports and
 Forms 10-K
 Dataquest
 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	67.81	44.60	49.76	44.16	34.82
International	32.19	55.40	50.24	55.84	65.18
Japan	30.07	28.20	22.63	37.26	39.87
Europe	2.12	24.62	23.56	12.73	14.87
Asia/Pacific	0	2.58	4.05	5.85	10.44

Source: Applied Materials, Inc.
 Annual Reports and
 Forms 10-K
 Dataquest
 1990

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	100.00	100.00
Indirect Sales	0	0

Source: Dataquest
 1990

1989 SALES OFFICE LOCATIONS

North America—12
Japan—11
Europe—9
Asia/Pacific—3
ROW—0

MANUFACTURING LOCATIONS

North America

Santa Clara, California
All products except ion implant

Japan

Narita, Chiba Prefecture
Chemical vapor deposition and system
customization

Europe

Horsham, England
Ion implant

SUBSIDIARIES

North America

Applied Acquisition Subsidiary
Applied Implant Technology Inc.
Applied Materials International Inc.
ILT Inc.

Europe

Applied Materials Europe B.V.
Applied Materials International B.V.
Applied Materials Limited
Applied Materials Sarl
Applied Materials Technology Electronics G.m.b.H.

Asia/Pacific

Applied Materials Asia/Pacific Ltd.
Applied Materials Hong Kong Ltd.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Peak Systems

The companies made a strategic alliance involving a development and production contract focused on adding rapid thermal processing (RTP) to semiconductor processes available to the worldwide customers of Applied Materials' Precision 5000 system. As part of the agreement, Applied Materials will acquire 10 percent ownership of Peak Systems.

1988

Gasonics

The companies made a technology agreement to explore the integration of a microwave downstream photoresist stripping capability into Applied Materials' multichamber Precision 5000 Etch system.

KEY OFFICERS

James C. Morgan

Chairman and chief executive officer

James W. Bagley

President and chief operating officer

Dan Maydan

Executive vice president

Dana C. Ditmore

Vice president, Customer Service

Steve Lindsay

Vice president, Sales and Marketing

Howard L. Neff

Vice president, Corporate Operations

Peter R. Hanely

Group vice president, Customer Business Group

Tetsuo Iwasaki

Vice president; president, Applied Materials Japan

Sasson Somekh

Vice president, Applied Conductor Technology

John G. Stewart

Vice president, Applied Implant Technology

David N. K. Wang

Vice president, Chemical Vapor Deposition and Etch Technologies

PRINCIPAL INVESTORS

FMR Corporation—9.6 percent

Neuberger & Berman—5.5 percent

T. Rowe Price Associates, Inc.—5.5 percent

Table 4
Comprehensive Financial Statement
Fiscal Year Ending October
(Thousands of U.S. Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$107,482.0	\$106,166.0	\$179,159.0	\$276,159.0	\$342,944.0
Cash	35,674.0	21,796.0	44,815.0	58,219.0	57,426.0
Receivables	31,199.0	39,577.0	49,527.0	98,624.0	131,563.0
Marketable Securities	N/A	N/A	25,907.0	42,570.0	49,682.0
Inventory	30,857.0	36,039.0	47,139.0	53,757.0	77,015.0
Other Current Assets	9,752.0	8,754.0	11,771.0	22,989.0	27,258.0
Net Property, Plants	\$35,718.0	\$43,358.0	\$47,039.0	\$55,994.0	\$82,127.0
Other Assets	\$5,220.0	\$6,614.0	\$6,428.0	\$7,055.0	\$8,786.0
Total Assets	\$148,420.0	\$156,138.0	\$232,626.0	\$339,208.0	\$433,857.0
Total Current Liabilities	\$37,582.0	\$32,384.0	\$48,130.0	\$116,985.0	\$142,852.0
Long-Term Debt	\$16,880.0	\$19,615.0	\$21,112.0	\$11,346.0	\$29,445.0
Other Liabilities	\$7,532.0	\$10,393.0	\$9,776.0	\$10,070.0	\$7,161.0
Total Liabilities	\$61,994.0	\$62,392.0	\$79,018.0	\$138,401.0	\$179,458.0
Total Shareholders' Equity	\$86,426.0	\$93,746.0	\$153,608.0	\$200,807.0	\$254,399.0
Converted Preferred Stock	N/A	N/A	N/A	N/A	N/A
Common Stock	53,673.0	55,428.0	155.0	158.0	162.0
Other Equity	1,072.0	4,407.0	119,206.0	126,382.0	128,486.0
Retained Earnings	31,681.0	33,911.0	34,247.0	74,267.0	125,751.0
Total Liabilities and Shareholders' Equity	\$148,420.0	\$156,138.0	\$232,626.0	\$339,208.0	\$433,857.0
Income Statement	1985	1986	1987	1988	1989
Revenue	\$174,595.0	\$149,261.0	\$174,444.0	\$362,758.0	\$501,846.0
U.S. Revenue	118,395.0	66,568.0	86,810.0	160,190.0	174,755.0
Non-U.S. Revenue	56,200.0	82,693.0	87,634.0	202,568.0	327,091.0
Cost of Sales	\$94,210.0	\$87,730.0	\$103,061.0	\$192,094.0	\$257,149.0
R&D Expense	\$31,519.0	\$24,621.0	\$31,204.0	\$43,477.0	\$72,296.0
SG&A Expense	\$32,763.0	\$31,811.0	\$38,096.0	\$56,659.0	\$88,935.0
Capital Expense	\$12,930.0	\$11,541.0	\$11,491.0	\$19,821.0	\$42,944.0
Pretax Income	\$15,983.0	\$3,313.0	\$578.0	\$66,700.0	\$84,402.0
Pretax Margin (%)	9.15	2.22	0.33	18.39	16.82
Effective Tax Rate (%)	42.00	44.00	42.00	40.00	39.00
Net Income	\$9,270.0	\$1,860.0	\$336.0	\$40,020.0	\$51,484.0
Shares Outstanding, Thousands	13,160.0	13,322.0	14,140.0	16,491.0	16,757.0
Per Share Data					
Earnings	\$0.71	\$0.14	\$0.02	\$2.43	\$3.07
Dividends	N/A	N/A	N/A	N/A	N/A
Book Value	\$6.57	\$7.04	\$10.86	\$12.18	\$15.18

Table 4 (Continued)
 Comprehensive Financial Statement
 Fiscal Year Ending October
 (Thousands of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	2.86	3.28	3.72	2.36	2.40
Quick (Times)	2.04	2.17	2.74	1.90	1.86
Fixed Assets/Equity (%)	41.33	46.25	30.62	27.88	32.28
Current Liabilities/Equity (%)	43.48	34.54	31.33	58.26	56.15
Total Liabilities/Equity (%)	71.73	66.55	51.44	68.92	70.54
<i>Profitability (%)</i>					
Return on Assets	-	1.22	0.17	14.00	13.32
Return on Equity	-	2.06	0.27	22.58	22.62
Profit Margin	5.31	1.25	0.19	11.03	10.26
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	18.05	16.50	17.89	11.99	14.41
Capital Spending % of Revenue	7.41	7.73	6.59	5.46	8.56
Employees	1,359	1,415	1,406	1,765	2,651
Revenue (\$K)/Employee	\$128.50	\$105.50	\$124.10	\$205.50	\$189.30
Capital Spending % of Assets	8.71	7.39	4.94	5.84	9.90

N/A = Not Available

Source: Applied Materials, Inc.
 Annual Reports and
 Forms 10-K
 Dataquest
 1990

Advanced Semiconductor Materials International N.V.

Jan Steenlaan 9
3723 BS Bilthoven
Netherlands
Phone: (31) 30-281836
Fax: (31) 30-281863
Dun's Number: Not Available

Date Founded: 1968

CORPORATE STRATEGIC DIRECTION

Advanced Semiconductor Materials International N.V. (ASM International N.V.) is a worldwide supplier of semiconductor process and assembly equipment. Products include assembly automation and encapsulation equipment, microcomputer-controlled wafer processing equipment, chemical vapor deposition (CVD) systems, epitaxial reactors, components for gas control systems, and semiconductor leadframe products and materials.

ASM markets its products to semiconductor manufacturers on a worldwide basis. Customers vary from independent semiconductor manufacturers to large, vertically integrated electronic systems companies that manufacture semiconductors for internal use. ASM's strategy addresses the needs of both types of customers, emphasizing sales among the largest manufacturers. New products are being designed in a modular style that will provide configurations for various customer requirements and that allow incorporation of technological advances in semiconductor processing technology.

Net sales of ASM products were slightly over F 416.2 million (US\$195.4 million) for the year ended December 31, 1989. This represents a 14.7 percent increase over 1988 sales of F 362.9 million (US\$183.3 million). (Percentage changes refer only to F amounts; US\$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Sales in the Far East and Japan showed the greatest gains, at F 130.9 million and F 110.5 million (US\$61.5 million and US\$51.9 million), respectively. This compares with 1988 sales of F 93 million and F 89 million (US\$47 million and US\$45 million). Product sales in Europe slowed during 1989, down to F 129.7 million (US\$60.9 million),

compared with F 135.7 million (US\$68.5 million) in 1988. Sales in the United States remained fairly flat, at F 45.1 million (US\$21.2 million) in 1989, versus F 45.2 million (US\$22.8 million) in 1988.

In order to develop and manufacture products to accommodate local needs and to market and service products in a worldwide market, ASM has manufacturing, sales, and service facilities in Europe, the United States, Hong Kong, and Japan. Most of the Company's sales are through its direct sales force. In addition to individual sales and service offices throughout the world, ASM maintains a specialized group of sales, support, and service personnel to meet specific technology and application requirements for each of the main product categories.

ASM has R&D facilities in Arizona, Tokyo, Hong Kong, and the Netherlands that enable it to draw on innovative and technical capabilities on an international basis. Each location is the center of expertise for a specific product or technology. ASM also has established an international research center in the Netherlands for the development of semiconductor manufacturing technology.

During 1989, ASM opened a factory in the Shenzhen economic zone of the People's Republic in China. In addition, ASM intends to set up a factory and R&D facility in Singapore and a new customer engineering facility in Kyushu, Japan, during the next few years. ASM plans to continue its significant investments in R&D to expand and improve product lines. During 1989, the Company spent F 39.7 million (US\$18.6 million) on R&D, a 39 percent increase over the 1988 level of F 28.6 million (US\$14.4 million).

As of December 31, 1989, ASM employed more than 2,200 people worldwide. ASM employment is highest in Hong Kong at 1,044, followed by the Netherlands with 635, the United States with 252, Japan with 177, and other European countries with 105.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Tables 4 and 5, comprehensive financial statements, are at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

ASM's business is divided into three main segments: wafer processing, assembly and encapsulation, and materials. The biggest revenue producer for 1989 was the wafer processing segment with net sales of F 224.5 million (US\$105.4 million), or 54 percent of total net sales. The assembly and encapsulation segment was second, with net sales of F 128.0 million (US\$60.1 million), followed by material segment sales of F 63.0 million (US\$30.0 million). Sales for the latter two business segments represented 31 and 15 percent of total net sales, respectively.

The wafer processing equipment products are used in the semiconductor manufacturing process, during which a series of thin films is deposited, or grown, on a silicon wafer. ASM manufactures equipment that uses CVD and diffusion technologies in this process. Dataquest estimates ASM's market share of the worldwide CVD equipment market at 12 percent for 1989 based on estimated sales of F 147.0 million (US\$69 million). For the 1989 worldwide diffusion tube market, Dataquest estimates ASM's market share at 9 percent based on estimated diffusion tube sales of F 61.8 million (US\$29 million).

The Company's wafer processing equipment sector has two main product categories: horizontal tube plasma-enhanced CVD reactors (PECVDs) used in wafer processing for VLSI devices such as 4Mb DRAMs, and micropressure CVD systems (LPCVD) used for low-pressure wafer processing that permits high deposition rates at moderate temperatures. LPCVD systems include the horizontal tube systems

of the DFS 210 and 250 series as well as the vertical tube LPCVD system, the VMP100 PRO. The DFS 210 and 250 series encompass diffusion and oxidation capabilities with LPCVD. Dataquest estimates ASM's 1989 sales at F 108 million (US\$51 million) in the PECVD market and F 38 million (US\$18 million) in the LPCVD market.

During 1989, ASM introduced the VMP100 PRO, which is a vertical tube LPCVD system, in Japan. The DFS 210 and 250 series of diffusion and oxidation systems are ASM's mainstream products in Europe.

Another wafer processing equipment category is epitaxial reactors, which are used for epitaxial growth of crystal structures on silicon wafers, a process commonly used in the manufacturing of advanced bipolar devices and CMOS devices. Dataquest estimates ASM's sales in this market for 1989 at F 13.2 million (US\$6.2 million). In 1988, ASM announced the Epsilon One, which features single-wafer production with high uniformity of layers and low particulate contamination. The system is aimed at the fast-growing CMOS device market. In 1989, ASM introduced the E2 model, with 200mm wafer capability.

Recent developments in ASM's wafer processing product line include the integration of microprocessor-based controls and the addition of automated wafer handling to existing products and newly developed systems. During 1989, ASM announced the Advance 600, a new family of multiprocessing systems for use in submicron chip manufacturing. The Advance 600 products incorporate ASM's Central Loadlock Systems, to which various modules for processing and handling can be connected. ASM's strategy is to make modular systems that allow a variety of system configurations to address selected applications.

ASM's assembly and encapsulation segment provides equipment used after the wafer processing step. The assembly equipment line includes automated systems for die inspection and separation, die bonders, wire bonders, molding systems, and trim-and-form systems. ASM's bonding equipment integrates mechanical and computer-based automation technology to meet productivity and quality criteria, while maintaining cost effectiveness.

During 1989, a new aluminum wire bonder, the AB509, was introduced. This product is targeted to the LED market for consumer electronics applications. More recently, in March 1990, ASM introduced the AB309 gold wire bonder. This product incorporates a new pattern recognition system and an ultralight moving bondhead for high-speed production rates. The AB309 system specifications are designed to provide higher productivity for customers in the high-volume IC market.

The Company's transfer molds, used in plastic packaged circuits, also provide fully automated systems operation. This category includes the AMS 480, a high-capacity, automated in-line molding system introduced several years ago. In 1987, lower-capacity automatic and semiautomatic molding systems, the AMS 140 and MS 100, were added to address a growing market for high-variety/small-series production of semiconductors. Similar to trends in wafer processing equipment, these encapsulation systems include the integration of microprocessor-based controls for process and information handling.

ASM expanded its molding systems product line with the introduction of the AMS 280 from ASM Fico in May 1989. This AMS 280 system offers a midrange production capacity, fitting between the MS 100 and AMS 140 at the low end and the AMS 480 at the high end. To further strengthen its position in the assembly markets, ASM is also developing advanced versions of its automatic and semiautomatic trim-and-form systems.

Manufacturing of assembly equipment is concentrated in Hong Kong for sale worldwide. ASM's encapsulation products are manufactured in the Netherlands and Hong Kong. The Company also has established precision machine tooling facilities in those locations to manufacture very high-precision transfer molds for encapsulation and automated trim-and-form tooling.

Further Information

For further information regarding the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$105,677.7	\$128,463.7	\$136,614.3	\$183,276.8	\$195,401.4
Percent Change	-	21.56	6.34	34.16	6.62
Capital Expenditure	\$18,660.2	\$14,679.2	\$11,852.7	\$9,623.2	\$18,028.6
Percent of Revenue	17.66	11.43	8.68	5.25	9.23
R&D Expenditure	\$11,056.3	\$18,730.6	\$17,476.8	\$14,447.0	\$18,659.6
Percent of Revenue	10.46	14.58	12.79	7.88	9.55
Number of Employees	1,868	2,092	2,056	1,984	2,213
Revenue (\$K)/Employee	\$56,573	\$61,407	\$66,447	\$92,377	\$88,297
Net Income	(\$5,794.6)	(\$25,182.0)	(\$22,544.8)	\$21,314.6	\$4,510.8
Percent Change	-	95.96	3,514.20	(194.54)	(78.84)
Exchange Rate (US\$1=F)	F 3.32	F 2.45	F 2.03	F 1.98	F 2.13
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	NA	NA	NA	NA	
Quarterly Profit	NA	NA	NA	NA	

NA = Not available

Source: Advanced Semiconductor Materials International N.V.
Quarterly Reports
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	27.00	15.00	12.00	12.00	11.00
International	73.00	85.00	88.00	88.00	89.00
Europe	24.00	44.00	46.00	37.00	31.00
Asia/Pacific	49.00	41.00	42.00	51.00	58.00

Source: Advanced Semiconductor Materials International N.V.
Annual Reports
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1985	1986	1987	1988	1989
Direct Sales	100.0	100.0	100.0	100.0	100.0
Indirect Sales	0	0	0	0	0

Source: Advanced Semiconductor Materials International N.V.
Annual Reports
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—7
Europe—4
Asia/Pacific—11

Europe

ASM Europe B.V. (Netherlands)
ASM Fico Tooling B.V. (Netherlands)
ASM Finance Ltd. (Germany)
ASM France SARL (France)
ASM Germany Sales B.V. (Germany)
ASM UK Sales B.V. (England)

MANUFACTURING LOCATIONS

North America

Phoenix, Arizona
Wafer processing equipment (PECVD)
Tempe, Arizona
Wafer processing equipment (epitaxy)

Europe

Bilthoven, Netherlands
CVD, diffusion, and oxidation wafer processing products
Brunssum, Netherlands
Encapsulation equipment manufacturing
Herwen, Netherlands
Encapsulation and tooling products manufacturing
Montpellier, France
Gas component manufacturing, small CVD systems, MOCVD

Asia/Pacific

Kwai Chung, N.T. Hong Kong
Assembly automation equipment, encapsulation, and leadframe manufacturing
Nagaoka, Japan
Wafer processing equipment
Shenzhen, People's Republic of China
Precision metal tooling
Singapore
Assembly automation equipment

Asia/Pacific

ASM Asia Ltd. (Hong Kong)
ASM Assembly Automation Ltd. (Hong Kong)
ASM Assembly Materials Ltd. (Hong Kong)
ASM Japan K.K. (Japan)
ASM Pacific International Marketing Ltd. (Singapore)
ASM Pacific Technology Ltd. (Hong Kong)
ASM Technology Singapore Pte. Ltd. (Singapore)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

SUBSIDIARIES

North America

ASM America, Inc. (United States)
ASM Epitaxy (United States)
ASM Pacific Assembly Products, Inc. (United States)
ASM Rio USA, Inc. (United States)

KEY OFFICERS

Arthur H. del Prado

Managing director, president, and chief executive officer

Andre C. van Rhee

Managing director, vice president of Finance, and chief financial officer

Lam See-Pong (Patrick)

Vice president of Asian Operations and managing director of ASM Pacific Technology Ltd., the holding company for Asia/Pacific subsidiaries

William H. de Leeuw

Managing director of ASM Europe B.V.

Herbert O. Lakens
Director of Marketing

Jan Willem Baud
Managing director of ASM Fico Tooling B.V.

Yo Miyazaki
Vice president of Japanese Operations and managing director of ASM Japan K.K.

John E. Krickl
President of ASM America, Inc., and ASM Epitaxy

L. David Sikes
General manager of ASM America, Inc., and ASM Epitaxy

PRINCIPAL INVESTORS

Stichting Administratiekantoor ASMI—47.3 percent
All officers and directors as a group (13 persons)—49.7 percent

FOUNDERS

Arthur H. del Prado

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$78,714.5	\$104,304.9	\$129,632.0	\$140,244.4	\$121,505.2
Cash	5,773.8	5,429.8	8,390.1	27,736.9	9,533.3
Receivables	20,345.5	34,413.9	47,794.1	59,249.5	53,110.8
Marketable Securities	0	0	0	0	6,316.4
Inventory	43,688.9	51,894.7	60,249.8	42,367.7	41,808.0
Other Current Assets	8,906.3	12,566.5	13,198.0	10,890.4	10,736.6
Net Property, Plants	\$32,566.6	\$45,131.4	\$52,610.8	\$47,658.1	\$48,378.4
Other Assets	\$1,622.3	\$1,243.7	\$1,513.3	\$5,236.9	\$7,079.3
Total Assets	\$112,903.3	\$150,680.0	\$183,756.2	\$193,139.4	\$176,962.9
Total Current Liabilities	\$51,525.6	\$80,199.6	\$111,408.9	\$94,344.9	\$85,153.1
Long-Term Debt	\$13,341.3	\$24,071.8	\$27,545.3	\$21,649.0	\$17,894.4
Other Liabilities	\$758.4	\$13,357.1	\$32,869.5	\$41,495.5	\$35,659.6
Total Liabilities	\$65,625.3	\$117,628.6	\$171,823.6	\$157,489.4	\$138,707.0
Total Shareholders' Equity	\$47,278.0	\$33,051.4	\$11,932.5	\$35,650.0	\$38,255.9
Converted Preferred Stock	0	0	0	0	0
Common Stock	63.0	85.3	103.0	105.6	104.2
Other Equity	34,831.0	41,366.5	44,512.8	47,738.4	44,976.1
Retained Earnings	12,384.0	(8,400.4)	(32,683.3)	12,193.9	(6,824.4)
Total Liabilities and Shareholder's Equity	\$112,903.3	\$150,680.0	\$183,756.2	\$193,139.4	\$176,962.9
Income Statement	1985	1986	1987	1988	1989
Revenue	\$105,677.7	\$128,463.7	\$136,614.3	\$183,276.8	\$195,401.4
Cost of Sales	\$64,604.2	\$87,338.8	\$87,996.6	\$112,505.6	\$116,165.3
R&D Expense	\$11,056.3	\$18,730.6	\$17,476.8	\$14,447.0	\$18,659.6
SG&A Expense	\$31,314.8	\$37,197.6	\$39,388.2	\$47,189.9	\$47,188.3
Capital Expense	\$18,660.2	\$14,679.2	\$11,852.7	\$9,623.2	\$18,028.6
Pretax Income	(\$1,802.4)	(\$18,302.9)	(\$13,820.2)	\$12,318.7	\$7,900.9
Pretax Margin (%)	NA	NA	NA	NA	NA
Effective Tax Rate (%)	43.0	43.0	43.0	43.0	43.0
Net Income	(\$5,794.6)	(\$25,182.0)	(\$22,544.8)	\$21,314.6	\$4,510.8
Shares Outstanding, Millions	\$6,959.0	\$6,959.0	\$6,959.0	\$6,959.0	\$6,959.0
Per Share Data					
Earnings	(\$0.8)	(\$3.6)	(\$3.3)	\$3.1	\$0.6
Dividend	NA	NA	NA	NA	NA
Book Value	NA	NA	NA	NA	NA
Exchange Rate (US\$1=F)	F 3.32	F 2.45	F 2.03	F 1.98	F 2.13

NA = Not available

Source: Advanced Semiconductor Materials International N.V.
 Annual Reports and Forms 10-K
 Dataquest (1990)

Table 5
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of Guilders, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	F 261,332.0	F 255,547.0	F 263,153.0	F 277,684.0	F 258,806.0
Cash	19,169.0	13,303.0	17,032.0	54,919.0	20,306.0
Receivables	67,547.0	84,314.0	97,022.0	117,314.0	113,126.0
Marketable Securities	0	0	0	0	13,454.0
Inventory	145,047.0	127,142.0	122,307.0	83,888.0	89,051.0
Other Current Assets	29,569.0	30,788.0	26,792.0	21,563.0	22,869.0
Net Property, Plants	F 108,121.0	F 110,572.0	F 106,800.0	F 94,363.0	F 103,046.0
Other Assets	F 5,386.0	F 3,047.0	F 3,072.0	F 10,369.0	F 15,079.0
Total Assets	F 374,839.0	F 369,166.0	F 373,025.0	F 382,416.0	F 376,931.0
Total Current Liabilities	F 171,065.0	F 196,489.0	F 226,160.0	F 186,803.0	F 181,376.0
Long-Term Debt	F 44,293.0	F 58,976.0	F 55,917.0	F 42,865.0	F 38,115.0
Other Liabilities	F 2,518.0	F 32,725.0	F 66,725.0	F 82,161.0	F 75,955.0
Total Liabilities	F 217,876.0	F 288,190.0	F 348,802.0	F 311,829.0	F 295,446.0
Total Shareholders' Equity	F 156,963.0	F 80,976.0	F 24,223.0	F 70,587.0	F 81,485.0
Converted Preferred Stock	0	0	0	0	0
Common Stock	209.0	209.0	209.0	209.0	222.0
Other Equity	115,639.0	101,348.0	90,361.0	94,522.0	95,799.0
Retained Earnings	41,115.0	(20,581.0)	(66,347.0)	24,144.0	(14,536.0)
Total Liabilities and Shareholders' Equity	F 374,839.0	F 369,166.0	F 373,025.0	F 382,416.0	F 376,931.0
Income Statement	1985	1986	1987	1988	1989
Revenue	F 350,850.0	F 314,736.0	F 277,327.0	F 362,888.0	F 416,205.0
Cost of Sales	F 214,486.0	F 213,980.0	F 178,633.0	F 222,761.0	F 247,432.0
R&D Expense	F 36,707.0	F 45,890.0	F 35,478.0	F 28,605.0	F 39,745.0
SG&A Expense	F 103,965.0	F 91,134.0	F 79,958.0	F 93,436.0	F 100,511.0
Capital Expense	F 61,952.0	F 35,964.0	F 24,061.0	F 19,054.0	F 38,401.0
Pretax Income	(F 5,984.0)	(F 44,842.0)	(F 28,055.0)	F 24,391.0	F 16,829.0
Pretax Margin (%)	NA	NA	NA	NA	NA
Effective Tax Rate (%)	43.0	42.0	42.0	40.0	35.0
Net Income	(F 19,238.0)	(F 61,696.0)	(F 45,766.0)	F 42,203.0	F 9,608.0
Shares Outstanding, Millions	F 6,959.0	F 6,959.0	F 6,959.0	F 6,959.0	F 7,185.0
Per Share Data					
Earnings	(F 2.8)	(F 8.9)	(F 6.6)	F 6.1	F 1.3
Dividend	NA	NA	NA	NA	NA
Book Value	NA	NA	NA	NA	NA

Table 5 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Thousands of Guilders, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	1.53	1.30	1.16	1.49	1.43
Quick (Times)	0.68	0.65	0.62	1.04	0.94
Fixed Assets/Equity (%)	68.88	136.55	440.90	133.68	126.46
Current Liabilities/Equity (%)	108.98	242.65	933.66	264.64	222.59
Total Liabilities/Equity (%)	138.81	355.90	1,439.96	441.77	362.58
<i>Profitability (%)</i>					
Return on Assets	(10.26)	(16.58)	(12.33)	11.17	2.53
Return on Equity	(24.51)	(51.86)	(87.01)	89.03	12.64
Profit Margin	(5.48)	(19.60)	(16.50)	11.63	2.31
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	10.46	14.58	12.79	7.88	9.55
Capital Spending % of Revenue	17.66	11.43	8.68	5.25	9.23
Employees	1,868	2,092	2,056	1,984	2,213
Revenue (F K)/Employee	F 187,821	F 150,447	F 134,887	F 182,907	F 188,073
Capital Spending % of Revenue	16.53	9.74	6.45	4.98	10.19
Exchange Rate (US\$1=F)	F 3.32	F 2.45	F 2.03	F 1.98	F 2.13

NA = Not available

Source: Advanced Semiconductor Materials International N.V.
 Annual Reports and Forms 10-K
 Dataquest (1990)

Canon Incorporated

7-1, Nishi-shinjuku 2-chome
Shinjuku-ku, Tokyo 163, Japan

Telephone: (03) 348-2121

Fax: (03) 349-8957

Dun's Number: 69-054-9662

Date Founded: 1937

CORPORATE STRATEGIC DIRECTION

Canon Incorporated, a Japanese parent/holding company, is the world's largest (in unit sales) maker of copiers and a leading producer of office equipment and cameras. Its business is divided into three product segments—business machines, cameras, and optical and other products—with net sales of 80 percent, 13 percent, and 7 percent, respectively. The Company conducts the majority of its business in Japan, Europe, and North America with approximately 30 percent of net sales coming from each respective region.

The main market factors affecting the Company are trade sanctions, exchange rate risk, and a rapidly expanding global economy. Trade sanctions affect all Japanese companies. Because of increasing anti-Japanese sentiment, European countries have imposed or threatened to impose import restrictions on products manufactured in Japan. Many of Canon's products are affected by these trade sanctions.

Another factor affecting the Company is fluctuating exchange rates. Because of the yen's decline over the past five years, profit margins on exported products have deteriorated. Japanese copier manufacturers have had to raise prices five times since 1987. In 1989 alone, foreign exchange translation adjustments affected Canon by ¥17,928 million (US\$123.4 million).

Last, with a globalizing economy, Canon and other multinational companies are expanding their sales and distribution to worldwide markets. By doing so, they are entering new markets where market demand challenges will be heightened.

In 1987, Canon implemented a five-year "Global Corporation Plan" to address these issues. The plan calls for an increase in international investment and

production, which effectively limits the effects of the trade sanctions because products manufactured outside Japan are not considered "Japanese" products. Rather, they are considered to be native to the country in which they are manufactured. Also, by increasing foreign investment and production, Canon's foreign branches are becoming more self-sufficient, thereby decreasing the number of cross-border transactions and reducing the Company's exposure to interest-rate volatility. By establishing a direct interest in the foreign market, the Company gains a closeness to the market that it would not otherwise be able to achieve.

Going one step further, Canon has begun to emphasize increases in research and development (R&D), joint company ventures, and product sourcing in the foreign markets. These steps are expected to improve the geopolitical relationships that Canon has with the foreign nations and to help its corporate image on an international level.

The Company is financially able to follow this strategy because it conducts business in large foreign markets, which can support large-scale, local production. It also has a significant cash base from which it may make the investments. The Company's cash base is ¥514,312 million (US\$3,729.0 million) with a net working capital to total asset ratio of 30 percent.

The Company's net sales increased by 22.1 percent to ¥1,350,917 million, (US\$9,794.9 million) in fiscal 1989 from ¥1,106,010 million (US\$8,633.3 million) in fiscal 1988. (Percentage changes refer only to ¥ amounts; US\$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Business machines and optical and other products net sales were both up approximately 23.0 percent in fiscal 1989. Contributing to the strong growth were copiers and computer peripherals.

Operating profit surpassed the improvement in sales by increasing 31.9 percent to ¥115,985 million (US\$840.0 million) in fiscal 1989 from ¥87,914 million (US\$686.2 million) in fiscal 1988. The increase was primarily due to the aforementioned increase in net sales as well as the introduction of higher profit margin products. R&D expense increased 15 percent to ¥75,566 million (US\$548.1 million) in fiscal 1989 from ¥65,522 million (US\$511.5 million) in fiscal 1988. However, as a percent of sales, R&D expense remained fairly stable at approximately 6 percent.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Tables 3 and 4, comprehensive financial statements, are at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Copiers

Copiers alone represent over one-quarter of the Company's business. In fiscal 1989, the Company retained its leadership position by capturing 23 percent of the copier market, while its closest competitors, Xerox and Sharp, captured 15 percent and 14.6 percent, respectively. The Company is striving to add value to the basic copier and capture more of the market by implementing editing and full-color capabilities. Some of the outstanding products introduced in 1989 are as follows:

- **Color Laser Copier 500 (CLC-500)**—In 1989, Canon introduced its top of the line digital full-color model, the CLC-500. The 400-dpi printer/copier produces photographic-quality, plain paper copies of color images at a rate of 5 pages per minute (ppm).
- **PS-IPU**—The PS-IPU is a new PostScript language interpreter for the Company's CLC-500 system. This interpreter enables color laser copier users to access, manipulate, and print more than 4,000 different computer software packages that support the PostScript page description language (PDL).
- **Color Bubble-Jet Copier A1**—One of Canon's outstanding new copiers is the Color Bubble-Jet Copier, which last year was sold as an output printer. However, at the 1989 Canon Expo, the copier was presented as a standalone device, capable of producing full-color documents up to 22 x 33 inches that are scanned on the color copier.

Peripherals

The peripheral segment of Canon's product line includes printers and data storage systems. Sales of the computer peripheral segment reached ¥274,048 million (US\$1,987 million) in fiscal 1989.

Canon is one of the leading manufacturers of electronic printers. In 1989, Canon accounted for approximately 80 percent of the less than 10-ppm electronic printer market (the market share figure is based on the machine unit itself, not the brand name). Canon's significant product introductions for 1989 include the following:

- **LBP-4**—The LBP-4 is Canon's first 4-ppm desktop laser beam printer. It has a printing resolution of 300 dpi and is equipped with nine scalable fonts.
- **LBP-8 Mark III series**—The LBP-8 Mark III series is a new series of laser beam printers that use Canon's new page control language, LBP Image Processing System. There are three products in this series, all equipped with scalable fonts, 1.5Mb standard memory, increased software support, and improved vector graphics capabilities.
- **BJ-130e**—The BJ-130e is a bubble-jet printer aimed at the impact matrix printer market. It offers 240-cps printing, automatic sheet feeder, 360-dpi resolution, and built-in Courier and Gothic fonts.

In data storage systems, Canon manufactures large-volume memory systems. One of the Company's products, the MOD, is an innovative small format memory device with a 256MB capacity per side, which is equivalent to 190,000 A4-size pages. The MOD's main application is in computer external storage peripherals. However, the first application of the MOD technology was incorporated in the memory of the NeXT workstation.

Another application of Canon's memory technology is the data card. In 1989, Canon unveiled its new Optical Memory Cards, which improved upon the magnetic and integrated circuit (IC) designs by allowing users to store graphics as well as alphanumeric data. The card's technology embeds optical-recording material onto a 2MB plastic card, immunizing it from static electricity or magnetic forces and making it more difficult to alter. These new cards have a higher storage capacity and cost less to manufacture than their predecessors. Applications for the card include personal identification, personal medical record storage, and security access cards.

Business Systems

The business systems segment of Canon encompasses a broad range of products, including facsimile transceivers, workstations, microcomputers, word processors, and desktop publishing (DTP), micrographics equipment, calculators, and electronic typewriters. The 1989 product introductions include the following:

- **FAX-L6500**—Canon refers to the plain paper FAX-L6500 facsimile transceiver as a Group 4, Class 1 "image terminal" capable of providing networking for Group 3 and 4 facsimiles, making it truly multifunctional. It combines the laser print engine of Canon's 9330 digital copier with a flat-bed scanner and 20MB of hard-disk memory. The user can use this product as a facsimile machine or a full-range copier, capable of reducing or enlarging documents by 35 to 800 percent. Its image editing and output is 30 ppm.
- **FAX-L4600**—This new plain paper laser beam G4 fax machine is designed for high-volume communication. This product provides true networking capabilities by accepting documents from either a G3 or G4 terminal without reprogramming.
- **Navigator**—The most innovative of Canon's new products is the Navigator. This compact, integrated personal workstation has the multifunctional features of a word processor, facsimile transceiver, telephone, IBM-compatible microcomputer, and personal data management—all of which can be operated from the touch of a screen.

- **Bubble-Jet Word Processor and Thermal Transfer Word Processor**—These are compact, all-in-one word processors that do not require a separate printer. They are marketed toward the home office and feature Canon's "nonimpact" printing systems.

Cameras

The camera is what first introduced the Canon name to the world. Along with cameras, Canon is involved in video camcorders, still video, and camera lenses. The camera division accounted for 13.1 percent of total net sales.

Optical Products

The optical product division comprises high-tech, precision products including semiconductor production equipment, broadcasting lenses, and medical equipment. The Company is currently one of the largest suppliers of optical lithography equipment used in semiconductor device manufacturing. Optical products contributed 5 percent to net sales.

Further Information

For further information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$4,006.8	\$5,276.6	\$6,728.5	\$8,633.3	\$9,794.9
Percent Change	-	31.69	27.52	28.31	13.46
Capital Expenditure	\$384.7	\$482.3	\$437.4	\$648.4	\$777.9
Percent of Revenue	9.60	9.14	6.50	7.51	7.94
R&D Expenditure	\$207.2	\$328.3	\$393.3	\$51.1	\$547.9
Percent of Revenue	5.17	6.22	5.84	0.59	5.59
Number of Employees	34,129	35,498	37,521	37,521	44,401
Revenue (\$K)/Employee	\$117.40	\$148.65	\$179.33	\$230.09	\$220.60
Net Income	\$155.3	\$63.7	\$91.1	\$289.6	\$277.6
Percent Change	-	(59.02)	43.10	217.89	(4.13)
Exchange Rate (US\$1=¥)	¥238.54	¥168.52	¥145.16	¥128.11	¥137.92
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	NA	NA	NA	NA	
Quarterly Profit	NA	NA	NA	NA	

NA = Not available

Source: Canon Incorporated
Annual Reports
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	37.87	34.77	32.48	30.24	30.55
International	71.44	69.17	70.27	68.49	69.36
Japan	28.56	30.83	29.73	31.51	30.64
Europe	24.22	27.45	30.48	30.70	31.36
ROW	9.35	6.95	7.31	7.55	7.45

Source: Canon Incorporated
Annual Reports

1989 SALES OFFICE LOCATIONS

North America—4
Europe—13
Asia/Pacific—6
Japan—4
ROW—3

MANUFACTURING LOCATIONS

North America

Canon Business Machines, Inc. (United States)
Produces electronic typewriters and facsimiles, as well as copier and electronic typewriter consumables
Canon Virginia, Inc. (United States)
Manufactures copiers, laser printers, and printer consumables

Europe

Canon Bretagne S.A. (France)
Manufactures electronic typewriters and facsimile transceivers
Canon Giessen GmbH (West Germany)
Manufactures plain paper copiers

Asia/Pacific

Canon Chemical Co., Inc. (Japan)
Produces rollers and blades for copiers
Canon Components, Inc. (Japan)
Manufactures hybrid ICs and other high-tech components
Canon Electronics, Inc. (Japan)
Manufactures precision components such as floppy disk drives, magnetic heads, single lens reflex (SLR) components, and micrographics
Canon Inc. (Taiwan) (Japan)
Manufactures 35mm range-finder cameras and micromotors for audio products
Canon Precision, Inc. (Japan)
Manufactures micromotors used in audio products, video tape recorders, business machines, and computers
Canon Seiko Co., Ltd. (Japan)
Manufactures molded parts and electronic flash guns
Coyer Co. Ltd. (Japan)
Manufactures copiers and copier supplies

Dai-ichi Seiki Kogyo Co., Ltd. (Japan)
Produces cartridges and accessories for copiers
Oita Canon Inc. (Japan)
Manufactures 35mm range-finder cameras

SUBSIDIARIES

North America

Ambassador Office Equipment, Inc. (United States)
Astro Office Products, Inc. (United States)
Canon Canada Inc. (Canada)
Canon U.S.A., Inc. (United States)
MCS Business Machines Inc. (United States)

Europe

Canon Business Machines Belgium N.V./S.A. (Belgium)
Canon Copylux GmbH. (West Germany)
Canon Espana S.A. (Spain)
Canon Europa N.V. (Netherlands)
Canon Euro-Photo Handelsgesellschaft m.b.H. (West Germany)
Canon France S.A. (France)
Canon Gesellschaft m.b.H. (West Germany)
Canon Italia S.p.A. (Italy)
Canon Photo Video France S.A. (France)
Canon Rechner Deutschland GmbH. (West Germany)
Canon Svenska AB (Sweden)
Canon (UK) Ltd. (United Kingdom)
Canon Verkooporganisatie Nederland B.V. (Netherlands)
Oy Canon Ab (Finland)
Selex France S.A. (France)

Asia/Pacific

Canon Australia Pty. Ltd. (Australia)
Canon Copyer Sales, Co., Ltd. (Japan)
Canon Eiken Co., Inc. (Japan)
Canon Hong Kong Trading Co., Ltd. (Hong Kong)
Canon Marketing (Malaysia) Sdn. Bhd. (Malaysia)
Canon Marketing Services Pte. Ltd. (Singapore)
Canon Sales Co., Inc. (Japan)
Canon Singapore Pte. Ltd. (Singapore)
Canon Software Inc. (Japan)
Canon System Sales Co., Inc. (Japan)

ROW

Canon de Brasil Industria e Comercio Limitada (Brazil)
Canon Latin America, Inc. (Panama)
Canon Panama S.A. (Panama)

ALLIANCES, JOINT VENTURES, LICENSING AGREEMENTS

1989

NeXT Incorporated

Canon agreed to be the exclusive distributor of NeXT computers in Asia.

Software Limited

Software Limited agreed to distribute Canon's LBP-4 and LPB-8 III laser printers, as well as the BJ-130 Bubble-Jet printer, in the United Kingdom.

Hewlett-Packard

Canon and Hewlett-Packard agreed to codevelop the specifications for a Japanese language version of the HP NewWave software.

Hitachi, Ltd.

Canon agreed to market Hitachi's high-capacity PBXs (Private Branch Exchanges) in combination with its own Office Automation equipment.

Adobe Systems

Canon licensed the Adobe Systems PostScript interpreter to implement into its own line of printers.

1988

Apple Computers

Canon distributes 80 to 90 percent of all Apple computers sold in Japan.

Eastman Kodak Company

Canon agreed to supply copiers and medical equipment to Kodak.

Intel Corporation

Canon and Intel agreed to jointly develop specialized large-scale integration for copiers. Canon has cosigned production to Intel.

Nippon Typewriter Co., Ltd.

Nippon commissioned the production of Canon's LBP-ST, a compact laser printer.

Ricoh Co., Ltd.

Canon and Ricoh agreed to OEM supply each other with plain paper copiers in order to supplement their respective copier lines.

Computer Automation

Canon acquired the patent rights for micro channel technology from Computer Automation.

1987

Siemens

Canon agreed to supply facsimiles and original bubble-jet printers to Siemens on an OEM and technology license basis.

Olivetti S.p.A. Inc.

Olivetti-Canon Industriale S.p.A. was established by Canon and Olivetti to produce plain paper copiers and laser printers.

National Semiconductor Corporation

National and Canon formed a technology agreement. The first by-product of this agreement is the 1989 LBP-8 Mark III model laser printers.

MERGERS AND ACQUISITIONS

1989

NeXT Incorporated

Canon purchased a 16.7 percent interest in NeXT stock, valued at \$100 million.

New Zealand Canon

DRG sold its New Zealand Canon business machines operations for NZD13.25 million to a newly established subsidiary of Canon.

KEY OFFICERS

Ryuzaburo Kaku

Chairman and representative director

Dr. Keizo Yamaji

President and representative director

Hajime Mitarai

Senior managing and representative director

Kazuo Naito

Senior managing director

Hiroshi Tanaka

Senior managing director

Fujio Mitarai

Senior managing director

Shigeru Nishioka

Senior managing director

Torakiyo Yamanaka

Managing director

Masahiro Tanaka

Managing director

Hideharo Takemoto
Managing director

Takeshi Mitarai
Managing director

Tsuneo Enome
Managing director

Giichi Marushima
Managing director

PRINCIPAL INVESTORS

Dai-Ichi Mutual Life Insurance Co.—6.7 percent
Mitsubishi Trust & Banking Co., Ltd.—4.4 percent
Sumitomo Trust & Banking Co., Ltd.—4.0 percent
Fuji Bank Ltd.—3.5 percent
Yasuda Trust & Banking Co., Ltd.—3.2 percent

Table 3
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$3,061.9	\$4,239.2	\$5,703.2	\$7,499.0	\$8,731.8
Cash	742.0	806.2	1,740.0	3,033.7	3,729.1
Receivables	701.6	1,002.5	1,125.7	1,512.8	1,758.3
Marketable Securities	489.8	734.1	1,061.5	412.5	210.6
Inventory	983.3	1,473.7	1,513.2	2,167.6	2,494.8
Other Current Assets	145.2	222.7	262.9	372.5	538.9
Net Property, Plants	\$902.8	\$1,373.3	\$1,630.2	\$1,999.5	\$2,191.5
Other Assets	\$231.9	\$377.9	\$477.9	\$647.8	\$941.4
Total Assets	\$4,196.5	\$5,990.4	\$7,811.2	\$10,146.3	\$11,864.7
Total Current Liabilities	\$2,004.2	\$2,680.9	\$3,303.1	\$4,695.7	\$5,172.6
Long-Term Debt	\$563.3	\$989.3	\$1,534.7	\$1,608.6	\$2,012.4
Other Liabilities	\$46.4	\$64.8	\$75.1	\$84.9	\$83.0
Total Liabilities	\$2,613.9	\$3,735.0	\$4,913.0	\$6,389.2	\$7,268.0
Total Shareholders' Equity	\$1,582.7	\$2,255.4	\$2,898.2	\$3,757.1	\$4,596.7
Common Stock	726.4	1,079.3	1,517.4	1,845.6	2,367.7
Other Equity	212.8	301.7	396.0	574.6	668.1
Retained Earnings	688.2	990.7	1,190.2	1,575.7	1,669.5
Currency Adjustments	(44.8)	(116.3)	(205.4)	(238.8)	(108.5)
Total Liabilities and Shareholders' Equity	\$4,196.5	\$5,990.4	\$7,811.2	\$10,146.3	\$11,864.7
Income Statement	1985	1986	1987	1988	1989
Revenue	\$4,006.8	\$5,276.6	\$6,728.5	\$8,633.3	\$9,794.9
Japan	1,144.3	1,627.0	2,000.4	2,720.0	3,000.7
International	2,862.5	3,649.7	4,728.1	5,913.3	6,794.3
Cost of Sales	\$1,603.4	\$2,346.6	\$3,248.8	\$4,493.5	\$4,258.5
R&D Expense	\$207.3	\$328.3	\$393.3	\$51.1	\$547.9
SG&A Expense	\$1,439.0	\$1,941.1	\$2,330.1	\$2,942.1	\$3,369.7
Capital Expense	\$384.7	\$482.3	\$437.4	\$648.4	\$777.9
Pretax Income	\$355.4	\$164.7	\$277.2	\$670.0	\$660.5
Pretax Margin (%)	8.87	3.12	4.12	7.76	6.74
Effective Tax Rate (%)	53.40	64.60	62.70	62.70	50.80
Net Income	\$155.3	\$63.7	\$91.1	\$289.6	\$277.6
Shares Outstanding, Thousands	661,142	678,280	679,140	612,489	780,546
Per Share Data					
Earnings	\$0.25	\$0.11	\$0.15	\$0.40	\$0.36
Dividend	\$0.05	\$0.05	\$0.07	\$0.09	\$0.09
Book Value	\$0.0024	\$0.0033	\$0.0043	\$0.0061	\$0.0059
Exchange Rate (US\$1=¥)	¥238.54	¥168.52	¥145.16	¥128.11	¥137.92

Source: Canon Incorporated
 Annual Reports
 Dataquest (1990)

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of Yen, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	¥730,374	¥714,393	¥827,878	¥960,699	¥1,204,283
Cash	176,987	135,860	252,576	388,645	514,312
Receivables	167,359	168,946	163,410	193,800	242,511
Marketable Securities	116,838	123,717	154,085	52,843	29,052
Inventory	234,545	248,349	219,649	277,691	344,077
Other Current Assets	34,645	37,521	38,158	47,720	74,331
Net Property, Plants	¥215,360	¥231,242	¥236,637	¥256,151	¥302,258
Other Assets	¥55,310	¥63,687	¥69,366	¥82,993	¥129,839
Total Assets	¥1,001,044	¥1,009,504	¥1,133,881	¥1,299,843	¥1,636,380
Total Current Liabilities	¥478,092	¥451,780	¥479,483	¥601,562	¥713,399
Long-Term Debt	¥134,366	¥166,722	¥222,784	¥206,083	¥277,556
Other Liabilities	¥11,060	¥10,921	¥10,908	¥10,879	¥11,447
Total Liabilities	¥623,518	¥629,423	¥713,175	¥818,524	¥1,002,402
Total Shareholders' Equity	¥377,526	¥380,081	¥420,706	¥481,319	¥633,978
Common Stock	173,277	181,892	220,273	236,443	326,547
Other Equity	50,765	50,838	57,478	73,607	92,146
Retained Earnings	164,161	166,947	172,766	201,866	230,252
Currency Adjustments	(10,677)	(19,596)	(29,811)	(30,597)	(14,967)
Total Liabilities and Shareholders' Equity	¥1,001,044	¥1,009,504	¥1,133,881	¥1,299,843	¥1,636,380
Income Statement	1985	1986	1987	1988	1989
Revenue	¥955,780	¥889,217	¥976,711	¥1,106,010	¥1,350,917
Japan	272,966	274,174	290,382	348,462	413,854
International	682,814	615,043	686,329	757,548	937,063
Cost of Sales	¥382,481	¥395,445	¥471,592	¥575,659	¥587,329
R&D Expense	¥49,461	¥55,330	¥57,085	¥6,552	¥75,566
SG&A Expense	¥343,269	¥327,108	¥338,231	¥376,915	¥464,747
Capital Expense	¥91,763	¥81,273	¥63,497	¥83,069	¥107,290
Pretax Income	¥84,780	¥27,759	¥40,237	¥85,829	¥91,091
Pretax Margin (%)	8.87	3.12	4.12	7.76	6.74
Effective Tax Rate (%)	53.40	64.60	62.70	62.70	50.80
Net Income	¥37,056	¥10,728	¥13,224	¥37,100	¥38,293
Shares Outstanding, Thousands	661,142	678,280	679,140	612,489	780,546
Per Share Data					
Earnings	¥58.72	¥18.34	¥21.61	¥51.27	¥49.31
Dividend	¥12.50	¥12.50	¥10.00	¥11.36	¥11.93
Book Value	¥0.57	¥0.56	¥0.62	¥0.79	¥0.81

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of Yen, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	1.53	1.58	1.73	1.60	1.69
Quick (Times)	1.04	1.03	1.27	1.14	1.21
Fixed Assets/Equity (%)	57.05	60.89	56.25	53.22	47.68
Current Liabilities/Equity (%)	126.64	118.86	113.97	124.98	112.53
Total Liabilities/Equity (%)	165.16	165.60	169.52	170.06	158.11
<i>Profitability (%)</i>					
Return on Assets	-	1.07	1.32	3.05	2.61
Return on Equity	-	2.83	3.30	8.23	6.87
Profit Margin	3.88	1.21	1.35	3.35	2.83
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	5.17	6.22	5.84	0.59	5.59
Capital Spending % of Revenue	9.60	9.14	6.50	7.51	7.94
Employees	34,129	35,498	37,521	37,521	44,400
Revenue (¥K)/Employee	¥28,005	¥25,050	¥26,031	¥29,477	¥30,425
Capital Spending % of Assets	9.17	8.05	5.60	6.39	6.56
Exchange Rate (US\$1=¥)	¥238.54	¥168.52	¥145.16	¥128.11	¥137.92

Source: Canon Incorporated
Annual Reports
Dataquest (1990)

E. I. du Pont de Nemours and Company

1007 Market Street
Wilmington, Delaware 19898
Telephone: (302) 774-1000
Fax: (302) 724-9560
Dun's Number: 00-1131-5704
Date Founded: 1802

CORPORATE STRATEGIC DIRECTION

E. I. du Pont de Nemours and Company was founded in 1802 and incorporated in Delaware in 1915. The Company consists of six primary business segments: industrial products; fibers; polymers; petroleum; coal; and diversified businesses consisting of electronics, imaging systems, agricultural products, and medical products.

Du Pont has approximately 85 major businesses selling a wide array of products to many different markets that include energy, transportation, textile, construction, electronics, health care, packaging, and agriculture. Business operations of Du Pont and its subsidiaries exist in approximately 60 countries.

Total revenue increased by 10 percent to \$36 billion* in fiscal 1989 from \$33 billion in fiscal 1988. Net income increased 13 percent to \$2.5 billion in fiscal 1989 from \$2.2 billion in fiscal 1988. Du Pont employs 145,787 people worldwide.

R&D expenditure totaled \$1.4 billion in fiscal 1989, representing 4 percent of revenue. Most R&D is performed internally, although some research is accomplished within joint ventures for a few embryonic businesses. R&D focus at present is being placed on health sciences, agricultural products, electronics, new imaging systems, and advanced materials.

Du Pont maintains two large research centers near Wilmington, Delaware: The Experimental Station engages in research of a fundamental, exploratory, and applied nature; the Chestnut Run Laboratories are concerned principally with technical activities related to the end-use performance and requirements of Company products. Du Pont conducts research at facilities

in Ponaca City, Oklahoma, for new products and new petroleum business technology, and in Library, Pennsylvania, for coal businesses. Internationally, major research facilities are located in Canada, Belgium, Germany, Switzerland, and Japan.

Capital spending totaled \$5 billion in fiscal 1989, representing 14 percent of revenue.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Industrial Products

In fiscal 1989, the industrial products business segment had sales of \$3.7 billion. Industrial products comprise a wide range of commodity and specialty products that include white pigments, organic chemicals, polymer intermediates, fluorochemicals, petroleum additives, and mineral acids. These products are used in the construction, transportation, petroleum, agricultural, coatings, paper, cleaning agents, and textile industries.

Fibers

Du Pont produces the most extensive family of man-made fibers in the world. In fiscal 1989, the fibers business segment had sales of \$6 billion. Developed through material and processing expertise, new fiber systems are being used wherever high performance is

*All dollars amounts are in US dollars.

required—from advanced composites to protective apparel, active sportswear, and floor coverings.

Polymer Products

Du Pont's polymer products are used by a wide array of industries that include transportation, packaging chemical processing, construction, electrical/electronics, paper, adhesives, and textiles. Product lines include engineering polymers, ethylene polymers, elastomers, fluoropolymers, films, acrylics, membranes, and fabricated parts. In fiscal 1989, the polymer products business segment had sales of \$5.6 billion.

Petroleum Exploration and Production

In fiscal 1989, the petroleum exploration and production business segment group had sales of \$12.3 billion. Du Pont's petroleum operations are conducted through its Conoco subsidiary. Exploration activities are conducted worldwide, with crude oil produced in the United States, Canada, the United Kingdom, Norway, the Netherlands, Egypt, Dubai, and Indonesia. Natural gas is sold in the United States, Canada, the United Kingdom, and Norway.

Coal

In fiscal 1989, the coal business segment's sales were \$1.8 billion. Du Pont's coal operations are conducted through Consolidated Coal Company (Consol), a subsidiary. Operations consist primarily of mining stream and metallurgical coal that is sold mainly to electric utilities and steel producers in the United States.

Diversified Businesses

The diversified businesses segment consists of electronics, imaging systems, agricultural products, and medical products. In fiscal 1989, the diversified businesses segment had revenue of \$6.2 billion.

Electronics

Du Pont's electronics businesses seek to become a premier supplier of materials and components to the worldwide data processing, telecommunications, and information storage industries. This segment includes materials for electronic circuits; electronic components that include connectors and microelectric packages; information storage media for the audio, video,

and data markets; photographic systems and products for printing and a broad array of industrial applications; finishes for the automotive, chemical, and petroleum industries; and analytical instruments for research and monitoring industrial processes. Du Pont at present ranks among the leaders of the world's broad-based material and components suppliers.

Acquisitions during 1989 concentrated on achieving a leadership position in a relatively new business—photomasks used in producing integrated circuits. New alliances were forged with National Semiconductor, SGS-Thompson, and N.V. Philips to supply them with photomasks. New plants were opened in Europe and North America.

Imaging Systems

In 1989, the imaging systems business used strategic acquisitions to improve its position as one of the top four suppliers to the world's printing industry. Howson-Algraphy, manufacturer of offset plates based in the United Kingdom, was acquired in 1989. Also, this segment expanded with the acquisitions of Imagitex and Camex. These companies provide Du Pont a strong position in the black-and-white prepress markets.

Agricultural Products

Du Pont's agricultural products include fungicides, herbicides, and insecticides.

Medical Products

The medical products segment includes a broad line of medical X-ray products; diagnostic kits, instruments, reagents, and imaging agents; prescription pharmaceuticals; and a wide range of radiolabeled chemicals, biological materials, and instruments used in biomedical research.

Further Information

For more information about the Company's business segments, please contact Dataquest's Semiconductor Equipment and Materials Service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$29,865.0	\$27,421.0	\$30,344.0	\$32,771.0	\$35,991.0
Percent Change	-	(8.18)	10.66	8.00	9.83
Capital Expenditure	\$3,095.0	\$2,939.0	\$3,212.0	\$4,207.0	\$5,092.0
Percent of Revenue	10.36	10.72	10.59	12.84	14.15
R&D Expenditure	\$1,144.0	\$1,156.0	\$1,223.0	\$1,319.0	\$1,387.0
Percent of Revenue	3.83	4.22	4.03	4.02	3.85
Number of Employees	146,017	141,268	140,145	140,949	145,787
Revenue (\$K)/Employee	\$204.53	\$194.11	\$216.52	\$232.50	\$246.87
Net Income	\$1,118.0	\$1,538.0	\$1,786.0	\$2,190.0	\$2,480.0
Percent Change	-	37.57	16.12	22.62	13.24
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	\$8,674.00	\$9,278.00	\$8,589.00	\$8,993.00	
Quarterly Profit	\$736.00	\$714.00	\$547.00	\$483.00	

Source: E. I. du Pont de Nemours and Company
 Annual Reports and Forms 10-K
 Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	67.98	68.41	67.09	66.63	66.31
International	32.02	31.59	32.91	33.37	33.69

Source: E. I. du Pont de Nemours and Company
 Annual Reports and Forms 10-K
 Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	100.00	100.00
Indirect Sales	0	0

Source: Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—80
Europe—15
Asia/Pacific—15
ROW—15

MANUFACTURING LOCATIONS

*North America—35; Europe—1; Asia/Pacific—3;
ROW—5*

Industrial products production activities include Ti-Pure titanium dioxide, Freon fluorocarbons, sodium cyanide, hydrogen peroxide, Adi-Pure adipic acid and other polymer intermediates, sulfuric acid, formaldehyde, methanol, aniline, Tetrathane products, and fuel additives.

*North America—5; Europe—2; Asia/Pacific—4;
ROW—4*

Electronics production activities include connectors and packaging, Riston photoresists, Kapton polyimide film, thick film and semiconductor materials and photomasks, Mylar polyester film, chromium dioxide particles, and optical disks.

North America—8; Europe—3

Imaging systems production activities include Cromalin proofing systems; Howson offset and Cyrel printing plates, chemicals and equipment; Bright Light and other silver-sensitized films and papers; a full line of color electronic systems; and color and black-and-white text systems for news, classified, and display ads for newspapers.

SUBSIDIARIES

North America

Conoco Inc.(United States)
Conoco International (United States)
Conoco Pipeline Company (United States)
Conoco Shale Company (United States)
Consolidated Coal Company (United States)
Continental Overseas Oil Company (United States)

Douglas Oil Company (United States)
Du Pont Canada Ltd. (Canada)
Du Pont Electronic Materials Inc. (Puerto Rico)
Du Pont Pharmaceutical Caribe Inc. (Puerto Rico)
Fairmont Supply Company (United States)
Kayo Oil Company (United States)
Louisiana Gas System Inc. (United States)
Remington Arms Company Inc. (United States)

Europe

Conoco Ireland Ltd. (Ireland)
Conoco Norway Inc. (Norway)
Du Pont de Nemours (Belgium)
Du Pont de Nemours B.V. (Netherlands)
Du Pont de Nemours GmbH (Germany)
Du Pont de Nemours Italiana S.p.A. (Italy)
Du Pont de Nemours International S.A. (Switzerland)
Du Pont de Nemours S.A. (France)
Du Pont de Nemours S.A. (Luxembourg)
Du Pont Iberia S.A. (Spain)
Du Pont Ltd. (United Kingdom)
Du Pont Scandinavia AB (Sweden)

Asia/Pacific

Conoco Irian Jaya Co. (Indonesia)
Du Pont China Ltd. (China)
Du Pont Company Ltd. (Thailand)
Du Pont Electronics Private Ltd. (Singapore)
Du Pont Japan Ltd. (Japan)
Du Pont Ltd. (Australia)
Du Pont Ltd. (New Zealand)
Du Pont Philippines (Philippines)
Du Pont Taiwan Ltd. (Taiwan)

ROW

Du Pont S.A. de C.V. (Mexico)
Du Pont de Brasil S.A. (Brazil)
Du Pont de Colombia S.A. (Colombia)
Du Pont de Venezuela C.A. (Venezuela)
Ducilio S.A. (Argentina)
World Wide Transport Inc. (Liberia)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Hewlett-Packard and Los Alamos National Laboratory

Du Pont, Hewlett-Packard, and the Los Alamos
National Laboratory have agreed to an \$11 million

cooperative superconductivity R&D project. The deal, one of the biggest such pacts between industry and a government research facility, covers a three-year period and initially will be for manufacturing thin-film, high-temperature superconductors for electronics components.

Hanyang Chemical

Du Pont and Hanyang Chemical have received government approval to build a joint-venture titanium dioxide plant in South Korea that will produce 65,000 metric tons per year. Planned start-up is expected in late 1993.

Freshworld and Sunkist Growers

Freshworld, a joint venture of Du Pont and DNA Plant Technology, signed a five-year agreement with Sunkist Growers to distribute produce. Patented packaging and processing techniques developed by the joint venture produce ready-to-eat celery and carrots with a shelf life of 30 days.

Waste Management of North America

Du Pont and Waste Management of North America entered into a joint venture to build a plastics recycling plant in southwest Chicago.

Chemical Exchange Industries

Du Pont acquired worldwide marketing rights for hexamethyleneimine (HMI) from Chemical Exchange Industries.

Merck and Co., Inc.

Du Pont and Merck entered into an agreement calling for Du Pont to receive exclusive marketing rights to Sinemet, a major Parkinson's disease therapy.

Waste Management, Inc.

Du Pont and Waste Management plan joint development of a \$5 million, 100,000-square-foot plastics recycling facility in the Harrowgate section of Philadelphia, Pennsylvania.

1989

Soviet Union

A discussed joint venture would have Du Pont produce and sell chemicals in the Soviet Union and be paid back in crude oil.

Biolistics

Du Pont and Biolistics entered into a licensing agreement that would have Biolistics license its biolistic gene gun technology to Du Pont.

C&C Industries

Du Pont and C&C Industries signed a marine fabrics technical and marketing pact relating to the use of woven Kevlar, along with glass fabrics, in sailboats made by C&C.

MERGERS AND ACQUISITIONS

1990

Seicor

Du Pont acquired Seicor's electronic and optoelectronic LAN component business, which produces connection devices that hook up personal computers to local area networks.

National Semiconductor

Du Pont acquired National Semiconductor's photo-mask operation.

1989

Howson-Algraphy

Du Pont acquired Howson-Algraphy, a leading printing plate manufacturer in the United Kingdom.

KEY OFFICERS

Edgar S. Woolard, Jr.

Chairman of the board, chief executive officer

Constantine S. Nicandros

Executive vice president

Charles L. Henry

Group vice president, Electronics

Mark A. Suwyn

Group vice president, Imaging Systems

J. Edward Newall

Group vice president, International

Alexander MacLachlan

Senior vice president, Technology

PRINCIPAL INVESTORS

Charles R. Bronfman—22.9 percent
Edgar M. Bronfman—22.9 percent

FOUNDERS

Information is not available.

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$8,876.0	\$8,960.0	\$9,953.0	\$10,238.0	\$11,344.0
Cash	583.0	584.0	756.0	603.0	692.0
Receivables	4,044.0	3,771.0	4,376.0	4,815.0	5,298.0
Inventory	3,873.0	4,253.0	4,342.0	4,467.0	4,910.0
Other Current Assets	376.0	352.0	479.0	353.0	444.0
Net Property, Plants	\$15,195.0	\$15,697.0	\$15,854.0	\$17,221.0	\$18,876.0
Other Assets	\$1,069.0	\$2,076.0	\$2,402.0	\$3,260.0	\$4,495.0
Total Assets	\$25,140.0	\$26,733.0	\$28,209.0	\$30,719.0	\$34,715.0
Total Current Liabilities	\$5,311.0	\$5,636.0	\$6,140.0	\$6,696.0	\$9,348.0
Long-Term Debt	\$3,191.0	\$3,227.0	\$3,018.0	\$3,158.0	\$4,080.0
Other Liabilities	\$3,979.0	\$4,496.0	\$4,807.0	\$5,285.0	\$5,489.0
Total Liabilities	\$12,481.0	\$13,359.0	\$13,965.0	\$15,139.0	\$18,917.0
Total Shareholders' Equity	\$12,659.0	\$13,374.0	\$14,244.0	\$15,580.0	\$15,798.0
Converted Preferred Stock	237.0	237.0	237.0	237.0	237.0
Common Stock	401.0	400.0	398.0	399.0	411.0
Other Equity	3,761.0	3,670.0	3,621.0	4,595.0	4,399.0
Retained Earnings	8,260.0	9,067.0	9,988.0	10,349.0	10,751.0
Total Liabilities and Shareholders' Equity	\$25,140.0	\$26,733.0	\$28,209.0	\$30,719.0	\$34,715.0
Income Statement	1985	1986	1987	1988	1989
Revenue	\$29,865.0	\$27,421.0	\$30,344.0	\$32,771.0	\$35,991.0
US Revenue	20,301.0	18,758.0	20,358.0	21,834.0	23,865.0
Non-US Revenue	9,564.0	8,663.0	9,986.0	10,937.0	12,126.0
Cost of Sales	\$17,898.0	\$15,129.0	\$16,613.0	\$17,900.0	\$19,604.0
R&D Expense	\$1,144.0	\$1,156.0	\$1,223.0	\$1,319.0	\$1,387.0
SG&A Expense	\$2,077.0	\$2,350.0	\$2,716.0	\$3,065.0	\$3,377.0
Capital Expense	\$3,095.0	\$2,939.0	\$3,212.0	\$4,207.0	\$5,092.0
Pretax Income	\$3,195.0	\$2,985.0	\$3,588.0	\$3,797.0	\$4,324.0
Pretax Margin (%)	10.70	10.89	11.82	11.59	12.01
Effective Tax Rate (%)	65.00	48.50	50.20	42.30	42.60
Net Income	\$1,118.0	\$1,538.0	\$1,786.0	\$2,190.0	\$2,480.0
Shares Outstanding, Millions	240.6	240.0	238.8	718.3	685.3
Per Share Data					
Earnings	\$4.61	\$6.35	\$2.46	\$3.04	\$3.53
Dividend	\$3.00	\$3.05	\$3.30	\$1.23	\$1.45
Book Value	\$52.61	\$55.73	\$59.65	\$21.69	\$23.05

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	1.67	1.59	1.62	1.53	1.21
Quick (Times)	0.94	0.84	0.91	0.86	0.69
Fixed Assets/Equity (%)	120.03	117.37	111.30	110.53	119.48
Current Liabilities/ Equity (%)	41.95	42.14	43.11	42.98	59.17
Total Liabilities/ Equity (%)	98.59	99.89	98.04	97.17	119.74
<i>Profitability (%)</i>					
Return on Assets	-	5.93	6.50	7.43	7.58
Return on Equity	-	11.82	12.93	14.69	15.81
Profit Margin	3.74	5.61	5.89	6.68	6.89
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	3.83	4.22	4.03	4.02	3.85
Capital Spending % of Revenue	10.36	10.72	10.59	12.84	14.15
Employees	146,017	141,268	140,145	140,949	145,787
Revenue (\$K)/Employee	\$204.53	\$194.11	\$216.52	\$232.50	\$246.87
Capital Spending % of Assets	12.31	10.99	11.39	13.70	14.67

Source: E. I. du Pont de Nemours and Company
 Annual Reports and Forms 10-K
 Dataquest (1990)

Hitachi, Ltd.

6, Kanda-Surugadai
4-chome, Chiyuoda-ku
Tokyo 101, Japan
Telephone: (03) 258-1111
Fax: (03) 253-2186
Dun's Number: 69-054-1503

Date Founded: 1910

CORPORATE STRATEGIC DIRECTION

Hitachi, Ltd., was founded to develop indigenous Japanese electrical power equipment manufacturing technology. Initially, the Company emphasized the development of heavy electrical equipment and industrial machinery. After World War II, Hitachi expanded into the consumer product area and in the 1950s entered the electronics field, producing computers, semiconductors, and other electronic devices.

Over the years, Hitachi continued to expand and diversify the scope of its business activities, which led to the development of the Hitachi Group. The Hitachi Group is made up of Hitachi, Ltd., domestic and overseas, and its subsidiaries and affiliates, including the three major subsidiaries, Hitachi Chemical, Hitachi Metals, and Hitachi Cable. The Hitachi Group companies conduct business in electrical and electronic equipment, metals, metallic products, machinery, chemicals, trading, and transportation.

Hitachi's consolidated revenue of ¥7,077.8 billion (US\$49.7 billion) in the period ending March 31, 1990, increased 10.5 percent from ¥6,401.4 billion (US\$49.9 billion) in 1989. (Percentage changes refer only to ¥ amounts; US\$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Information, Communication Systems, and Electronic Devices were the largest contributors, responsible for 33 percent of revenue with ¥2,318 billion (\$16.3 billion). Overseas computer sales had substantial increases, primarily for large general-purpose machines.

The Japanese domestic sales contribution to Hitachi's total revenue increased to ¥5,420.1 billion (US\$38.0 billion) for the period ending March 31, 1990, up from ¥4,932.3 billion (US\$38.5 billion) in fiscal 1988. In fiscal 1989, domestic sales accounted for about 77 percent of total revenue.

Net income increased by 13.69 percent to ¥211.0 billion (US\$1.5 billion) for the period ending March 31, 1990, compared with ¥185.6 billion (US\$1.4 billion) in fiscal 1988. The improved results were attributed to the Company's steady expansion on a worldwide scale. Hitachi employs more than 290,000 people worldwide.

Research and development expenditure increased to ¥429.4 billion (US\$3.0 billion) and represented 6.0 percent of total revenue for the period. This figure is an increase of 15 percent over the 1988 figure of ¥373.5 billion (US\$2.9 billion). Areas of focus were the development of technologies that will enable Hitachi to respond to future increased processing power, the development of higher speed and packing density technologies for semiconductors, and development of nonsilicon devices.

Capital expenditure for the year ending March 31, 1990, were not available.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Tables 4 and 5, comprehensive financial statements, are at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

Hitachi is the third largest worldwide semiconductor manufacturer with ¥5.09 trillion (US\$3.974 billion, Dataquest exchange rate) in if-sold revenue for calendar 1989, representing a 6.9 percent market share.

Dataquest estimates the Company's single largest market to be Japan, which generates approximately ¥3.48 trillion (US\$2.7 billion), representing 11.8 percent of the market. Dataquest ranks Hitachi third in this market. Hitachi's next largest market is in North America, where Hitachi earned ¥752 billion (US\$587 million) in calendar 1989, ranking eighth and posting a 28 percent increase in revenue generated. Dataquest estimates that Hitachi ranks tenth in Europe with 3 percent of the market and fourth in Rest of World with a 5.8 percent market share in calendar 1989.

Dataquest estimates that the highest growth rate experienced by Hitachi in semiconductors was in BiCMOS semiconductors, which grew by 2,086 percent worldwide. Hitachi's best-selling semiconductor was the MOS memory chip, which accounted for approximately ¥1.96 trillion (US\$13.75 billion) worldwide in calendar 1989. Hitachi's CMOS semiconductors accounted for ¥1.86 trillion (US\$13.05 billion) worldwide in calendar 1989.

Dataquest estimates that the Company ranked second in the Japanese bipolar digital market with a 19.7 percent share. This ranking is based on ¥4.4 billion (US\$345 million) in revenue for calendar 1989. The revenue figures were down 7 percent when compared with the 1988 figures of ¥4.73 billion (US\$369 million), while the total market experienced an 8 percent decrease in sales.

Hitachi has focused on high-value-added products such as 1MB, 4MB, and 16MB DRAMs. However, future revenue may be gained by the Company's increasing efforts on 32-bit MPUs and ASICs. These efforts are part of a corporate goal to expand the Company's product mix and reduce dependence on any one product line.

Hitachi generates significant revenue from its bipolar (ECL) products. In calendar 1989, Hitachi earned ¥1.56 billion (US\$122 million) in revenue from the ECL products.

Computers

In 1989, Hitachi and General Motors Electronic Data Systems bought National Advanced Systems, the mainframe arm of National Semiconductor. The two companies have changed the name of the company to Hitachi Data Systems (HDS).

In 1989, Hitachi had less than 1 percent of the worldwide market share in the personal, business, and

technical computer industry segments. Dataquest estimates that Hitachi had 4.9 percent of the worldwide mainframe market while Hitachi Data Systems controlled 1.8 percent of the market. HDS's Andromeda system, which competes directly with IBM in the United States and elsewhere, is pushing the eventual release of IBM's Summit system.

HDS announced in 1989 extensions to its family of 370 plug-compatible machines (PCMs). The three new machines—the EX 85, EX 310, and EX 420—are upgrades of the existing EX Series. A fourth model was announced in Japan, the M880/220. The announcement precedes the release of HDS's new mainframe, "ZEUS," expected out in 1990.

Other Hitachi computers include the B16 LX XX, the B32 Series, the HL 500 Series, the PROSET 30, the PWS 2020, and the PWS 2050.

Computer Storage

Hitachi is active in two computer storage markets. Dataquest estimates that Hitachi ranks second in the 12-inch WORM optical disk drive market, with a 28 percent share based on 3,400 units shipped. Hitachi is the leader in the CD-ROM optical disk drive market. Hitachi captured 26 percent of this market in 1989 by selling 40,000 units, which generated \$11.8 million in if-sold revenue. Hitachi sold CD-ROMs under its own brand name, as well as through Amdek and Denon via its subsidiary Nippon Columbia.

Printers

Dataquest estimates that in the printer peripheral market, Hitachi is in the lower 25 percent of both line printer and page printer companies. Hitachi had less than 1 percent in these markets in 1989.

Telecommunications

Hitachi is not a very significant competitor in the PBX business communications market. Dataquest estimates that Hitachi ranked tenth in the US PBX market, with a 2.3 percent market share. Hitachi is not considered a major player in the European PBX market.

CAD/CAM

Hitachi holds a 1.4 percent market share by revenue, on a worldwide basis, of the CAD/CAM market. Hitachi has concentrated on the Asian market, which

is responsible for all of its market-generated revenue in 1989. The revenue generated was in turnkey systems and services.

Other Products

Hitachi's Power and Equipment Division witnessed a 10 percent increase in calendar 1989 sales because of expanded sales of thermal plants to power companies. Sales in Hitachi's Consumer Product Division, on the other hand, grew only slightly as a result of a mature VCR market, reduced export levels, and increasing

competition. Revenue in the Industrial Machinery and Plants Division increased 16 percent, primarily because of expanded activities in the construction equipment field. The Wire and Cable, Metals, Chemicals, and Other Products Division witnessed a 10 percent growth in sales over the preceding year.

Further Information

For further information pertaining to the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Billions of US Dollars)

	1986	1987	1988	1989	1990
Five-Year Revenue	\$22.6	\$30.4	\$36.0	\$49.9	\$49.7
Percent Change	-	34.19	18.61	38.48	(0.47)
Capital Expenditure	\$2.0	\$4.1	\$2.3	\$4.2	NA
Percent of Revenue	8.92	13.56	6.44	8.32	0
R&D Expenditure	\$1.3	\$1.9	\$2.3	\$2.9	\$3.0
Percent of Revenue	5.90	6.34	6.51	5.83	6.07
Number of Employees	164,117	161,325	159,910	274,508	290,000
Revenue (\$K)/Employee	\$0.14	\$0.19	\$0.23	\$0.18	\$0.17
Net Income	\$0.4	\$0.6	\$1.0	\$1.4	\$1.5
Percent Change	-	38.67	60.22	46.02	2.34
Exchange Rate (US\$1=¥)	¥221.26	¥159.56	¥138.03	¥128.25	¥142.47

NA = Not available

Source: Hitachi, Ltd.
Annual Reports and Forms 20-F
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1986	1987	1988	1989	1990
Japan	99.86	99.84	76.00	77.05	76.58
International	30.16	26.18	24.00	22.95	23.42

Source: Hitachi, Ltd.
Annual Reports
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989	1990
Direct Sales	30	30	30
Indirect Sales	70	70	70
Distributor	70	70	70

Source: Hitachi, Ltd.
Annual Reports
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—2
Europe—2
Asia/Pacific—11
Japan—50
ROW—9

MANUFACTURING LOCATIONS

North America

High Voltage Breakers, Norcross, Georgia
SF6 gas breakers
Hitachi Automotive Products, Farminghills, Michigan
Electronic auto parts
Hitachi Cable Manchester, Inc., Manchester, New Hampshire
Cables
Hitachi Cable Manchester, Inc., New Albany, Indiana
Automobile brake hose
Hitachi (Canadian), Ltd., Calgary, Alta.
Turbine generator and heavy industrial equipment
Hitachi Computer Products (America), Norman, Oklahoma
Computer products (magnetic disk devices, magnetic tape cartridges)
Hitachi Construction Machinery Corp., Brampton, Ontario
Excavators, cranes, tunnel shield machines
Hitachi Consumer Products of America, Anaheim, California
Color TVs, VCRs
Hitachi Denshi (Canada), Ltd., Scarborough, Ontario
Broadcast and professional video, CCTV equipment, test and instrumentation
Hitachi (HSC) Canada, Inc., Pointe Claire, Quebec
TVs, VCRs, and household electric appliances
Hitachi Semiconductor (America), Irving, Texas
Semiconductors
Hitachi Telecom, Norcross, Georgia
Digital PBXs

Europe

Hitachi Consumer Products (Europe), Germany
VCRs
Hitachi Consumer Products (U.K.), United Kingdom
Color TVs
Hitachi Semiconductor Europe, Germany
Semiconductors

Asia/Pacific

Akita Electronic Co., Akita, Japan
MOS, bipolar IC
Hanshi Electric, Japan
Ignition coils for automobiles
Haramachi Semiconductor Ltd., Ibaraga, Japan
Diodes, thyristors
Hitachi Computer Engineering, Japan
Development of automatic designing systems
Hitachi Consumer Products, Malaysia
TV parts
Hitachi Consumer Products, Singapore
Color TVs, audio equipment, vacuum cleaners
Hitachi Consumer Products, Thailand
Electric fans, refrigerators, TVs, motors, air-conditioners, electric rice cookers
Hitachi Cubu Electric, Japan
Switchboards
Hitachi Denshi, Japan
Communications equipment, measuring instruments, information equipment
Hitachi Electronic Devices, Singapore
Color CRTs
Hitachi Electronics Engineering, Japan
Information equipment, semiconductor devices, energy-saving equipment
Hitachi Elevator Engineering, Singapore
Elevators, escalators
Hitachi Engineering, Japan
Electric/electronic equipment, plant engineering
Hitachi Haramachi Semiconductor, Japan
Semiconductor parts
Hitachi Kiden Kogyo, Japan
Cranes, water treatment equipment, FA-related equipment
Hitachi Kyowa Kogyo, Japan
Electric equipment
Hitachi Maxell, Japan
Dry batteries, magnetic tapes, electronic devices
Hitachi Medical, Japan
Medical equipment
Hitachi Microcomputer Engineering, Tokyo, Japan
MPUs, ASICs
Hitachi Mizusawa, Japan
Transformers for TVs
Hitachi Naka Seiki, Japan
Chromatographic equipment, scientific instruments
Hitachi Nissin Electronics, Japan
Electronic parts
Hitachi Ohira Industrial, Japan
Parts for refrigerators, air conditioners
Hitachi Process Computer Engineering, Japan
Process computers
Hitachi Semiconductor, Malaysia
Semiconductors

Hitachi Setsubi Engineering, Japan
FA equipment
Hitachi Techno Engineering, Japan
Electronic part manufacturing equipment
Hitachi Telecom Technologies, Japan
Switching systems
Hitachi Television, Taiwan
Color TVs, audio equipment, displays
Hitachi Video Engineering, Japan
Development of video equipment
Hitachi Works, Ibaraga, Japan
Discrete devices
Hitachi Yomezawa Electronic, Japan
Semiconductor elements
Hokkai Semiconductor, Hokkaido, Japan
SRAMs
Horiba Ltd., Japan
Electric measuring instruments
Japan Servo, Japan
Precision motors
Jidosha Denki Kogyo, Japan
Electrical auto parts
Kaohsiung Hitachi Electronics, Taiwan
Electronic parts, transistors, LCDs
Kokusai Electric, Japan
Electric communications equipment
Kokusan Denki, Japan
Electrical auto parts, generators, motors
Komoro Works, Nagano, Japan
Photo devices, hybrid ICs
Mobara Works, Chiba, Japan
DRAMs, CMOS logic, LCDs
Musashi Works, Tokyo, Japan
MPUs, diodes, DRAMs, SRAMs
Naka Works, Ibaraga, Japan
Semiconductor sensors, DRAMs, SRAMs
Nakayo Telecommunications, Japan
Telephone and switching systems
Nigata Works, Nigata, Japan
Linear, bipolar digital ICs
Nippon Columbia, Japan
Records, stereos, and other audio equipment
Nissin Electronics Ltd., Ibaraga, Japan
MOS
Taga Sangyo, Japan
Electric equipment
Taiwan Hitachi, Taiwan
Room air-conditioners
Takasaki Works, Gunma, Japan
Bipolar and MOS ICs, EPROMs, CMOS logic

Tobu Semiconductor Ltd., Aomari, Japan
Bipolar ICs
Tobu Semiconductor Ltd., Saitama, Japan
Transistor, hybrid ICs
Tokico Ltd., Japan
Electrical auto parts and equipment
Tokyo Electronics Co., Yamanashi, Japan
Diodes, bipolar ICs
Yagi Antenna, Japan
Antennas
Yomezawa Electronic Co., Yamagata, Japan
MOS

ROW

Industrias Hitachi, Brazil
Distribution equipment, air-conditioners, electronic parts, transformers, switches

SUBSIDIARIES

North America

Hitachi America, Ltd. (United States)
Hitachi Automotive Products (USA), Inc.
(United States)
Hitachi Computer Products (America), Inc.
(United States)
Hitachi Consumer Products of America Inc.
(United States)
Hitachi Semiconductor (America) Inc. (United States)
Hitachi Telecom (USA), Inc. (United States)

Europe

Hitachi Consumer Products Europe Ltd.
(United Kingdom)
Hitachi Semiconductor Europe (Germany)
Hitachi Consumer Products (Europe) (Germany)

Asia/Pacific

Asahi Kogyo Co., Ltd. (Japan)
Babcock-Hitachi K.K. (Japan)
Chuo Shoji, Ltd. (Japan)
Hitachi Air Conditioning & Refrigeration Co., Ltd.
(Japan)
Hitachi Australia Ltd. (Australia)
Hitachi Automobile Appliances Sales Co., Ltd.
(Japan)
Hitachi Cable Ltd. (Japan)
Hitachi Chemical Co., Ltd. (Japan)
Hitachi Construction Machinery Co., Ltd. (Japan)
Hitachi Consumer Products (Malaysia) Sdn. Bhd.
(Malaysia)
Hitachi Consumer Products Pte. Ltd.
Hitachi Credit Corporation (Japan)

Hitachi Electronic Components (Asia) Ltd.
 (Hong Kong)
 Hitachi Electronic Devices (Singapore) Pte. Ltd.
 (Singapore)
 Hitachi Denshi, Ltd. (Japan)
 Hitachi Electronics Engineering Co., Ltd. (Japan)
 Hitachi Electronics Service Co., Ltd. (Japan)
 Hitachi Elevator Engineering and Service Co., Ltd.
 (Japan)
 Hitachi Engineering Co., Ltd. (Japan)
 Hitachi Heating Appliances Co., Ltd. (Japan)
 Hitachi Higashi Shohin Engineering, Ltd. (Japan)
 Hitachi Hokkai Semiconductor, Ltd. (Japan)
 Hitachi Kiden Kogyo, Ltd. (Japan)
 Hitachi Lighting, Ltd. (Japan)
 Hitachi Machinery and Engineering, Ltd. (Japan)
 Hitachi Maxell, Ltd. (Japan)
 Hitachi Medical Corporation (Japan)
 Hitachi Metals, Ltd. (Japan)
 Hitachi Mokuzai Jisho, Ltd. (Japan)
 Hitachi Nishi Shohin Engineering, Ltd. (Japan)
 Hitachi Plant Engineering & Construction Co., Ltd.
 (Japan)
 Hitachi Power Engineering Co., Ltd. (Japan)
 Hitachi Printing Co., Ltd. (Japan)
 Hitachi Sales Corporation (Japan)
 Hitachi Seiko, Ltd. (Japan)
 Hitachi Semiconductor (Malaysia) Sdn. Bhd.
 (Malaysia)
 Hitachi Service Engineering Co., Ltd. (Japan)
 Hitachi Software Engineering Co., Ltd. (Japan)
 Hitachi Techno Engineering Co., Ltd. (Japan)
 Hitachi Telecom Technologies, Ltd. (Japan)
 Hitachi Television, Ltd. (Taiwan)
 Hitachi Tochigi Electronics, Co., Ltd. (Japan)
 Hitachi Tohbu Semiconductor, Ltd. (Japan)
 Hitachi Tokyo Electronics Co., Ltd. (Japan)
 Hitachi Transport System, Ltd. (Japan)
 Hitachi Welfare Service, Ltd. (Japan)
 Japan Servo Co., Ltd. (Japan)
 Nippon Business Consultant Co., Ltd. (Japan)
 Nissei Sangyo Co., Ltd. (Japan)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Comparex Information Systems GmbH

Comparex Information Systems GmbH will ship Hitachi's new Integrated Vector Feature for its 8/9X series of processors.

VLSI Technology Inc.

Hitachi plans to supply SRAMs to VLSI Technology Inc. on an OEM basis. The SRAMs have been jointly developed by the two companies.

Kansai Electric Power Co., Matsushita Electric Industrial Co., Toshiba Corp., Mitsubishi Electric Corp., Sumitomo Electric Industries, Ltd., Kawasaki Heavy Industries, Ltd., and Kobe Steel, Ltd.

Hitachi has agreed to set up a new company by year end, which will perform research and development for free electron lasers with the preceding companies.

Sears and Roebuck

Hitachi agreed to let Sears and Roebuck market its VY15A video printer.

1989

Sun Microsystems

Hitachi will license Sun's Open Network Computing/Network File System technology for implementation on Hitachi's mainframe computers.

Zuken Inc.

Hitachi agreed to allow Zuken to develop CAD/CAM/CAE software packages for the 2050G Series of engineering workstations made by Hitachi.

Adaptive Information Systems (AIS)

AIS has been formed by Hitachi to market document image processing systems using optical storage technology.

Hewlett-Packard

Hewlett-Packard is licensing its proprietary Precision Architecture to Hitachi.

Texas Instruments

Texas Instruments will supply SRAMs to Hitachi on an OEM basis.

GoldStar

Hitachi signed a major pact with South Korea's GoldStar Company covering 1Mb DRAMs, for which Hitachi will provide technical consultations and manufacturing technology. Hitachi will get royalty payments from GoldStar and eventually will buy chips to sell under its own label.

Cray

This agreement gives each company the right to make use of the other's patents in designing computer hardware.

Hewlett-Packard

The two companies will jointly develop a new set of chips using HP's proprietary Precision Architecture RISC MPU technology.

National Semiconductor

Under this production agreement for FACT logic devices, both companies can mutually produce independently defined and independently developed new functions.

MERGERS AND ACQUISITIONS

1990

Dataproducs Corporation

Two Hitachi affiliates, Hitachi Koki and Nissei Sangyo, acquired Dataproducts Corporation for approximately \$160 million. Dataproducts manufactures a broad range of band, dot matrix, laser, solid ink, and thermal printers, and a wide range of printer supplies. Dataproducts is counting on solid ink jet printers to play a significant role in the printer industry and is investing heavily to finance this strategically important technology. The 1988 acquisition of Imaging Solutions, Inc., gave Dataproducts 100 percent ownership of this new technology. Dataproducts had sales of \$353 million in fiscal 1989, an increase of 2 percent over 1988.

1989

National Advanced Systems

Mainframe computers and peripheral subsystems

KEY OFFICERS

Katsushige Mita

President and representative director

Masataka Nishi

Executive vice president and representative director

Shiro Kawada

Executive vice president and director

Yutaka Sonoyama

Executive vice president and director

Sutezo Hata

Executive vice president and director

Takeo Miura

Executive vice president and director

Tsutomu Kanai

Executive vice president and director

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March
(Billions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$14.8	\$21.6	\$27.2	\$38.0	\$37.8
Cash	3.0	5.6	8.0	12.8	12.0
Receivables	4.4	6.3	7.8	10.7	11.2
Marketable Securities	2.2	2.9	3.0	3.0	3.3
Inventory	4.4	5.6	7.0	9.7	9.5
Other Current Assets	0.8	1.1	1.4	1.7	1.8
Net Property, Plants	\$5.4	\$7.4	\$8.2	\$11.5	\$12.0
Other Assets	\$3.1	\$4.4	\$5.3	\$4.6	\$5.0
Total Assets	\$23.3	\$33.4	\$40.7	\$54.1	\$54.8
Total Current Liabilities	\$10.8	\$14.3	\$17.4	\$24.8	\$23.3
Long-Term Debt	\$1.7	\$3.1	\$3.1	\$4.1	\$9.7
Other Liabilities	\$1.4	\$2.2	\$2.8	\$3.8	NA
Total Liabilities	\$13.9	\$19.6	\$23.3	\$32.6	\$33.0
Minority Interests	\$1.5	\$2.3	\$2.8	\$3.7	\$3.9
Total Shareholders' Equity	\$7.9	\$11.4	\$14.6	\$17.8	\$18.0
Common Stock	0.6	0.9	1.3	1.7	1.7
Other Equity	0.8	1.3	1.8	2.5	2.5
Retained Earnings	6.4	9.3	11.5	13.6	13.7
Total Liabilities and Shareholders' Equity	\$23.3	\$33.4	\$40.7	\$54.1	\$54.8
Income Statement	1986	1987	1988	1989	1990
Revenue	\$22.6	\$30.4	\$36.0	\$49.9	\$49.7
Japanese Revenue	22.6	30.3	27.4	38.5	38.0
Non-Japanese Revenue	6.8	8.0	8.7	11.5	11.6
Cost of Sales	\$16.9	\$23.0	\$28.7	\$35.5	\$35.3
R&D Expense	\$1.3	\$1.9	\$2.3	\$2.9	\$3.0
SG&A Expense	\$4.4	\$6.0	\$7.5	\$11.0	\$10.8
Capital Expense	\$2.0	\$4.1	\$2.3	\$4.2	N/A
Pretax Income	\$1.7	\$1.6	\$2.4	\$3.8	\$3.7
Pretax Margin (%)	7.41	5.33	6.66	7.67	7.49
Effective Tax Rate (%)	57.50	57.50	56.10	56.10	56.10
Net Income	\$0.4	\$0.6	\$1.0	\$1.4	\$1.5
Shares Outstanding, Millions	2,803.4	2,816.3	2,921.7	3,017.7	3,418.6
Per Share Data					
Earnings	\$0.23	\$0.21	\$0.32	\$0.46	\$0.43
Dividend	\$0.04	\$0.06	\$0.07	\$0.07	\$0.06
Book Value	0	0	\$0.01	\$0.01	\$0.01
Exchange Rate (US\$1=¥)	¥221.26	¥159.56	¥138.03	¥128.25	¥142.47

Source: Hitachi Ltd.
Annual Reports
Dataquest (1990)

Table 5
Comprehensive Financial Statement
Fiscal Year Ending March
(Billions of Yen, except Per Share Data)

Balance Sheet	1986	1987	1988	1989	1990
Total Current Assets	¥3,276.2	¥3,444.8	¥3,757.4	¥4,870.0	¥5,390.9
Cash	661.7	892.9	1,103.9	1,638.3	1,705.5
Receivables	971.0	1,010.6	1,080.7	1,372.2	1,594.3
Marketable Securities	492.4	470.6	412.3	385.1	473.0
Inventory	980.0	898.5	960.6	1,250.0	1,355.0
Other Current Assets	171.1	172.2	199.9	224.4	263.1
Net Property, Plants	¥1,200.0	¥1,179.1	¥1,133.0	¥1,473.1	¥1,708.9
Other Assets	¥688.0	¥704.1	¥730.7	¥594.4	¥705.3
Total Assets	¥5,164.2	¥5,328.0	¥5,621.1	¥6,937.5	¥7,805.1
Total Current Liabilities	¥2,393.3	¥2,288.5	¥2,399.0	¥3,183.5	¥3,314.9
Long-Term Debt	¥369.7	¥488.9	¥432.8	¥520.9	¥1,380.8
Other Liabilities	¥319.6	¥352.3	¥381.9	¥481.0	NA
Total Liabilities	¥3,082.6	¥3,129.7	¥3,213.7	¥4,185.4	¥4,695.7
Minority Interests	¥338.9	¥372.4	¥388.8	¥470.4	¥548.7
Total Shareholders' Equity	¥1,742.7	¥1,825.8	¥2,018.6	¥2,281.7	¥2,560.7
Common Stock	140.3	141.2	180.3	219.4	246.8
Other Equity	186.5	199.6	244.4	322.0	357.8
Retained Earnings	1,415.9	1,485.0	1,593.9	1,740.3	1,956.1
Total Liabilities and Shareholders' Equity	¥5,164.2	¥5,327.9	¥5,621.1	¥6,937.5	¥7,805.1
Income Statement	1986	1987	1988	1989	1990
Revenue	¥5,010.5	¥4,848.7	¥4,975.0	¥6,401.4	¥7,077.8
Japanese Revenue	3,499.5	3,579.3	3,781.0	4,932.3	5,420.1
Non-Japanese Revenue	1,511.0	1,269.4	1,194.0	1,469.1	1,657.7
Cost of Sales	¥3,741.2	¥3,675.0	¥3,961.9	¥4,552.1	¥5,023.5
R&D Expense	¥295.7	¥307.6	¥324.0	¥373.5	¥429.4
SG&A Expense	¥962.7	¥958.8	¥1,032.4	¥1,416.1	¥1,533.2
Capital Expense	¥447.0	¥657.4	¥320.4	¥532.4	NA
Pretax Income	¥371.1	¥258.3	¥331.1	¥491.1	¥530.0
Pretax Margin (%)	7.41	5.33	6.66	7.67	7.49
Effective Tax Rate (%)	57.50	57.50	56.10	56.10	56.10
Net Income	¥98.7	¥98.7	¥136.8	¥185.6	¥211.0
Shares Outstanding, Millions	2,803.4	2,816.3	2,921.7	3,017.7	3,418.6
Per Share Data					
Earnings	¥50.65	¥33.45	¥44.14	¥58.94	¥61.71
Dividend	¥9.00	¥9.00	¥9.00	¥9.00	¥9.00
Book Value	¥0.62	¥0.65	¥0.69	¥0.76	¥0.75

Table 5 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending March
(Billions of Yen, except Per Share Data)

Key Financial Ratios	1986	1987	1988	1989	1990
<i>Liquidity</i>					
Current (Times)	1.37	1.51	1.57	1.53	1.63
Quick (Times)	0.96	1.11	1.17	1.14	1.22
Fixed Assets/Equity (%)	68.86	64.58	56.13	64.56	66.74
Current Liabilities/Equity (%)	137.33	125.34	118.84	139.52	129.45
Total Liabilities/Equity (%)	176.89	171.42	159.20	183.43	183.37
<i>Profitability (%)</i>					
Return on Assets	-	1.88	2.50	2.96	2.86
Return on Equity	-	5.53	7.12	8.63	8.71
Profit Margin	1.97	2.04	2.75	2.90	2.98
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	5.90	6.34	6.51	5.83	6.07
Capital Spending % of Revenue	8.92	13.56	6.44	8.32	0
Employees	164,117	161,325	159,910	274,508	290,000
Revenue (¥K)/Employee	¥30.53	¥30.06	¥31.11	¥23.32	¥24.41
Capital Spending % of Assets	8.66	12.34	5.70	7.67	0
Exchange Rate (US\$1=¥)	¥221.26	¥159.56	¥138.03	¥128.25	¥142.47

NA = Not available

Source: Hitachi, Ltd.
 Annual Reports
 Dataquest (1990)

Hoechst AG

Postfach 80 03 20
D-6230 Frankfurt am main 80
Federal Republic of Germany
Telephone: (069) 305-0
Fax: (069) 316700
Dun's Number: 31-756-2718

Date Founded: 1863

CORPORATE STRATEGIC DIRECTION

Hoechst AG (The Hoechst Group) comprises six business areas: chemicals and color, fibers and plastic film, polymers, health, engineering and technology, and agriculture. The Company is active in the European Community (EC), North America, Latin America, Africa, and the Asia/Pacific region.

Consolidated revenue increased 12.0 percent to DM 45.9 billion (US\$24.4 billion) in 1989, from DM 41.0 billion (US\$23.5 billion) in 1988. Growth outside Germany proved to be greater, with sales rising 14.0 percent as opposed to sales within Germany increasing 7.0 percent. Chemical sales rose 5.0 percent during 1989 totaling DM 11.6 billion (US\$6.1 billion), representing 25.3 percent of total revenue. (Percentage changes refer only to DM amounts; US\$ percentage changes will differ because of fluctuations in Dataquest exchange rates.)

Revenue in the fibers and plastic film business area increased 16.0 percent and totaled DM 9.0 billion (US\$4.9 billion), representing 19.6 percent of total revenue. In this business area, plastic film generated approximately DM 1.6 billion (US\$851 million), whereas fibers and fiber intermediates generated DM 7.4 billion (US\$3.9 billion).

Revenue from the polymers business area increased approximately 5 percent to DM 7.8 billion (US\$4.1 billion), representing 17 percent of total revenue. Of this total, paints and synthetic resins generated nearly DM 3.3 billion (US\$1.8 billion), and plastics and waxes and engineering plastics generated DM 3.1 (US\$1.6 billion) and DM 1.4 billion (US\$744 million), respectively, for fiscal 1989.

In the health business area, revenue increased 14.0 percent, totaling DM 8.3 billion (US\$4.4 billion) for fiscal 1989. Almost half of the sales were in Western Europe, with 11.0 percent in North America and 14.0 percent in Japan. Sales of pharmaceuticals increased nearly DM 1 billion (US\$531.9 million), reaching approximately DM 8 billion (US\$4.3 billion). Sales in cosmetics remained stable, totaling approximately DM 300 million (US\$159.0 million). Sales in this business area represented 18.1 percent of total revenue.

The engineering and technology business area sales grew 7.0 percent to DM 6.5 billion (US\$3.5 billion), representing 14.2 percent of total revenue for fiscal 1989. The industrial gases and welding technologies total sales were approximately DM 2.0 billion (US\$1.1 billion), showing an 11.0 percent increase over the previous year's total. Technical information systems sales remained stable at DM 1.3 billion (US\$691.5 million), whereas the new carbon products division posted DM 1.0 billion (US\$532.0 million) in sales for fiscal 1989. The plant engineering division and the engineering ceramics division generated DM 500.0 million (US\$266.0 million) and DM 250.0 million (US\$133.0 million) during fiscal 1989, respectively.

The agriculture business area sales increased 14 percent, totaling DM 2.7 billion (US\$1.4 billion) for fiscal 1989. Nearly 93 percent of these sales occurred outside Germany.

Net income increased 5.7 percent in fiscal 1989 to DM 2.1 billion (US\$1.1 billion) from DM 2.0 billion (US\$1.1 billion) in fiscal 1988.

R&D for fiscal 1989 totaled DM 2.6 billion (US\$1.4 billion), representing 5.7 percent of revenue. This is an increase of 8.3 percent over the previous

year's figure of DM 2.4 billion (US\$1.4 billion). Research costs by business area show that the health business area received 44.0 percent of R&D expenditure. Chemicals and color received 13.0 percent, the polymers area received 12.0 percent, agriculture 10.0 percent, and fibers and plastic film 8.0 percent for fiscal 1989. Engineering and technology and central research received 7.0 and 6.0 percent, respectively.

Capital expenditure totaled DM 3.9 billion (US\$2.1 billion) for fiscal 1989, representing 8.4 percent of revenue. This is an 87.3 percent increase from the previous year's figure of DM 2.1 billion (US\$1.2 billion), which represented 5.0 percent of fiscal 1988 revenue.

The Hoechst Group employed 169,295 people at the close of fiscal 1989. Seventy percent of these employees worked in the EC, 15 percent in North America, 7 percent in Latin America, and the remaining 8 percent in the Asia/Pacific and the Rest of World regions.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Tables 3 and 4, comprehensive financial statements, are at the end of this background.

BUSINESS SEGMENT STRATEGIC DIRECTION

Products for Component Equipment

Hoechst has 12 divisions and subsidiaries that serve all areas of microelectronics. The Technical Information Systems Division serves the semiconductor manufacturer market. Materials for photolithography such as AZ positive photoresists, protective coatings, developers and thinners for photoresists, adhesion promoters, and strippers are manufactured by this division. The division provides printed circuit board (PCB) manufacturers with materials for photoprinting and screen printing, such as negative and positive Ozatec dry film, photoresists and liquid photoresists, diazo-duplicating film and screen emulsion, screen stencil films, photosolder masks, and dry film photoresist processing equipment.

Messer Griesheim GmbH provides semiconductor manufacturers with deposition gases like silane, dichlorosilane, nitrous oxide, ammonia, tungsten hexafluoride, and oxygen; and with doping gases like arsine, phosphine, diborane, and boron trifluoride. This division provides gases used in etching, such as tetrafluoromethane, trifluoromethane, silicon tetrafluoride, sulphur hexafluoride, nitrogen trifluoride, chlorine, hydrogen chloride, and boron trichloride. It also supplies storage and transfer equipment for gases, as well as purification and supply systems, including valves, pressure regulators, manifolds, and gas cabinets.

Messer Griesheim GmbH PECO manufactures seal welding machines for metal and ceramic housings for semiconductor and hybrid manufacturers; gap welding machines for bonding for PCB manufacturers; and thin- and thick-film equipment.

Riedel-de Haen AG manufactures VLSI PURANAL, which is the brand name of a product range specially designed for the cleaning and etching processes in VLSI manufacturing. Riedel-de Haen's hydrofluoric acid production also forms the basis for a number of chemicals used in the production of PCBs.

Hoechst's Chemicals Division manufactures chemicals for the doping and production of III/V compounds, as well as inorganic and fluorocarbon gases for doping and plasma etching processes. This division also produces acids, bases, and salts for etching and stripping PCBs; Frigen 113 TR for cleaning, perfluorinated inert fluids for vaporphase soldering and components testing, and lubricants for vacuum pumps.

Ringsdorf Werke GmbH produces high-purity graphite components, such as susceptors, heating elements, heat shields for crystal growth, slicing beams, SiC-coated susceptors for epitaxy, wafer trays for plasma-etched chemical vapor deposition (PECVD), electrodes, diffusers, shields for ion implantation, soldering and glass-to-metal sealing jigs, and pyrolytic boron-nitride components.

The equipment that SIGRI GmbH produces for semiconductor manufacturers includes carbon felts, graphite felts and foils, heating elements, charge carriers, charging equipment, and superstructures for furnaces.

The Hoechst Plastics and Waxes Division manufactures a sealing agent for semiconductor manufacturers. This division also produces fluoropolymers

hostafion as insulating and corrosion-resistant materials for PCB manufacturers. The Plastics and Waxes Division produces heat- and chemical-resistant components for wire and cable insulation, PCB housing, plugs, and insulating components.

Hoechst's Synthetic Resins Division manufactures phenolic and durophen, which are phenolic and epoxy resins. This division also produces Beckopox for laminates.

The Hoechst Films Division produces hostaphan, polyester films, trespaphan, polypropylene films for the component market, and carrier film for audio, video, and computer tapes. This division produces polyester films as base materials for flexible PCBs.

Hoechst CeramTec produces chip carrier and pin grid arrays for the semiconductor market. This division produces ceramic rods and tubes for carbon film, metal film, and wire wound resistors for all leading manufacturers of resistors in the components market.

Herberts produces solder, finishing varnishes, and casting resins for the PCB market.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$14,531.3	\$17,518.0	\$20,531.1	\$23,275.0	\$24,413.8
Percent Change	-	20.55	17.20	13.36	4.89
Capital Expenditure	\$804.4	\$1,234.6	\$1,330.0	\$1,171.0	\$2,057.4
Percent of Revenue	5.54	7.05	6.48	5.03	8.43
R&D Expenditure	\$708.5	\$985.3	\$1,231.7	\$1,372.7	\$1,394.1
Percent of Revenue	4.88	5.62	6.00	5.90	5.71
Number of Employees	180,561	153,651	167,781	164,527	169,295
Revenue (\$K)/Employee	\$80	\$114	\$122	\$141	\$144
Net Income	\$499.3	\$644.7	\$848.9	\$1,144.9	\$1,133.0
Percent Change	-	29.12	31.66	34.87	(1.04)
Exchange Rate (US\$1=DM)	DM 2.94	DM 2.17	DM 1.80	DM 1.76	DM 1.88
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	NA	NA	NA	NA	
Quarterly Profit	NA	NA	NA	NA	

NA = Not available

Source: Hoechst AG
 Annual Reports and Forms 10-K
 Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
German	25.28	28.49	60.19	58.73	57.73
Non-German	74.72	71.51	39.81	41.27	42.27

Source: Hoechst AG
 Annual Reports and Forms 10-K
 Dataquest 1990

SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

Information is not available.

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Chemiefaser Guben

Hoechst and Chemiefaser Guben have signed a letter of intent to establish a joint venture in East Germany to produce polyester tire cord, with Hoechst becoming the majority owner of the joint venture.

BASF and Bayer

Hoechst, BASF, and Bayer will form Entwicklungsgesellschaft fuer die Wiederverwertung von Kunststoffen (EWK), which will be responsible for recycling plastics waste.

Deutsche Wellcome

Hoechst has received marketing rights for Zovirax, an antiviral, from Deutsche Wellcome, a subsidiary of Wellcome Foundation (United Kingdom).

Daicel Chemical Industries, Ltd.

Hoechst and Daicel plan to establish a UK joint venture for the production and marketing of acrylonitrile butadiene styrene (ABS) resin. A production plant will be built in the United Kingdom.

Lucky Goldstar

Hoechst AG and Lucky Goldstar of South Korea have established a joint venture to produce chiefly ultrahigh molecular weight high-density plasma etchant (HDPE) in South Korea. The venture calls for the construction of a plant in South Korea.

Mitsubishi Kasei

Hoechst and Mitsubishi formed a 50/50 dyestuffs joint venture.

MERGERS AND ACQUISITIONS

1990

Benckiser-Knapsack

Joh Benckiser sold its 50 percent share in its joint venture company, Benckiser-Knapsack, to partner Hoechst.

Fincisa, Fibras Sinteticos SA of Portugal

Hoechst has agreed to purchase from Imperial Chemical Industries Plc its 50 percent share in Fincisa, Fibras Sinteticos SA of Portugal. At its Portalegre site, Fincisa produces polyester fiber staple and PET polymer for bottle and packaging applications.

Union Carbide

Union Carbide will sell its primary alcohol ethoxylates business to Hoechst. Applications for primary alcohol ethoxylates include household products such as cleaners and laundry detergents.

Schwarzkopf GmbH

Hoechst has increased its holding in Schwarzkopf to 77 percent. Schwarzkopf operates in the Eastern European cosmetics market.

KEY OFFICERS

R. Sammet

Chairman of the Supervisory Board

R. Brand

Vice chairman of the Supervisory Board

G. Bradeck

Member of the Supervisory Board

E. Bouillon
Member of the Supervisory Board

W. Hilger
Chairman of the Board of Directors

G. Metz
Vice chairman of the Board of Directors

M. Fruhauf
Member of the Board of Directors

H. Gareis
Member of the Board of Directors

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$6,005.6	\$8,366.3	\$8,866.1	\$9,935.8	\$9,899.5
Cash	356.0	1,875.6	946.1	970.5	763.3
Receivables	2,768.1	3,316.3	4,060.6	4,576.1	4,460.1
Marketable Securities	425.7	195.3	499.4	943.8	1,065.4
Inventory	2,455.8	2,979.0	3,360.0	3,445.5	3,610.6
Other Current Assets	0	0	0	0	0
Net Property, Plants	\$3,090.1	\$3,996.6	\$7,118.3	\$7,831.8	\$4,411.6
Other Assets	\$213.5	\$310.5	\$88.3	\$61.9	\$73.9
Total Assets	\$9,309.3	\$12,673.4	\$16,072.8	\$17,829.5	\$14,385.0
Total Current Liabilities	\$2,319.7	\$2,767.6	\$1,286.1	\$1,607.4	\$1,549.5
Long-Term Debt	\$1,235.3	\$1,393.3	\$3,598.9	\$3,497.7	\$3,279.8
Other Liabilities	\$2,433.7	\$3,555.9	\$1,762.2	\$6,264.8	\$6,206.9
Total Liabilities	\$5,988.7	\$7,716.9	\$6,647.2	\$11,369.9	\$11,036.2
Total Shareholders' Equity	\$3,320.6	\$4,956.5	\$9,425.6	\$6,459.7	\$6,701.6
Common Stock	876.9	1,264.5	1,553.9	1,608.5	1,534.0
Other Equity	1,508.0	1,212.4	4,593.3	4,148.3	4,468.1
Retained Earnings	935.7	2,479.7	3,278.3	702.8	699.5
Total Liabilities and Shareholders' Equity	\$9,309.3	\$12,673.4	\$16,072.8	\$17,829.5	\$7,737.8
Income Statement	1985	1986	1987	1988	1989
Revenue	\$14,531.3	\$17,518.0	\$20,531.1	\$23,275.0	\$24,413.8
German Revenue	3,672.8	4,991.7	12,358.3	13,669.9	14,094.1
Non-German Revenue	10,858.5	12,526.3	8,172.8	9,605.1	10,319.7
Cost of Sales	NA	NA	\$12,881.1	\$14,534.1	\$15,572.3
R&D Expense	\$708.5	\$985.3	\$1,231.7	\$1,372.7	\$1,394.1
SG&A Expense	NA	NA	\$4,845.6	\$5,303.4	\$5,542.6
Capital Expense	\$804.4	\$1,234.6	\$1,330.0	\$1,171.0	\$2,057.4
Pretax Income	\$1,073.5	\$1,479.7	\$1,726.7	\$2,321.6	\$2,205.3
Pretax Margin (%)	7.39	8.45	8.41	9.97	9.03
Effective Tax Rate (%)	NA	NA	NA	NA	NA
Net Income	\$499.3	\$644.7	\$848.9	\$1,144.9	\$1,133.0
Shares Outstanding, Millions	63.1	63.1	62.0	62.5	64.1
Per Share Data					
Earnings	\$7.91	\$10.21	\$13.68	\$18.30	\$17.79
Dividend	\$3.40	\$4.61	\$6.11	\$6.82	\$6.91
Book Value	\$52.62	\$78.55	\$152.03	\$103.35	\$104.55
Exchange Rate (US\$1=DM)	DM 2.94	DM 2.17	DM 1.8	DM1.76	DM 1.88

NA = Not available

Source: Hoechst AG
 Annual Reports and Forms 10-K
 Dataquest (1990)

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of Deutsche Marks, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	DM 17,656.6	DM 18,154.9	DM 15,959.0	DM 17,487.0	DM 18,611.0
Cash	1,046.5	4,070.1	1,703.0	1,708.0	1,435.0
Receivables	8,138.3	7,196.4	7,309.0	8,054.0	8,385.0
Marketable Securities	1,251.7	423.9	899.0	1,661.0	2,003.0
Inventory	7,220.1	6,464.5	6,048.0	6,064.0	6,788.0
Other Current Assets	0	0	0	0	0
Net Property, Plants	DM 9,084.9	DM 8,672.7	DM 12,813.0	DM 13,784.0	DM 14,597.0
Other Assets	DM 627.8	DM 673.7	DM 159.0	DM 109.0	DM 139.0
Total Assets	DM 27,369.3	DM 27,501.3	DM 28,931.0	DM 31,380.0	DM 33,347.0
Total Current Liabilities	DM 6,820.0	DM 6,005.8	DM 2,315.0	DM 2,829.0	DM 2,913.0
Long-Term Debt	DM 3,631.8	DM 3,023.5	DM 6,478.0	DM 6,156.0	DM 6,166.0
Other Liabilities	DM 7,155.0	DM 7,716.3	DM 3,172.0	DM 11,026.0	DM 11,669.0
Total Liabilities	DM 17,606.8	DM 16,745.6	DM 11,965.0	DM 20,011.0	DM 20,748.0
Total Shareholders' Equity	DM 9,762.5	DM 10,755.7	DM 16,966.0	DM 11,369.0	DM 12,599.0
Common Stock	2,578.2	2,743.9	2,797.0	2,831.0	2,884.0
Other Equity	4,433.4	2,630.9	8,268.0	7,301.0	8,400.0
Retained Earnings	2,750.9	5,380.9	5,901.0	1,237.0	1,315.0
Total Liabilities and Shareholders' Equity	DM 27,369.3	DM 27,501.3	DM 28,931.0	DM 31,380.0	DM 33,347.0
Income Statement	1985	1986	1987	1988	1989
Revenue	DM 42,722.0	DM 38,014.0	DM 36,956.0	DM 40,964.0	DM 45,898.0
German Revenue	10,798.0	10,832.0	22,245.0	24,059.0	26,497.0
Non-German Revenue	31,924.0	27,182.0	14,711.0	16,905.0	19,401.0
Cost of Sales	NA	NA	DM 23,186.0	DM 25,580.0	DM 29,276.0
R&D Expense	DM 2,083.0	DM 2,138.0	DM 2,217.0	DM 2,416.0	DM 2,621.0
SG&A Expense	NA	NA	DM 8,722.0	DM 9,334.0	DM 10,420.0
Capital Expense	DM 2,365.0	DM 2,679.0	DM 2,394.0	DM 2,061.0	DM 3,868.0
Pretax Income	DM 3,156.0	DM 3,211.0	DM 3,108.0	DM 4,086.0	DM 4,146.0
Pretax Margin (%)	7.39	8.45	8.41	9.97	9.03
Effective Tax Rate (%)	NA	NA	NA	NA	NA
Net Income	DM 1,468.0	DM 1,399.1	DM 1,528.0	DM 2,015.0	DM 2,130.0
Shares Outstanding, Millions	63.1	63.1	62.0	62.5	64.1
Per Share Data					
Earnings	DM 23.27	DM 22.16	DM 24.63	DM 32.21	DM 33.44
Dividend	DM 10.00	DM 10.00	DM 11.00	DM 12.00	DM 13.00
Book Value	DM 154.71	DM 170.45	DM 273.65	DM 181.90	DM 196.55

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of Deutsche Marks, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	2.59	3.02	6.89	6.18	6.39
Quick (Times)	1.53	1.95	4.28	4.04	4.06
Fixed Assets/Equity (%)	93.06	80.63	75.52	121.24	115.86
Current Liabilities/Equity (%)	69.86	55.84	13.64	24.88	23.12
Total Liabilities/Equity (%)	180.35	155.69	70.52	176.01	164.68
<i>Profitability (%)</i>					
Return on Assets	-	5.10	5.42	6.68	6.58
Return on Equity	-	13.64	11.02	14.22	17.77
Profit Margin	3.44	3.68	4.13	4.92	4.64
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	4.88	5.62	6.00	5.90	5.71
Capital Spending % of Revenue	5.54	7.05	6.48	5.03	8.43
Employees	180,561	153,651	167,781	164,527	169,295
Revenue (DM K)/Employee	DM 237	DM 247	DM 220	DM 249	DM 271
Capital Spending % of Assets	8.64	9.74	8.27	6.57	11.60
Exchange Rate (US\$1=DM)	DM 2.94	DM 2.17	DM 1.8	DM 1.76	DM 1.88

NA = Not available

Source: Hoechst AG
 Annual Reports and Forms 10-K
 Dataquest (1990)

KLA Instruments Corporation

3506 Bassett Street
Santa Clara, California 95054
Telephone: (408) 988-6100
Fax: (415) 659-1560
Dun's Number: 01-093-6193

Date Founded: 1975

CORPORATE STRATEGIC DIRECTION

KLA Instruments Corporation designs, manufactures, markets, and services automated optical inspection equipment used primarily by the semiconductor and interconnect industries in the production of all types of integrated circuits and printed circuit boards (PCBs). The need for automation arises from the complex patterns with decreasing feature dimensions that must be inspected during manufacturing.

The Company's customers are semiconductor manufacturers, photomask producers, PCB manufacturers, and other companies primarily in the computer, telecommunications, and automation industries that manufacture LSI and VLSI circuits for use in their own products. The Company markets its systems in the United States, Canada, and Europe through its own sales organization.

Total revenue increased by 47 percent to \$165.5 million in fiscal 1989, from \$112.9 million* in fiscal 1988. Net income increased substantially to \$11.7 million in fiscal 1989, from \$887,000 in fiscal 1988. KLA employs 991 people worldwide.

Research and development expenditures totaled \$25.1 million in fiscal 1989, representing 15 percent of revenue. The Company entered into research and development contracts with four partnerships, organized from 1981 to 1986, to develop certain new technologies—wholly owned subsidiaries of the Company are general partners in these partnerships. Approximately 25 percent of the Company's work

force is engaged in engineering, research, and development.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

The Company's business activities are organized into four operating divisions and one research and development laboratory responsible for the application of the Company's image-processing technology. These groups are named the Reticle and Photomask Inspection Division (RAPID); the Wafer Inspection System for the Automatic Recognition of Defects Division (WISARD); the Automated Test Systems Division (ATS); the KLA Scanning, Inspection, and Classification Division (KLASIC); and the Company's Advanced Development Laboratory.

RAPID Division

The RAPID Division manufactures, sells, and services the KLA 100 and KLA 200 Series systems, which are the product lines. In 1989, the RAPID Division introduced the KLA 210e Automatic Reticle Inspection System, which can detect smaller defects than any previous or competing systems. Also in 1989, RAPID began deliveries of the KLA-259 System, which inspects images on transparent (quartz) substrates.

*All dollar amounts are in U.S. dollars.

WISARD Division

The WISARD Division manufactures, sells, and services the KLA 2020, KLA 2028, KLA 2029, and the KLA 2030 and KLA 2031. The KLA 2020 is the older-generation model, which has both inspection and critical-dimension measurement (CD) capability. CD is the measurement of the circuit and line dimensions on the wafer, which are typically on the order of one micron or less. The KLA 2028 and KLA 2030 models are the newer-generation products with higher resolution, which offer inspection speeds up to 15 times greater than the KLA 2020 and CD capabilities either independently or in one machine. In 1989, WISARD announced the KLA 2029 for use in defect detection and the KLA 2031 for use in defect detection and metrology by manufacturers of 4Mb dynamic random-access memory (DRAM) chips. The trend toward denser, multilayer circuits and dramatically reduced line widths resulted in the development of the KLA 5000 Coherence Probe Metrology System.

ATS Division

The ATS Division manufactures, sells, and services the KLA 1007 wafer prober, the KLAASP, the KLA 1500 Networking Controller, and the Emission Microscope for Multilayer Inspection (EMMI). The ATS Division's products address the finished chip in wafer tests and assembly, with a microscopic probe

that inspects the wafer both optically and electronically. Additionally, the wafer also can be inspected to determine whether the probe itself is causing damage to the wafer.

KLASIC Division

The KLASIC Division manufactures, sells, and services the KLA 3000 Series Systems. These products optically inspect PCB layers at all interconnect points under varying surface conditions. The KLA 3000 Series provides one of the fastest throughput rates in the automatic PCB-inspection market. In 1989, the KLASIC Division introduced the CAM-300 Series, which generates PCB images by computer-aided design (CAD). KLA believes that the CAM-3000 Series will provide a high-performance central node for future integrated data networks.

KLA Advanced Development Laboratory

The KLA Advanced Development Laboratory is the central engineering, research, and development laboratory of the Company.

Further Information

For more information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Thousands of U.S. Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$62,878.0	\$82,526.0	\$88,194.0	\$112,851.0	\$165,459.0
Percent Change	-	31.25	6.87	27.96	46.62
Capital Expenditure	\$4,452.0	\$2,999.0	\$2,869.0	\$9,289.0	\$10,692.0
Percent of Revenue	7.08	3.63	3.25	8.23	6.46
R&D Expenditure	\$10,734.0	\$10,141.0	\$8,655.0	\$13,714.0	\$25,087.0
Percent of Revenue	17.07	12.29	9.81	12.15	15.16
Number of Employees	560	660	760	861	991
Revenue (\$K)/Employee	\$112.28	\$125.04	\$116.04	\$131.07	\$166.96
Net Income	\$8,802.0	\$9,854.0	\$7,489.0	\$887.0	\$11,678.0
Percent Change	-	11.95	(24.00)	(88.16)	1,216.57
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	\$42,000.00	\$43,160.00	\$40,200.00	NA	
Quarterly Profit	\$2,920.00	\$3,110.00	\$2,500.00	NA	

N/A = Not available

Source: KLA Instruments
 Annual Reports and Forms 10-K
 Dataquest
 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	51.00	68.00	80.22	50.17	52.27
International	49.00	32.00	19.78	49.83	47.73
Japan	-	-	00	2.00	7.00
Europe	-	-	18.00	26.00	17.00
Asia/Pacific	-	-	-	21.00	24.00
ROW	-	-	-	-	-

Source: KLA Instruments
 Annual Reports

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	77.00	76.00
Indirect Sales	23.00	24.00
VARs	-	-
Distributors	21.00	17.00
Dealers	-	-
Mass Merchandisers	2.00	7.00
Manufacturers' Representatives	-	-

Source: Dataquest
 1990

1989 SALES OFFICE LOCATIONS

North America—1
Europe—3
Japan—2
ROW—1

MANUFACTURING LOCATIONS

North America

San Jose, California
Santa Clara, California

Europe

Coburg, West Germany

ROW

Migdal Ha'mek, Israel

Manufacturing activities include high-speed image processors, air-bearing stages, image digitizers and optical systems. Other manufacturing activities consist primarily of assembling standard parts and subsystems manufactured to its specifications into subassemblies that are, in turn, assembled into finished product.

SUBSIDIARIES

North America

KLA Building Corporation (United States)
KLA Instruments KLINNIK Corporation (United States)
KLA Instruments Sales Corporation (U.S. Virgin Islands)
KLA International Corporation (United States)
KLA Management Corporation (United States)
KLA PCBI Corporation (United States)

Japan

KLA Technology Center Limited

Europe

KLA Instruments France S.A. (France)
KLA Instruments GmbH (West Germany)
KLA Instruments Ltd. (United Kingdom)

ROW

KLA Instruments (Cayman) Ltd. (British West Indies)
KLA Instruments (Israel) Corporation (Israel)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Kenneth Levy

President, chief executive officer

Robert R. Anderson

Chairman of the board, chief financial officer

Robert J. Boehlke

Executive vice president, chief operating officer

Paul Sandland

Senior vice president, chief technical officer

PRINCIPAL INVESTORS

State Farm Mutual Automobile Insurance Co.—
8.4 percent
Levy, Kenneth—7.4 percent

Table 4
Comprehensive Financial Statement
Fiscal Year Ending June
(Thousands of U.S. Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$56,745.0	\$73,331.0	\$79,567.0	\$103,823.0	\$126,421.0
Cash	15,308.0	12,204.0	15,248.0	9,917.0	18,153.0
Receivables	15,466.0	20,951.0	23,216.0	40,819.0	54,183.0
Marketable Securities	6,827.0	13,277.0	10,605.0	14,491.0	8,755.0
Inventory	18,440.0	26,195.0	29,172.0	36,717.0	42,480.0
Other Current Assets	704.0	704.0	1,326.0	1,879.0	2,850.0
Net Property, Plants	\$8,891.0	\$8,992.0	\$8,408.0	\$14,590.0	\$20,024.0
Other Assets	\$14,967.0	\$15,854.0	\$27,523.0	\$16,212.0	\$14,309.0
Total Assets	\$80,603.0	\$98,177.0	\$115,498.0	\$134,625.0	\$160,754.0
Total Current Liabilities	\$16,509.0	\$20,477.0	\$24,757.0	\$31,477.0	\$42,269.0
Long-Term Debt	-	-	-	-	-
Other Liabilities	\$1,453.0	\$2,104.0	\$3,696.0	\$5,684.0	\$7,468.0
Total Liabilities	\$17,962.0	\$22,581.0	\$28,453.0	\$37,161.0	\$49,737.0
Total Shareholders' Equity	\$62,641.0	\$75,596.0	\$87,045.0	\$97,464.0	\$111,017.0
Converted Preferred Stock	-	-	-	-	-
Common Stock	17.0	17.0	17.0	18.0	18.0
Other Equity	42,331.0	45,432.0	49,392.0	50,983.0	52,858.0
Retained Earnings	20,293.0	30,147.0	37,636.0	46,463.0	58,141.0
Total Liabilities and Shareholders' Equity	\$80,603.0	\$98,177.0	\$115,498.0	\$134,625.0	\$160,754.0
Income Statement	1985	1986	1987	1988	1989
Revenue	\$62,878.0	\$82,526.0	\$88,194.0	\$112,851.0	\$165,459.0
U.S. Revenue	32,068.0	56,118.0	70,745.0	56,620.0	86,479.0
Non-U.S. Revenue	30,810.0	26,408.0	17,449.0	56,231.0	78,980.0
Cost of Sales	\$28,981.0	\$44,008.0	\$51,076.0	\$67,269.0	\$91,173.0
R&D Expense	\$10,734.0	\$10,141.0	\$8,655.0	\$13,714.0	\$25,087.0
SG&A Expense	\$12,076.0	\$14,001.0	\$14,924.0	\$19,637.0	\$31,136.0
Capital Expense	\$4,452.0	\$2,999.0	\$2,869.0	\$9,289.0	\$10,692.0
Pretax Income	\$14,442.0	\$16,845.0	\$12,777.0	\$13,876.0	\$17,966.0
Pretax Margin (%)	22.97	20.41	14.49	12.30	10.86
Effective Tax Rate (%)	39.00	41.50	41.30	36.40	35.00
Net Income	\$8,802.0	\$9,854.0	\$7,489.0	\$887.0	\$11,678.0
Shares Outstanding, Thousands	17,509.0	17,702.0	17,787.0	18,006.0	7,934.0
Per Share Data					
Earnings	\$0.50	\$0.56	\$0.42	\$0.49	\$0.65
Dividends	-	-	-	-	-
Book Value	\$3.58	\$4.27	\$4.89	\$5.41	\$13.99

Table 4 (Continued)
 Comprehensive Financial Statement
 Fiscal Year Ending June
 (Thousands of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	3.44	3.58	3.21	3.30	2.99
Quick (Times)	2.32	2.30	2.04	2.13	1.99
Fixed Assets/Equity (%)	14.19	11.89	9.66	14.97	18.04
Current Liabilities/Equity (%)	26.35	27.09	28.44	32.30	38.07
Total Liabilities/Equity (%)	28.67	29.87	32.69	38.13	44.80
<i>Profitability (%)</i>					
Return on Assets	-	11.02	7.01	0.71	7.91
Return on Equity	-	14.26	9.21	0.96	11.20
Profit Margin	14.00	11.94	8.49	0.79	7.06
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	17.07	12.29	9.81	12.15	15.16
Capital Spending % of Revenue	7.08	3.63	3.25	8.23	6.46
Employees	560	660	760	861	991
Revenue (\$K)/Employee	\$112.28	\$125.04	\$116.04	\$131.07	\$166.96
Capital Spending % of Assets	5.52	3.05	2.48	6.90	6.65

Source: KLA Instruments
 Annual Reports and Forms 10-K
 Dataquest
 1990

Lam Research Corporation

4650 Cushing Parkway

Fremont, California

Telephone: (415) 659-0200

Fax: (415) 659-1560

Dun's Number: 03-813-7956

Date Founded: 1980

CORPORATE STRATEGIC DIRECTION

Lam Research Corporation develops, manufactures, markets, and services semiconductor wafer processing capital equipment used in the production of very large-scale integrated (VLSI) circuits. The Company's wafer fabrication equipment is designed to meet the demands of semiconductor manufacturers by offering reliable automated equipment with low particle contamination levels and high levels of process integration.

Lam Research markets and sells single wafer plasma etch systems through its Lam Research Etch Division and epitaxy wafer processing equipment through its Gemini Epitaxy Equipment Division. However, the Company has recently announced a decision to remove itself slowly from the epitaxy market.

The Company's current product market focus is on equipment for silicon epitaxy and dry etch, which are key wafer fabrication technologies. The Company's products are targeted at independent semiconductor device manufacturers that sell their semiconductor devices to others (merchants) and to computer, telecommunications, and other companies that manufacture semiconductors for use in their own products (captives).

Total revenue increased 68 percent to \$126.0 million* in fiscal 1989 from \$74.9 million in fiscal 1988. Net income increased 271 percent to \$9.3 million in fiscal 1989 from \$2.5 million in fiscal 1988. Lam Research employs 731 people worldwide.

R&D expenditure totaled \$21.9 million in fiscal 1989, representing 17 percent of revenue. Lam's current R&D efforts are directed at improvements to its existing etch and epitaxy product lines and at the

development of a new chemical vapor deposition (CVD) system. As part of the Company's efforts to develop a CVD system, it has acquired a portion of Monkowski-Rhine Inc. (MRI) and entered into an investment and R&D agreement. MRI engages in the development, design, and process development of the CVD of thin films used in semiconductor device fabrication. Pursuant to the R&D agreement, Lam Research employed MRI to develop a CVD system.

Process technology is essential to success in this industry. More than one-quarter of Lam's facilities are dedicated to advanced research and process development. Lam employs over 100 process engineers and researchers who work in partnership with customers, consortia, and industry leaders. Key relationships with Du Pont, Sematech, Sumitomo Metal Industries, Ltd. (SMI), and other major customers allows Lam to anticipate future process requirements and maintain the process advantages.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Table 3, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Etch Products

Dataquest estimates that the sale of dry etch products raised \$85.6 million for Lam Research during 1989. The Company's largest single market was in North America, which accounted for 51.4 percent of sales, or \$44 million. Lam's second largest market was Rest of World, where the Company held a 37.3 percent

*All dollar amounts are in US dollars.

share. Dataquest estimates that Lam had a 13.5 percent share of the worldwide dry etch market for 1989.

Lam manufactures two families of single wafer etch systems: the AutoEtch and Rainbow etchers. Designed to meet the full range of etch applications, the AutoEtch series includes the AutoEtch 490, 590, 690, and 790, for etching polysilicon, nitrides, silicides, refractory metals, oxides, and aluminum.

The Rainbow series (Lam's flagship product) of etchers is designed to respond to the demands of the semiconductor manufacturers to increase total circuit density and speed without sacrificing manufacturing yield or device reliability. Lam Research claims that the Rainbow's design and process capability provide its users with reduced particulate contamination and improved selectivity, etch repeatability, uniformity, system reliability, and the ability to process wafer sizes up to 8 inches in diameter.

Electron cyclotron resonance (ECR) is one of the possible techniques capable of depositing films with high aspect ratios for intermetal dielectrics—crucial in 64 and 256Mb devices. Currently, Lam markets and supports the ECR systems designed and manufactured by its Japanese trading partner, SMI.

With the continued growth of multilayer integrated circuits regulating the requirements for unconventional CVD tools, Lam has incorporated unique technologies into a low-pressure CVD system introduced in fall 1990.

Epitaxy Products

In revenue, Lam held a dominant position in the \$72 million 1989 epitaxy market when compared with other manufacturers. Dataquest estimates that the sale of epitaxy products generated \$25.7 million in worldwide revenue for Lam in 1989, giving it a 35.7 percent share of the market. Recently, LAM has decided to remove itself slowly from this market in favor of the more lucrative etching market.

Lam manufactures a series of epitaxy products: the Gemini-1 and Gemini-2 Reactors, the Tetron One Reactor, and the Gemini-3. The Gemini-1 and Gemini-2 are high-performance epitaxy reactors capable of addressing a wide range of process, device, and production volume variations. The Gemini-1, which is available in three different models, has the capability to process wafers up to 6 inches in diameter. The Gemini-2, which is also available in three different models, has higher productivity and processes wafers up to 8 inches in diameter. The Gemini-1 and Gemini-2 Reactors also are capable of processing thick polysilicon films required for radiation-hardened circuits and certain communications switching devices demanding long process times at high temperatures.

As of 1988, the Tetron One Reactor is believed to be the largest epitaxy reactor, with a load size of fifty 5- or 6-inch diameter wafers. The Tetron One is targeted at the MOS-on-epitaxy market, where large numbers of wafers are expected to be manufactured to a relatively small number of specifications in the centralized materials operations of larger device companies and silicon materials manufacturers. The Tetron One system consists of a large single-process chamber. It offers productivity advantages of two to five times those of the Gemini-2. The Tetron One is fully automated, with cassette-to-cassette wafer handling.

The Gemini-3 is an advanced version of the Gemini-1 and Gemini-2 Reactors. Its design provides improved uniformity, lower maintenance cost, robotic wafer handling, and advanced computer control. The Gemini-3 is targeted at advanced bipolar and BiC-MOS wafer fabrication, where process control, uniformity, and particle contamination are major concerns. The Gemini-3 is also targeted at the application-specific integrated circuit (ASIC) market.

Further Information

For more information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$62,816.0	\$46,739.0	\$35,468.0	\$74,963.0	\$126,048.0
Percent Change	-	(25.59)	(24.11)	111.35	68.15
Capital Expenditure	-	-	-	-	-
Percent of Revenue	0	0	0	0	0
R&D Expenditure	\$5,181.0	\$13,883.0	\$12,809.0	\$15,749.0	\$21,852.0
Percent of Revenue	8.25	29.70	36.11	21.01	17.34
Number of Employees	288	323	440	558	731
Revenue (\$K)/Employee	\$218.11	\$144.70	\$80.61	\$134.34	\$172.43
Net Income	\$7,133.0	(\$900.0)	(\$6,908.0)	\$2,505.0	\$9,302.0
Percent Change	-	(112.62)	667.56	(136.26)	271.34
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	\$33.58	\$34.24	\$37.40	\$35.72	
Quarterly Profit	\$2.54	\$2.65	\$2.30	\$2.35	

Source: Lam Research Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	87.40	55.04	61.75	62.20	56.03
International	12.60	44.96	38.25	37.80	43.97
Europe	3.60	17.96	20.25	13.80	10.97
Asia/Pacific	9.00	27.00	18.00	24.00	33.00
Japan	9.00	21.00	16.00	19.00	31.00

Source: Lam Research Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—10
Europe—2
Asia/Pacific—3
Japan—2

MANUFACTURING LOCATIONS

North America

Fremont, California

Lam Research maintains two separate manufacturing facilities for the Lam Research Etch Division and the Gemini Epitaxy Equipment Division. The Company's manufacturing activities consist of assembling and testing components and subassemblies that then are integrated into finished systems. Prior to shipping a completed etching process system, the customer's engineers may perform acceptance tests at Lam's facility, using the customer's own wafers.

Epitaxy products are tested similarly, but only for electromechanical function. Because of contamination issues, process chemicals are not introduced into the epitaxy reactor until it is installed at the customer's location.

SUBSIDIARIES

North America

Gemini Research (United States)
LRC International Inc. (United States)

Europe

Lam Research GmbH (Germany)
West Germany Monkowski-Rhine Inc. (Germany)

Asia/Pacific

Lam Research Ltd. (Japan)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Perkin-Elmer Corporation

Lam Research and Perkin-Elmer entered a patent purchase and sales agreement.

Sematech

LAM Research and Sematech agreed to codevelop an enhanced metal etch system exclusively for sale to Sematech members. The agreement involves the use of each other's facilities and personnel.

Du Pont

Lam Research and Du Pont agreed to codevelop a future generation of etch systems. The five-year agreement also calls for exchanging technology regarding the process of etchant gases. The technology that results will be sold by each firm separately.

Brookside Software

Lam Research received an exclusive distribution contract to market LamStation, a software program developed by Brookside Software. LamStation is a data acquisition program tailored for Lam Research's AutoEtch plasma etch equipment and performs data analysis control process monitoring.

1988

Sumitomo Metal Industries Ltd. (SMI)

Lam Research and SMI entered into a licensing agreement calling for SMI to market Lam's Rainbow line of plasma etching systems in Japan. Also, LAM will market and service SMI's new ECR systems in North America and Europe.

1987

Tokyo Electron, Ltd.

Lam Research and Tokyo Electron converted their joint venture agreement to a five-year licensing and consulting agreement. As a result, Lam Research recorded a gain of \$940,000 from the sale of its 50 percent equity position in the joint venture.

MERGERS AND ACQUISITIONS

1989

Monkowski-Rhine Inc. (MRI)

Lam Research acquired MRI, a maker of semiconductor equipment.

1988

Gemini Research

Lam Research acquired Gemini Research, a manufacturer of capital equipment for the semiconductor industry.

KEY OFFICERS

Roger D. Emerick

President and chief executive officer

Carl A. Kountz

Chief operating officer, Lam Research Corporation, and president, Etch Division

Osamu Kano

Senior vice president, Japan Operations

Joseph R. Monkowski

Senior vice president, chief technical officer

Bruce Rhine

Vice president, Marketing

PRINCIPAL INVESTORS

Merrill Pickard Anderson & Eyre I—7.7 percent
Fiduciary Management Inc.—5.2 percent

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement
Fiscal Year Ending June
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$44,511.0	\$41,898.0	\$48,607.0	\$54,079.0	\$79,514.0
Cash	30,893.0	23,383.0	25,814.0	11,836.0	14,579.0
Receivables	6,093.0	9,585.0	8,681.0	19,961.0	31,884.0
Inventory	6,622.0	6,284.0	12,033.0	21,408.0	30,610.0
Other Current Assets	903.0	2,646.0	2,079.0	874.0	2,441.0
Net Property, Plants	\$3,205.0	\$4,009.0	\$7,322.0	\$10,070.0	\$12,901.0
Other Assets	\$673.0	\$2,322.0	\$1,225.0	\$2,199.0	\$3,489.0
Total Assets	\$48,389.0	\$48,229.0	\$57,154.0	\$66,348.0	\$95,904.0
Total Current Liabilities	\$8,210.0	\$5,220.0	\$10,184.0	\$16,204.0	\$26,407.0
Long-Term Debt	\$231.0	\$306.0	\$2,952.0	\$3,410.0	\$12,396.0
Other Liabilities	\$43.0	\$209.0	-	-	-
Total Liabilities	\$8,484.0	\$5,735.0	\$13,136.0	\$19,614.0	\$38,803.0
Total Shareholders' Equity	\$39,905.0	\$42,494.0	\$44,018.0	\$46,734.0	\$57,101.0
Common Stock	35,374.0	35,591.0	38,430.0	11.0	11.0
Other Equity	-	38,630.0	39,684.0	38,630.0	39,684.0
Retained Earnings	4,531.0	6,903.0	5,588.0	8,093.0	17,406.0
Total Liabilities and Shareholders' Equity	\$48,389.0	\$48,229.0	\$57,154.0	\$66,348.0	\$95,904.0
Income Statement	1985	1986	1987	1988	1989
Revenue	\$62,816.0	\$46,739.0	\$35,468.0	\$74,963.0	\$126,048.0
US Revenue	54,904.0	25,725.0	21,902.0	46,630.0	70,625.0
Non-US Revenue	7,912.0	21,014.0	13,566.0	28,333.0	55,423.0
Cost of Sales	\$16,312.0	\$24,538.0	\$19,149.0	\$37,995.0	\$68,596.0
R&D Expense	\$5,181.0	\$13,883.0	\$12,809.0	\$15,749.0	\$21,852.0
SG&A Expense	\$8,951.0	\$13,939.0	\$14,097.0	\$18,530.0	\$26,827.0
Capital Expense	-	-	-	-	-
Pretax Income	\$7,865.0	(\$3,456.0)	(\$9,468.0)	\$3,850.0	\$12,474.0
Pretax Margin (%)	12.52	(7.39)	(26.69)	5.14	9.90
Effective Tax Rate (%)	-	-	-	40.60	25.40
Net Income	\$7,133.0	(\$900.0)	(\$6,908.0)	\$2,505.0	\$9,302.0
Shares Outstanding, Thousands	10,202.0	10,250.0	10,320.0	10,950.0	11,135.0
Per Share Data					
Earnings	(\$0.70)	(\$0.09)	(\$0.67)	\$0.23	\$0.84
Dividend	-	-	-	-	-
Book Value	\$3.91	\$4.15	\$4.27	\$4.27	\$5.13

Table 3 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending June
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	5.42	8.03	4.77	3.34	3.01
Quick (Times)	4.61	6.82	3.59	2.02	1.85
Fixed Assets/Equity (%)	8.03	9.43	16.63	21.55	22.59
Current Liabilities/Equity (%)	20.57	12.28	23.14	34.67	46.25
Total Liabilities/Equity (%)	21.26	13.50	29.84	41.97	67.96
<i>Profitability (%)</i>					
Return on Assets	-	(1.86)	(13.11)	4.06	11.47
Return on Equity	-	(2.18)	(15.97)	5.52	17.92
Profit Margin	11.36	(1.93)	(19.48)	3.34	7.38
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	8.25	29.70	36.11	21.01	17.34
Capital Spending % of Revenue	0	0	0	0	0
Employees	288	323	440	558	731
Revenue (\$K)/Employee	\$218.11	\$144.70	\$80.61	\$134.34	\$172.43
Capital Spending % of Assets	0	0	0	0	0

Source: Lam Research Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Nippon Kogaku K.K. (Nikon)

Fuji Building, 2-3, Maronouchi 3-Chome

Chiyoda-ku, Tokyo 100, Japan

Telephone: 03-214-5311

Fax: 03-201-5856

Dun's Number: Not available

Date Founded: 1917

CORPORATE STRATEGIC DIRECTION

Nippon Kogaku K.K., also known as Nikon, is the result of a 1917 merger of three leading Japanese optical manufacturers. Today, Nikon is a leading manufacturer of precision instruments, cameras and other photo products, and ophthalmic products. In recent years, Nikon has become an important developer of IC-related equipment such as steppers and inspection systems.

Total revenue increased by 33 percent to \$1.9 billion* in fiscal 1989 from \$1.4 billion in fiscal 1988. Net income increased to \$87.1 million in fiscal 1989 from a loss of \$9.6 million in fiscal 1988.

Research and development expenditures totaled \$54.8 million in fiscal 1989, representing 2.8 percent of revenue. Capital spending expenditures totaled \$79.0 million in fiscal 1989, representing 4.0 percent of revenue.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Precision Equipment

In fiscal 1989, the Precision Equipment Sector segment had revenue of \$989 million, a 60 percent

increase over fiscal 1988. Sales from this sector accounted for 53.7 percent of total net sales, up from 42.8 percent in fiscal 1988.

This sector includes semiconductor-related equipment, measuring instruments, microscopes, surveying equipment, binoculars, and telescopes.

In semiconductor-related equipment, Nikon is the leading manufacturer worldwide of steppers used in the production of very large scale integrated (VLSI) circuits and maintains a dominant market share in Japan. In fiscal 1989, sales of semiconductor-related equipment were \$628 million, almost twice the level of fiscal 1988.

In the measuring instruments area, Nikon's most sophisticated product is the Tristation. The Tristation is a computerized, three-dimensional, coordinate-measuring machine capable of measuring complex shapes. Sales of measuring instruments in fiscal 1989 were \$59 million, a 20 percent increase over fiscal 1988.

Photo Products and Electronic Imaging Equipment

In fiscal 1989, consolidated sales of photo products and electronic imaging equipment were \$716.6 million, a 6.5 percent increase over 1988. This sector represents 38.9 percent of the company's total revenue.

This sector includes 35mm single-lens-reflex (SLR) and automatic compact cameras; interchangeable camera lenses, speedlights, and accessories; and electronic imaging equipment such as still video camera systems, television camera lenses, and camcorders.

*All dollar amounts are in US dollars.

Ophthalmic Products

In fiscal 1989, consolidated sales for ophthalmic products were \$136 million, a decrease of 7.5 percent over fiscal 1988. This sector accounted for 7.4 percent of net sales.

This sector includes equipment used by professional optometrists and ophthalmologists, including optical frames, lenses, and sunglasses.

Further Information

For more information about the Company's business segments, please contact the appropriate industry service. Dataquest tracks Nikon's semiconductor equipment products through the Component Group's Semiconductor Equipment and Materials Service (SEMS).

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$1,666.9	\$1,521.2	\$1,386.4	\$1,449.4	\$1,923.5
Percent Change	-	(8.74)	(8.86)	4.54	32.71
Capital Expenditure	\$106.0	\$144.6	\$52.8	\$42.4	\$79.0
Percent of Revenue	6.36	9.51	3.81	2.93	4.11
R&D Expenditure	\$34.7	\$46.5	\$43.8	\$45.5	\$54.8
Percent of Revenue	2.08	3.06	3.16	3.14	2.85
Number of Employees	NA	NA	NA	NA	NA
Revenue (\$K)/Employee	NA	NA	NA	NA	NA
Net Income	\$54.5	\$16.9	(\$12.0)	(\$9.6)	\$87.1
Percent Change	-	(68.99)	(171.01)	20.00	1,007.29
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	NA	NA	NA	NA	
Quarterly Profit	NA	NA	NA	NA	

NA = Not available

Source: Nikon
Annual Reports and Forms 10K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
Japan	-	-	48.70	52.80	60.40
International	-	-	51.30	47.20	39.60
North America	-	-	28.00	22.30	15.30
Europe	-	-	15.00	15.10	13.70
Asia/Pacific	-	-	7.50	9.20	10.20
ROW	-	-	0.80	0.60	0.40

Source: Nikon
Annual Reports and Forms 10K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	100	100
Indirect Sales	0	0
VARs	-	-
Distributors	-	-
Dealers	-	-
Mass Merchandisers	-	-
Manufacturers' Representatives	-	-

Source: Nikon
Annual Reports and Forms 10K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—3
Japan—17
Europe—6
Asia/Pacific—1

MANUFACTURING LOCATIONS

Japan

Ohji, Yokohama, and Kumagaya

Manufacturing activities at these locations include the making of IC production-related measuring instruments and other precision instruments, as well as industrial supplies.

Ohji, Ibaraki, Tochigi, and Miyagi

Manufacturing activities here include most of Nikon's cameras.

Yokohama, Miyagi, and Tochigi

Manufacturing activities include optical instruments such as objective lenses for microscopes and eyeglasses.

SUBSIDIARIES

Japan

Kurobane Nikon Co. Ltd.
Mito Nikon K.K.
Nasu Nikon Co. Ltd.
Nikon Photo Products Inc.
Nikon Tec Corporation
Sendai Nikon K.K.
Tochigi Nikon K.K.
Zao Nikon K.K.

North America

Nikon Canada Inc. (Canada)
Nikon Inc. (United States)
Nikon Precision Inc. (United States)

Europe

Nikon AG (Switzerland)
Nikon Europe B.V. (the Netherlands)
Nikon France S.A. (France)
Nikon GmbH (West Germany)
Nikon Precision Europe GmbH (West Germany)
Nikon U.K. Ltd. (United Kingdom)

Asia/Pacific

Nikon Hong Kong Ltd. (Hong Kong)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1988

Anam Precision

Nikon and Anam Precision (South Korea) entered into a technology transfer agreement. Under the agreement, Nikon will transfer technology related to the production of low-priced 35mm compact cameras to Anam Precision in South Korea.

1987

Davidson Optronics

Nikon and Davidson Optronics entered into a licensing agreement. Under the agreement, Davidson Optronics will market Nikon's Autocollimators in the United States. Davidson also will administer the warranty/repair service.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Shigetada Fukuoka
Chairman

Koji Sho
President

Isao Ichikawa
Executive vice president

Shigeo Ono
Senior managing director

Shoichiro Yoshida
Senior managing director

PRINCIPAL INVESTORS

The Mitsubishi Trust and Banking Corporation—
6.74 percent

The Meiji Mutual Life Insurance Company—
5.45 percent

The Mitsubishi Bank Ltd.—4.81 percent

The Sumitomo Trust and Banking Company
Ltd.—4.02 percent

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$718.6	\$1,116.2	\$1,127.8	\$1,258.4	\$1,305.0
Cash	118.1	128.9	132.5	142.8	112.7
Receivables	254.8	334.9	357.7	465.9	558.7
Marketable Securities	46.5	42.7	30.0	34.9	26.6
Inventory	282.8	581.9	575.8	574.5	564.5
Other Current Assets	16.4	27.8	31.8	40.3	42.5
Net Property, Plants	\$206.3	\$429.2	\$414.9	\$432.2	\$429.6
Other Assets	\$72.7	\$162.0	\$204.6	\$255.6	\$317.6
Total Assets	\$997.6	\$1,707.4	\$1,747.3	\$1,946.2	\$2,052.2
Total Current Liabilities	\$473.8	\$653.9	\$704.7	\$862.9	\$907.7
Long-Term Debt	\$116.7	\$344.3	\$331.9	\$243.9	\$243.2
Other Liabilities	\$3.6	\$5.9	\$12.8	\$16.7	\$12.4
Total Liabilities	\$594.1	\$1,004.1	\$1,049.4	\$1,123.5	\$1,163.3
Total Shareholders' Equity	\$403.6	\$703.3	\$698.1	\$822.7	\$888.9
Converted Preferred Stock	-	-	-	-	-
Common Stock	103.1	183.1	192.8	243.2	247.9
Other Equity	161.0	287.8	301.6	373.8	380.8
Retained Earnings	139.5	232.4	203.7	205.7	260.2
Total Liabilities and Shareholders' Equity	\$997.7	\$1,707.4	\$1,747.5	\$1,946.2	\$2,052.2
Income Statement	1985	1986	1987	1988	1989
Revenue	\$1,666.9	\$1,521.2	\$1,386.4	\$1,449.4	\$1,923.5
Japan Revenue	-	-	675.2	765.3	1,161.8
Non-Japan Revenue	-	-	711.2	684.1	761.7
Cost of Sales	\$496.6	\$832.0	\$831.7	\$986.0	\$1,112.9
R&D Expense	\$34.7	\$46.5	\$43.8	\$45.5	\$54.8
SG&A Expense	\$485.7	\$500.9	\$431.7	\$523.0	\$458.9
Capital Expense	\$106.0	\$144.6	\$52.8	\$42.4	\$79.0
Pretax Income	\$70.5	\$43.5	\$5.3	\$48.2	\$159.1
Pretax Margin (%)	4.23	2.86	0.38	3.33	8.27
Effective Tax Rate (%)	-	-	-	-	-
Net Income	\$54.5	\$16.9	(\$12.0)	(\$9.6)	\$87.1
Shares Outstanding, Millions	262.0	300.0	349.0	362.2	363.5
Per Share Data					
Earnings	\$0.17	\$0.05	(\$0.04)	(\$0.03)	\$0.24
Dividends	\$0.04	\$0.05	\$0.05	\$0.04	\$0.06
Book Value	\$1.54	\$2.34	\$2.00	\$2.27	\$2.45

Table 4 (Continued)
 Comprehensive Financial Statement
 Fiscal Year Ending March
 (Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	1.52	1.71	1.60	1.46	1.44
Quick (Times)	0.92	0.82	0.78	0.79	0.82
Fixed Assets/Equity (%)	51.11	61.03	59.43	52.53	48.33
Current Liabilities/Equity (%)	117.39	92.98	100.95	104.89	102.11
Total Liabilities/Equity (%)	147.20	142.77	150.32	136.56	130.87
<i>Profitability (%)</i>					
Return on Assets	-	1.25	(0.69)	(0.52)	4.36
Return on Equity	-	3.05	(1.71)	(1.26)	10.18
Profit Margin	3.27	1.11	(0.87)	(0.66)	4.53
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	2.08	3.06	3.16	3.14	2.85
Capital Spending % of Revenue	6.36	9.51	3.81	2.93	4.11
Employees	NA	NA	NA	NA	NA
Revenue (\$K)/Employee	NA	NA	NA	NA	NA
Capital Spending % of Assets	10.63	8.47	3.02	2.18	3.85

NA = Not available

Source: Nikon
 Annual Reports and Forms 10-K
 Dataquest (1990)

Nippon Sanso K.K.

16-7, Nishi-Shinbashi 1-chome

Minato-ku, Tokyo, Japan

Telephone: (03) 581-8200

Fax: (03) 580-9425

Dun's Number: Not Available

Date Founded: 1910

CORPORATE STRATEGIC DIRECTION

Nippon Sanso K.K. is one of the world's leading industrial gas manufacturers. The Company supplies industrial gases such as oxygen, nitrogen, and argon. It also provides air separation plants and various chemical plants. Nippon Sanso's consolidated revenue was ¥191.3 billion (US\$1.3 billion) in the year ended March 31, 1990, compared with revenue of ¥166.7 billion (US\$1.3 billion) for fiscal year 1989. Consolidated net income totaled ¥3.5 billion (US\$24.5 million) in fiscal 1990 compared with ¥3.2 billion (US\$24.7 million) in fiscal 1989. Sales of oxygen and nitrogen represented 29 percent of revenue, argon 7 percent, special-purpose gases 12 percent, gas-related equipment 14 percent, foodstuffs 8 percent, and other products made up the remaining 30 percent. R&D expenditure was ¥3.1 billion (US\$21.8 million) in fiscal 1990.

Financial statements are not included in this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Nippon Sanso is the largest supplier of bulk and specialty gases in Japan and a major supplier in the Pacific Rim countries. The Company is a primary manufacturer of specialty gases, including phosphine and diborane. The Company is also the largest supplier of metal oxide chemical vapor deposition (MOCVD) equipment in Japan.

Matheson's US operations were acquired in 1983 as a joint venture between Nippon Sanso of Japan and

Amerigas of the United States. Matheson's European operations were acquired at the same time by Union Carbide Corporation. In 1989, Nippon Sanso acquired the 50 percent of Matheson's US operations that was owned by Amerigas. Matheson supplies specialty gases to semiconductor manufacturers in the United States and ROW.

Nippon Sanso has a strong distribution network for both bulk and specialty products in the Japanese markets. Matheson's US operations provide primary manufacturing capability for many semiconductor gases, including phosphine and diborane.

In 1988, Nippon Sanso announced that it would invest in Industrial Oxygen Inc., Malaysia's second largest gas producer. Also in 1988, Nippon Sanso and Linde AG of Wiesbaden, Germany, agreed to a joint technology exchange. This agreement involved the exchange of engineers and technology to improve the production, analysis, and safe handling of silane, arsine, and phosphine gases.

In 1990, Nippon Sanso attempted to purchase Semi-gas Systems of San Jose, California. The Justice Department is reviewing the case, and a ruling is expected later this year on whether the combined companies would control a dominant market share of semiconductor gas distribution systems. Semi-gas is the leading US manufacturer of gas containment systems used in chip manufacturing.

Further Information

For further information about Nippon Sanso's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

Information is not available.

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

AGA

Nippon Sanso and AGA formed AGA/NSK to market Japanese production technology in Europe. AGA/NSK will be based in Germany.

Nippon Sanso, Nikko Sanso, Taiyo Sanso, and Toyo Sanso

Four of Japan's leading oxygen manufacturers plan to establish a joint venture for the production of oxygen, nitrogen, and argon. The new venture will be called Shin Sagamihara Sanso Co., Ltd.

MERGERS AND ACQUISITIONS

1989

Thermos

Nippon Sanso acquired Thermos, a supplier of glass vacuum bottles.

KEY OFFICERS

Natsuro Ishizawa
Chairman

Hideo Mabuchi
President

PRINCIPAL INVESTORS

Fuji Bank
Yasuda Life Insurance
Yasuda Trust

FOUNDERS

Information is not available.

Olin Corporation

120 Long Ridge Road
Stamford, Connecticut 06904

Telephone: (203) 356-2000

Fax: (203) 356-3065

Dun's Number: 00-133-8086

Date Founded: 1892

CORPORATE STRATEGIC DIRECTION

Olin Corporation is a manufacturer of chemicals, metals and materials, defense-related products, and ammunition. The chemicals segment includes industrial chemicals, performance chemicals, and image-forming and related specialty chemicals. Products in the metals and materials area include copper alloy sheet, strip, rod, tube, and fabricated parts; stainless steel strip, specialty clad, and inlay materials; and electronic interconnect materials and services. The defense and ammunition area includes small-, medium-, and large-caliber defense ammunition and advanced technology products and services for the aerospace and defense industries.

Total revenue increased by 8.7 percent to \$2.5 billion* in fiscal 1989 from \$2.3 billion in fiscal 1988. Net income increased 27.0 percent to \$124 million in fiscal 1989 from \$98 million in fiscal 1988. Olin employs 15,400 people worldwide.

Research and development expenditure totaled \$66 million in fiscal 1989, representing 2.6 percent of revenue. Capital spending totaled \$142 million in fiscal 1989, representing 6.0 percent of revenue.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Table 3, a comprehensive financial statement, is at the end of this profile.

*All dollar amounts are in US dollars.

BUSINESS SEGMENT STRATEGIC DIRECTION

Chemicals

Olin's Chemical business segment consists of seven major operating segments: Urethane Chemicals, Electrochemicals, Pool Products, Electronic Chemicals, Cleaning Products and Services, Organics, and Specialty Chemicals.

Olin develops, manufactures, and markets industrial and performance chemicals. Olin's wholly owned subsidiary, Olin Hunt Specialty Products Inc., manufactures and markets image-forming and related specialty chemicals.

Olin Hunt's products include photoresists, high-purity semiconductor-grade acids and solvents, dopants, and etchants for use in the manufacture of semiconductors and printed wireboard products; toners and developers used in photocopiers and computer printers; and conductive materials used in the electronics industry.

Metals and Materials

Olin's Metals and Materials business segment consists of two major operating units: Olin Brass and Interconnect Materials.

The metals products business is focused on the electronics market, providing high-performance and high-quality materials needed by the electronics industry and other advanced technology customers. These

materials include specialty clad and inlay materials and Copperbond, a treated copper foil marketed to the printed circuit industry.

Olin's subsidiary, Fabricated Metal Products, fabricates ferrous and nonferrous specialty stamped metal products and shaped charge copper cones and produces specialized fabricated parts for durable goods and consumer recreational items.

Olin manufactures and sells strips, sheets, rods, and seamless and welded tubes of copper and copper alloy. Principal customers include producers of electrical and electronic equipment, producers of builders' hardware and appliances, the plumbing, automobile, and air-conditioning industries, and manufacturers of a variety of consumer goods. Fabricating operations allow Olin to produce stamped, formed, and drawn parts from its strip for many of these markets. In 1988, Olin acquired Bridgeport Brass Corporation, a producer of copper and copper alloy (strips, rods, and seamless tubes).

Defense and Ammunition

Olin's Defense and Ammunition business segment consists of three major operating units: Aerospace Division, Ordnance Division, and Winchester Division.

The Defense Systems Group's Aerospace Division manufactures specialty defense products, including small rocket engines used for altitude control and guidance, pulsed power systems, power supplies, and antiarmor warheads. Olin also operates the US government-owned Lake City Ammunition Plant, the largest small-caliber ammunition facility in the United States, as well as other government arsenals. Olin manufactures small-, medium-, and large-caliber defense ammunition; Winchester sporting ammunition (including shot shells and centerfire and rimfire ammunition); and smokeless powder.

In December 1988, Olin acquired General Defense Corporation, a prime systems contractor in large-caliber ammunition. The subsidiary's Tactical Systems Division produces large-caliber tank and artillery projectiles and components.

Further Information

For more information about the Company's business segments, please contact the appropriate industry service. Dataquest tracks Olin Hunt through the Semiconductor Equipment and Materials Service (SEMS).

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$1,760.0	\$1,732.0	\$1,930.0	\$2,308.0	\$2,509.0
Percent Change	-	(1.59)	11.43	19.59	8.71
Capital Expenditure	\$154.0	\$128.0	\$115.0	\$147.0	\$142.0
Percent of Revenue	8.75	7.39	5.96	6.37	5.66
R&D Expenditure	\$54.0	\$56.0	\$62.0	\$58.0	\$66.0
Percent of Revenue	3.07	3.23	3.21	2.51	2.63
Number of Employees	14,900	13,200	14,100	16,400	15,400
Revenue (\$K)/Employee	\$118.12	\$131.21	\$136.88	\$140.73	\$162.92
Net Income	(\$165.0)	\$75.0	\$78.0	\$98.0	\$124.0
Percent Change	-	(145.45)	4.00	25.64	26.53
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	\$671.00	\$658.00	\$580.00	\$600.00	
Quarterly Profit	\$34.00	\$35.00	\$24.00	\$31.00	

Source: Olin Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	92.84	94.00	92.75	89.95	92.79
International	7.16	6.00	7.25	10.05	7.21

Source: Olin Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—5
Europe—5
Asia/Pacific—5
Japan—1
ROW—3

MANUFACTURING LOCATIONS

North America

Augusta, Georgia
Chlorine, caustic soda, hydrochloric acid, sodium hypochlorite, sodium hydrosulfate
Beaumont, Texas
Sulfuric acid and a mix of ammonium sulfite-bisulfite
Berea, Ohio
Dry toners, developers
Bloomington, Illinois
Stamped metal products, fabricated parts, shaped charge copper cones
Brandenburg, Kentucky
Ethylene oxide, industrial glycols, glycol ethers, surfactants, polyols, functional fluids
Brook Park, Ohio
Urethane foam systems
Bryan, Ohio
Copper, copper alloy re-rolling
Charleston, Tennessee
Chlorine, caustic soda, sodium hypochlorite, sodium hydrosulfite, calcium hypochlorite
Cuba, Missouri
Copper alloy welded tube
East Alton, Illinois
Copper and copper alloy sheet and strip, fabricated parts, composite metal strip for coins, specialty metal products
East Providence, Rhode Island
Formulation and packaging of photoresists
Indianapolis, Indiana
Copper and copper alloy strip, rod, seamless tube
Joliet, Illinois
Industrial phosphates, high-grade fertilizers, sodium fluorides
Kansas City, Kansas
Formulated water-treatment chemicals
Lancaster, Pennsylvania
Mechanical and electronic fuses

Lincoln, Rhode Island
Photographic and reprographic chemicals, photoresists
Livonia, Michigan
Chloroisocyanurate packaging
Manteca, California
Assembly of integrated circuits and microelectric packages
McIntosh, Alabama
Chlorine, caustic soda, hydrogen, hydrazine propellant blending, storage
Mountain View, California
Tape-automated bonding materials
Nazareth, Pennsylvania
High-purity acids
New Bedford, Massachusetts
Packages for hybrid integrated circuits
Niagara Falls, New York
Chlorine, caustic soda, hydrogen, potassium hydroxide, sodium chlorite, sodium methylete, sodium hypochlorite
Ontario, California
Conductive inks, coatings
Palisades Park, New Jersey
Filming agents, liquid toners, plating chemicals
Redmond, Washington
Rocket engines, gas generators, electronic subsystems for aircraft and ships
Rochester, New York
Specialty chemicals and intermediates, biocides
Rolling Meadows, Illinois
Photographic chemical systems
San Leandro, California
Pulsed-power equipment and services, radiation simulators, ordnance components
Seward, Illinois
Electronic chemicals, delivery systems
Shreveport, Louisiana
Sulfuric acid
South Charleston, West Virginia
Chloroisocyanurates, cyanuric acid
Tempe, Arizona
Specialty etchants
Wadsworth, Ohio
Ordnance components
Waterbury, Connecticut
Copper foil, thin-gauge copper alloys and stainless steel, custom conversion rolling

SUBSIDIARIES

North America

Bridgeport Brass Corp. (United States)
 General Defense Corp. (United States)
 Hi-Pure Chemicals Inc. (United States)
 Olin Fabricated Metal Products Inc. (United States)
 Olin Financial Services Inc. (United States)
 Olin Hunt Specialty Products Inc. (United States)
 Olin Specialty Metals Group (United States)
 Olin Technology Inc. (United States)
 Pacific Electro Dynamics Inc. (United States)
 Physics International Inc. (United States)
 Rocket Research Co. (United States)

Europe

Olin S.p.A. (Italy)

Asia/Pacific

Olin Australia Ltd. (Australia)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Asahi Glass

Olin and Asahi Glass formed Asahi-Olin America to make urethane materials principally for automotive applications. Asahi-Olin was founded in Japan in 1974 to supply automakers, and the new US company will supply Japanese companies in the United States.

MERGERS AND ACQUISITIONS

1989

Indy Electronics

Olin acquired majority ownership (55 percent) in Indy Electronics, a major contract assembler of ICs and microelectronic packages. Olin had previously had a 45 percent stake in Indy Electronics.

1988

General Defense

Olin acquired General Defense for approximately \$104 million. General Defense markets large-caliber ammunition and artillery projectiles.

Bridgeport Brass

Olin acquired Bridgeport Brass, a producer of copper and copper alloy products, including rod and tube.

KEY OFFICERS

John W. Johnstone

Chairman, president and chief executive officer

Donald W. Griffin

Executive vice president

Robert L. Yohe

Executive vice president

Joseph M. Gaffney

Senior vice president, Planning and Development

Edward Pollack

Senior vice president

C. Robert Tully

Senior vice president and chief financial officer

Michael E. Campbell

Vice president, Human Resources

Irving Chain

Vice president and chief scientist

PRINCIPAL INVESTORS

Connecticut National—16.8 percent

Boatmen's Bankshares Inc.—7.1 percent

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$695.2	\$601.0	\$680.0	\$801.0	\$790.0
Cash	47.9	9.0	34.0	25.0	12.0
Receivables	324.3	321.0	362.0	437.0	453.0
Marketable Securities	-	-	-	-	-
Inventory	267.0	264.0	273.0	311.0	296.0
Other Current Assets	56.0	7.0	11.0	28.0	29.0
Net Property, Plants	\$718.0	\$720.0	\$727.0	\$801.0	\$781.0
Other Assets	\$185.0	\$224.0	\$278.0	\$338.0	\$333.0
Total Assets	\$1,598.2	\$1,545.0	\$1,685.0	\$1,940.0	\$1,904.0
Total Current Liabilities	\$391.0	\$391.0	\$404.0	\$617.0	\$585.0
Long-Term Debt	\$354.0	\$375.0	\$392.0	\$474.0	\$501.0
Other Liabilities	\$166.0	\$125.0	\$189.0	\$166.0	\$153.0
Total Liabilities	\$911.0	\$891.0	\$985.0	\$1,257.0	\$1,239.0
Total Shareholders' Equity	\$686.0	\$654.0	\$700.0	\$683.0	\$665.0
Converted Preferred Stock	-	-	-	-	-
Common Stock	24.0	21.0	22.0	20.0	19.0
Other Equity	93.0	123.0	204.0	193.0	178.0
Retained Earnings	569.0	510.0	474.0	470.0	468.0
Total Liabilities and Shareholders' Equity	\$1,597.0	\$1,545.0	\$1,685.0	\$1,940.0	\$1,904.0
Income Statement	1985	1986	1987	1988	1989
Revenue	\$1,760.0	\$1,732.0	\$1,930.0	\$2,308.0	\$2,509.0
US Revenue	1,634.0	1,628.0	1,790.0	2,076.0	2,328.0
Non-US Revenue	126.0	104.0	140.0	232.0	181.0
Cost of Sales	\$1,389.0	\$1,318.0	\$1,455.0	\$1,781.0	\$1,929.0
R&D Expense	\$54.0	\$56.0	\$62.0	\$58.0	\$66.0
SG&A Expense	\$252.0	\$252.0	\$264.0	\$289.0	\$287.0
Capital Expense	\$154.0	\$128.0	\$115.0	\$147.0	\$142.0
Pretax Income	(\$282.0)	\$115.0	\$127.0	\$151.0	\$192.0
Pretax Margin (%)	(16.02)	6.64	6.58	6.54	7.65
Effective Tax Rate (%)	(32.60)	34.80	38.60	35.10	35.40
Net Income	(\$165.0)	\$75.0	\$78.0	\$98.0	\$124.0
Shares Outstanding, Millions	23.0	22.4	23.1	21.1	20.0
Per Share Data					
Earnings	(\$8.28)	\$3.36	\$3.38	\$4.63	\$6.02
Dividend	\$1.50	\$1.52	\$1.60	\$1.70	\$1.95
Book Value	\$29.83	\$29.20	\$30.30	\$32.37	\$33.25

Table 3 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	1.78	1.54	1.68	1.30	1.35
Quick (Times)	1.10	0.86	1.01	0.79	0.84
Fixed Assets/Equity (%)	104.66	110.09	103.86	117.28	117.44
Current Liabilities/Equity (%)	57.00	59.79	57.71	90.34	87.97
Total Liabilities/Equity (%)	132.80	136.24	140.71	184.04	186.32
<i>Profitability (%)</i>					
Return on Assets	-	4.77	4.83	5.41	6.45
Return on Equity	-	11.19	11.52	14.17	18.40
Profit Margin	(9.38)	4.33	4.04	4.25	4.94
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	3.07	3.23	3.21	2.51	2.63
Capital Spending % of Revenue	8.75	7.39	5.96	6.37	5.66
Employees	14,900	13,200	14,100	16,400	15,400
Revenue (\$K)/Employee	\$118.12	\$131.21	\$136.88	\$140.73	\$162.92
Capital Spending % of Assets	9.64	8.28	6.82	7.58	7.46

Source: Olin Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Osaka Titanium Co.

1, Higashi-Hamacho
Amagasaki City, Hyogo, Japan
Telephone: 06-411-1121
Fax: 06-413-3435
Telex: 64510
Dun's Number: 69-087-8475

Date Founded: 1950

CORPORATE STRATEGIC DIRECTION

Osaka Titanium Co. is the world's largest manufacturer of metallic titanium and one of Japan's top producers of semiconductor silicon. The Company is a member of the Sumitomo Metal Industries Group. Osaka has established itself in the United States by absorbing US Semiconductor Corporation, an epitaxial wafer maker, in 1987.

Revenue for year ended March 1990 was ¥6.1 billion (US\$421.7 million). This is a 21.3 percent increase over the previous year's figure of ¥50.0 billion (US\$347.6 million). (Percentage changes refer only to ¥ amounts; US\$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Net income was posted as a decrease of 38.5 percent at year ended March 1990 to ¥2.0 billion (US\$13.7 million) from ¥3.2 billion (US\$22.3 million) in the previous year.

R&D expenditure totaled ¥705 million (US\$4.9 million) for year ended March, 1990. Capital expenditure totaled ¥3.2 billion (US\$22.7 million) for the same period and is expected to increase to ¥4.4 billion (US\$30.9 million) by year ending March 1991. The Company had 762 employees as of fiscal year ended March 1990.

No financial analysis is included in this backgrounder because financial information was unavailable.

BUSINESS SEGMENT STRATEGIC DIRECTION

Sponge titanium is currently in capacity production due to increased demand from US and European civil

aircraft manufacturers. Sponge titanium also is used in seawater desalination plants. Profits are expected to rise, offsetting lowered sales resulting from silicon production cuts.

Metallic titanium is responsible for 28 percent of total revenue for year ended March 1990; semiconductor silicon is responsible for the remaining 72 percent. The Company exports approximately 20 percent of its products.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1990 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

North America

Cincinnati Semiconductor, Inc., United States

Wafer production

OTC Semiconductor Corporation, United States

Wafer production

US Semiconductor Corporation, United States
Wafer production

Asia/Pacific

Hyushu Electronic Metal
Silicon wafer processing
Kyushu Denshi Kinzoku
Production of silicon wafers for 4Mb chips

SUBSIDIARIES

North America

Cincinnati Semiconductor, Inc. (United States)
OTC Semiconductor Corporation (United States)
US Semiconductor Corporation (United States)

**ALLIANCES, JOINT VENTURES, AND
LICENSING AGREEMENTS**

1990

Toho Titanium Co. and Showa Denko KK
Osaka Titanium, joined by Toho Titanium and
Showa Denko, plan to build a pilot plant with a
1,000-metric-ton annual capacity on the
Company's premises in Amagasaki, Japan, in
1992.

MERGERS AND ACQUISITIONS

1987

US Semiconductor
Osaka Titanium purchased US Semiconductor to
help launch itself in the United States.

KEY OFFICERS

Hiroshi Kojima
Chairman of the board

Shigeru Tamamoto
President

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Shin-Etsu Chemical Co., Ltd.

6-1, Ohtemachi, 2-chome

Chiyoda-ku, Tokyo, Japan

Telephone: (03) 246-5111

Fax: (03) 246-5350

Dun's Number: Not Available

Date Founded: 1926

CORPORATE STRATEGIC DIRECTION

Established in 1926, Shin-Etsu Chemical Co., Ltd., specializes in the development and production of specialty chemicals and high-tech materials. The Company offers an extensive array of products including silicones, high-purity semiconductor silicon, synthetic quartz, polyvinyl chloride (PVC), cellulose derivatives, rare earth materials and products, and oxidized single crystals.

Shin-Etsu's consolidated revenue was ¥403,436 million (US\$3,145.7 million) in the period ended March 31, 1989, compared with revenue of ¥298,447 million (US\$2,162.2 million) for fiscal year ended March 31, 1988. Fiscal year 1988 was only ten months long due to a change in the account settlement date. Consolidated net income totaled ¥27,894 million (US\$217.5 million) in fiscal 1989.

Shin-Etsu's five divisions are plastics, organic and inorganic chemicals, electronics materials, fertilizers and ferroalloys, and international operations. Plastics and electronics materials were the largest revenue contributors, responsible for 45.3 and 35.4 percent of revenue, respectively. Organic and inorganic chemicals represented 9.3 percent of sales, international operations 6.0 percent, and fertilizers and ferroalloys 4.0 percent.

R&D costs for the year ended March 31, 1989, and for the ten-month period ended March 31, 1988, were respectively ¥18,094 million (US\$141.1 million) and ¥14,656 million (US\$106.2 million). Capital expenditure for fiscal 1989 was ¥25,241 million (US\$196.8 million). The Company employs 3,420 people worldwide.

This backgrounder includes no financial information.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

Shin-Etsu Handotai (also known as SEH) is the largest silicon and epitaxial wafer company in the world. The company was formed as a joint venture between Shin-Etsu Chemical and Dow Corning in 1967. In 1979, Shin-Etsu Chemical acquired full ownership of Shin-Etsu Handotai. Shin-Etsu Handotai's subsidiaries and affiliates include SEH America, SEH Europe, and SEH Malaysia. SEH's world headquarters are in Tokyo, and its R&D centers are in Isobe, Japan, and Vancouver, Washington. In addition to silicon products, SEH manufactures gallium arsenide and gallium phosphide through a joint venture with Furukawa Mining known as Iwaki Handotai. Like several of the major silicon merchant companies, Shin-Etsu Handotai's silicon manufacturing is vertically integrated, from polysilicon to polished wafers.

Further Information

For further information about Shin-Etsu Chemical, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

Information is not available.

SUBSIDIARIES

North America

Shin-Etsu Silicones of America, Inc. (United States)
Shin-Etsu Technical Services Inc. (United States)
Shintech Incorporated (United States)
SM Yttrium Canada Ltd. (Canada)

Europe

Companhia Industrial de Resinas Sinteticas S.A.R.L.
(CIRES) (Portugal)

Asia/Pacific

Kashima Vinyl Chloride Monomer Co., Ltd. (Japan)
Nagano Electronics Industrial Co., Ltd. (Japan)
Naoetsu Electronics Co., Ltd. (Japan)
Nissin Chemical Industry Co., Ltd. (Japan)
Shinano Electric Refining Co., Ltd. (Japan)
Shin-Etsu Engineering Co., Ltd. (Japan)
Shin-Etsu Film Co., Ltd. (Japan)
Shin-Etsu Handotai Co., Ltd. (Japan)
Shin-Etsu Kasei Co., Ltd. (Japan)
Shin-Etsu (Malaysia) Sdn. Bhd. (Malaysia)
Shin-Etsu Metallurgical Co., Ltd. (Japan)
Shin-Etsu Polymer Co., Ltd. (Japan)
Shin-Etsu Quartz Products Co., Ltd. (Japan)
Shin-Etsu Silicone Korea Co., Ltd. (South Korea)
Shin-Etsu Silicone Taiwan Co., Ltd. (Taiwan)
Shin-Etsu Vinyl Acetates Co., Ltd. (Japan)
Shinken Sangyo Co., Ltd. (Japan)
Shinyo Home-Services Co., Ltd. (Japan)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Ciba-Geigy

Shin-Etsu Chemical has supplied Ciba-Geigy with
technology for the production of epoxy resin mold-

ing compound (EMC). EMC is used as a sealing
material in semiconductor manufacturing.

Admatechs

Admatechs has been formed by Toyota Motor (55
percent), Shin-Etsu Chemical (25 percent), and
Shin-Etsu Quartz (20 percent) to build a ceramic
powder plant at Shin-Etsu's Maoetsu, Japan, com-
plex.

MERGERS AND ACQUISITIONS

1990

MicroSci

MicroSci was formed in Delaware from Shin-Etsu
Chemical's purchase of Huls America's micro-
electrochemical division.

KEY OFFICERS

Yutaro Kosaka
President

Chihiro Kanagawa
Executive vice president

Katsurao Fujita
Executive vice president

Fumio Wakasugi
Senior managing director

Taro Sugawara
Senior managing director

Masami Hashimoto
Senior managing director

Shunichi Koyanagi
Senior managing director

Tadashi Wada
Senior managing director

Katsuro Miyasaka
Senior managing director

PRINCIPAL INVESTORS

Nippon Life Insurance Company
The Long-Term Credit Bank of Japan, Ltd.
The Mitsubishi Bank, Ltd.
The Mitsubishi Trust and Banking Corp.
The Toyo Trust and Banking Ltd.

FOUNDERS

Information is not available.

Silicon Valley Group, Inc.

541 E. Trimble Road
San Jose, California 95131
Telephone: (408) 432-9300
Fax: (408) 432-8629
Dun's Number: 08-291-0233

Date Founded: 1977

CORPORATE STRATEGIC DIRECTION

Silicon Valley Group, Inc. (SVG), designs, manufactures, and markets semiconductor production processing equipment used in the fabrication of integrated circuits. Founded in 1977 as a manufacturer of photoresist track systems and components, the Company has expanded its operations through internal development and acquisition.

SVG expanded into the chemical vapor deposition (CVD) market in 1986 by developing a vertical thermal reactor. In 1987, SVG acquired Anicon, a manufacturer of nontube CVD equipment. In December 1988, SVG further expanded its product offerings through the acquisition of Thermco Systems. The Thermco acquisition resulted in SVG's more than doubling its previous sales volume and has provided the Company with significant expansion of its customer base in the oxidation, diffusion, and low-pressure CVD (LPCVD) processing equipment market.

All SVG divisions operate as independent profit centers, complete with operations to support product development, manufacturing, marketing, and sales. The Track Systems Division is focused on the photolithography processing equipment market; the Thermco Systems Division offers oxidation, diffusion, and LPCVD processing systems. SVG Lithography Systems, Inc. (SVGL), acquired in May 1990 when SVG acquired a controlling equity position in Perkin-Elmer Corporation's optical lithography unit in Wilton, Connecticut, provides the Company with the leading-edge technology in the photolithography equipment market through Perkin-Elmer's step-and-scan lithography tools.

SVG markets and sells its products as part of new wafer fabrication lines and in connection with the expansion and upgrading of existing fabrication lines.

SVG's major customers include IBM, Intel, Motorola, Philips AG, Samsung Electronics, SGS-Thompson, and Texas Instruments. Dataquest ranks SVG as the tenth largest manufacturer of semiconductor wafer fab equipment in 1989, based on estimated equipment sales of \$127 million* worldwide.

Total revenue increased by 168 percent to \$131.0 million in fiscal 1989 from \$9.0 million in fiscal 1988. Net income increased 116 percent to \$9.6 million in fiscal 1989 from \$4.4 million in fiscal 1988. Domestic sales represented approximately 59 percent of sales for the year. The foreign sales figure of 41 percent was up from 32 percent in the previous year.

R&D expenditure totaled \$15.2 million in fiscal 1989, representing 11.6 percent of revenue. Capital spending totaled \$1.8 million in fiscal 1989, or 1.4 percent of revenue. Silicon Valley Group employs 1,500 people worldwide (including SVGL employees).

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Track Systems Division

SVG's Track Systems Division designs, manufactures, markets, and services processing equipment that performs the wafer cleaning, adhesion promotion,

*All dollar amounts are in US dollars.

coating, developing, and baking steps in the photolithographic stage of semiconductor production. The division's products include photolithography processing systems, wafer cleaning systems, and lithography automation systems.

All of the Track Systems Division's products are available in fully automated, cassette-to-cassette configurations. The products can be configured as standalone processing stations or as in-line integrated manufacturing systems that incorporate a selected assortment of the photolithography processing products offered by SVG. The equipment is modular in design to allow many different system combinations and individual product replacements or additions to existing fabrication operations.

SVG offers four product lines of photolithography processing equipment: the 8800 Series, the 8600 Series, the 8100 Series, and the new 90 Series, which was introduced in May 1990.

Thermco Systems Division

SVG's Thermco Systems Division designs, manufactures, and markets LPCVD and oxidation/diffusion processing equipment. These products include horizontal thermal systems, the Company's Vertical Thermal Reactor (VTR), the Anicon Cross Flow Reactor, and LPCVD systems.

The horizontal thermal systems include furnaces, systems for LPCVD, systems for high-temperature processing, automated load stations, lab furnaces, boatloaders, multiaccess elevators, wafer transfer stations, cassette managers, and host computer interfaces and software.

SVG Lithography Systems, Inc. (SVGL)

SVGL offers the Micrascan generation of systems, originally developed by Perkin-Elmer's optical lithography unit and introduced in 1989. Micrascan merges the optical advantages of scanning aligner technology with the registration advantages of step-and-repeat technology. SVGL believes the result to be a system capable of delivering high-resolution, local alignment and leveling while maintaining high throughput, large image field size, and low distortion.

SVGL products include the Micrascan step-and-scan system, the Micrascan projection aligner, and X-ray step-and-repeat systems.

Further Information

For more information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights
(Thousands of US Dollars)

	1985	1986	1987*	1988*	1989*
Five-Year Revenue	\$36,864.0	\$27,842.0	\$39,300.0	\$48,969.0	\$131,080.0
Percent Change	-	(24.47)	41.15	24.60	167.68
Capital Expenditure	0	\$1,914.0	\$625.0	\$1,740.0	\$1,837.0
Percent of Revenue	0	6.87	1.59	3.55	1.40
R&D Expenditure	\$4,660.0	\$4,686.0	\$5,808.0	\$7,006.0	\$15,177.0
Percent of Revenue	12.64	16.83	14.78	14.31	11.58
Number of Employees	297	268	344	382	932
Revenue (\$K)/Employee	\$12,412.12	\$10,388.81	\$11,424.42	\$12,819.11	\$14,064.38
Net Income	\$5,734.0	\$2,646.0	\$3,148.0	\$4,440.0	\$9,612.0
Percent Change	-	(53.85)	18.97	41.04	116.49
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	\$18,940.00	\$35,455.00	\$37,421.00	\$39,264.00	
Quarterly Profit	\$1,483.00	\$2,527.00	\$2,828.00	\$2,774.00	

*Figures for 1987 through 1989 have been restated to reflect acquisitions.

Source: Silicon Valley Group, Inc.
 Annual Reports and Forms 10-K
 Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	NA	NA	63.00	68.00	59.00
International	NA	NA	37.00	32.00	41.00
Europe	NA	NA	21.00	17.00	18.00
Asia/Pacific	NA	NA	7.00	10.00	22.00
ROW	NA	NA	9.00	5.00	1.00

NA = Not available

Source: Silicon Valley Group, Inc.
 Annual Reports and Forms 10-K
 Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	80.00	80.00
Indirect Sales	20.00	20.00
Distributors	10.00	10.00
Manufacturers' Representatives	10.00	10.00

Source: Dataquest (1990)

1990 SALES OFFICE LOCATIONS

North America—18
Europe—14
Asia/Pacific—9
ROW—2

MANUFACTURING LOCATIONS

North America

Track Systems Division—San Jose, California

Manufacturing activities include photoresist processing equipment; brush scrubbers; high-pressure cleaners; vacuum bake vapor prime; chill plates; coaters; developers; interfaces to steppers, etchers, inspection systems, and host computers; hotplate ovens; and multiple hotplate ovens.

Thermco Systems Division—Orange and San Jose, California

Manufacturing activities include horizontal thermal systems, the Vertical Thermal Reactor (VTR), and CVD systems.

SVG Lithography Systems—Wilton, Connecticut

Manufacturing activities include step-and-scan lithography equipment, projection aligners, and X-ray step-and-repeat systems.

SUBSIDIARIES

North America

Silicon Valley Group International Inc. (United States)

SVG International Service (United States)

SVG Lithography Systems, Inc. (United States)

Thermco Systems Inc. (United States)

Europe

SVG Europe Ltd. (England)

SVG France S.A.R.L. (France)

SVG Halbleiter Anlagen GmbH (Germany)

SVG Lithography Europe B.V. (Netherlands)

SVG Lithography GmbH (Germany)

SVG Lithography S.A.R.L. (France)

Thermco Products GmbH (Germany)

Thermco Semiconductor Equipment Ltd. (England)

Asia/Pacific

Silicon Valley Group K.K. (Japan)

SVG Lithography (Japan)

Thermco Systems (Far East) Ltd. (Hong Kong)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

1990

Perkin-Elmer Corporation

SVG acquired a controlling interest in Perkin-Elmer Corporation's Optical Lithography Operation in a complex deal worth \$40 million. The new company, known as SVG Lithography Systems, Inc. (SVGL), will run the operation; approximately two-thirds of its stock will be owned by SVG.

1988

Thermco Systems

Silicon Valley Group acquired Thermco Systems, a manufacturer of oxidation/diffusion furnaces and LPCVD systems, for approximately \$22.7 million.

1987

Anicon

SVG acquired Anicon, a manufacturer of CVD equipment, for \$6.9 million.

KEY OFFICERS

Gerald M. Starek

Chairman of the board

Papken S. Der Torossian

President and chief executive officer

Vahe A. Sarkissian

President and chief executive officer, SVG Lithography Systems, and vice president, Silicon Valley Group

Nicholas E. Miller

President, Thermco Systems Division, and vice president, Silicon Valley Group

H. F. Ken Machado

President, Track Systems Division, and vice president, Silicon Valley Group

Patrick O'Conner

Vice president, Corporate Planning

Russell G. Weinstock

Vice president, Finance, and chief financial officer

Charles Desmond

Vice president, Corporate Sales

PRINCIPAL INVESTORS

Prudential Insurance Co. of America—7.9 percent
Brinson Partners—7.7 percent

FOUNDERS

Information is not available.

Table 4
Comprehensive Financial Statement
Fiscal Year Ending September
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987*	1988*	1989*
Total Current Assets	\$36,698.0	\$38,677.9	\$46,165.0	\$51,504.0	\$66,886.0
Cash	23,637.0	1,636.4	3,209.0	13,127.0	10,396.0
Receivables	5,629.0	24,018.7	9,730.0	12,794.0	29,370.0
Marketable Securities	0	6,619.2	26,259.0	14,384.0	1,400.0
Inventory	6,855.0	5,980.8	6,243.0	9,140.0	21,592.0
Other Current Assets	577.0	422.8	724.0	2,059.0	4,128.0
Net Property, Plants	\$1,750.0	\$3,171.8	\$4,942.0	\$5,027.0	\$7,860.0
Other Assets	\$233.0	\$262.8	\$3,636.0	\$3,221.0	\$10,165.0
Total Assets	\$38,681.0	\$42,112.5	\$54,743.0	\$59,752.0	\$84,911.0
Total Current Liabilities	\$3,938.0	\$4,319.4	\$8,901.0	\$8,912.0	\$22,687.0
Long-Term Debt	0	0	\$544.0	\$169.0	0
Other Liabilities	\$364.0	\$408.1	\$1,018.0	\$1,154.0	\$1,632.0
Total Liabilities	\$4,302.0	\$4,727.5	\$10,463.0	\$10,235.0	\$24,319.0
Total Shareholders' Equity	\$34,380.3	\$37,385.0	\$44,280.0	\$49,517.0	\$60,592.0
Common Stock	15,748.7	16,107.1	19,854.0	20,651.0	24,328.0
Other Equity	0	0	0	0	(2,214.0)
Retained Earnings	18,631.6	21,277.9	24,426.0	28,866.0	38,478.0
Total Liabilities and Shareholders' Equity	\$38,682.3	\$42,112.5	\$54,743.0	\$59,752.0	\$84,911.0
Income Statement	1985	1986	1987*	1988*	1989*
Revenue	\$36,864.0	\$27,842.0	\$39,300.0	\$48,969.0	\$131,080.0
US Revenue	NA	NA	24,759.0	33,299.0	77,337.0
Non-US Revenue	NA	NA	14,541.0	15,670.0	53,743.0
Cost of Sales	\$15,130.0	\$12,378.0	\$18,160.0	\$22,169.0	\$71,546.0
R&D Expense	\$4,660.0	\$4,686.0	\$5,808.0	\$7,006.0	\$15,177.0
SG&A Expense	\$7,945.0	\$8,036.0	\$11,813.0	\$14,877.0	\$28,951.0
Capital Expense	NA	\$1,914.0	\$625.0	\$1,740.0	\$1,837.0
Pretax Income	\$10,823.0	\$4,739.0	\$5,293.0	\$6,628.0	\$15,758.0
Pretax Margin (%)	29.36	17.02	13.47	13.54	12.02
Effective Tax Rate (%)	47.00	44.20	40.50	33.00	39.00
Net Income	\$5,734.0	\$2,646.0	\$3,148.0	\$4,440.0	\$9,612.0
Shares Outstanding, Thousands	8,764.0	8,876.0	9,892.0	9,879.0	10,196.0
Per Share Data					
Earnings	\$0.65	\$0.30	\$0.32	\$0.45	\$0.94
Dividend	0	0	0	0	0
Book Value	\$3.92	\$4.21	\$4.48	\$5.01	\$5.94

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending September
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987*	1988*	1989*
<i>Liquidity</i>					
Current (Times)	9.32	8.95	5.19	5.78	2.95
Quick (Times)	7.58	7.57	4.49	4.75	2.00
Fixed Assets/Equity (%)	5.09	8.48	11.16	10.15	12.97
Current Liabilities/Equity (%)	11.45	11.55	20.10	18.00	37.44
Total Liabilities/Equity (%)	12.51	12.65	23.63	20.67	40.14
<i>Profitability (%)</i>					
Return on Assets	-	6.55	6.50	7.76	13.29
Return on Equity	-	7.37	7.71	9.47	17.46
Profit Margin	15.55	9.50	8.01	9.07	7.33
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	12.64	16.83	14.78	14.31	11.58
Capital Spending % of Revenue	0	6.87	1.59	3.55	1.40
Employees	297	268	344	382	932
Revenue (\$K)/Employee	\$12,412.12	\$10,388.81	\$11,424.42	\$12,819.11	\$14,064.38
Capital Spending % of Assets	0	4.54	1.14	2.91	2.16

*Figures for 1987 through 1989 have been restated to reflect acquisitions.
 NA = Not available

Source: Silicon Valley Group, Inc.
 Annual Reports and Forms 10-K
 Dataquest (1990)

Tokyo Electron Ltd.

2-30-7, Sumiyoshi-cho
Fuchu City, Tokyo, Japan

Telephone: 0423-33-8111

Fax: 0423-33-8480

Telex: 2832475

Dun's Number: 69-054-9777

Date Founded: 1963

CORPORATE STRATEGIC DIRECTION

Tokyo Electron Ltd. (TEL) was founded in 1963 as an electronic products distributor. Currently, TEL manufactures semiconductor manufacturing equipment and measuring instruments as well as pursuing its original trade. Sales for fiscal year ended September 1990 grew rapidly, led by semiconductor manufacturing equipment.

TEL has three divisions: Semiconductor Equipment, Computer Systems, and Electronic Parts and Components. The Company has formed strategic joint ventures in all three divisions that allow it to trade technologies and products.

Revenue for year ended September 1990 totaled ¥190.0 billion (US\$1.3 billion), an increase of 9.7 percent over the previous year's total of ¥173.2 billion (US\$1.4 billion). (Percentage changes refer only to ¥ amounts; US\$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Net income for year ended September 1990 totaled ¥11.0 billion (US\$77.2 million), an increase of 21.7 percent over the previous year's figure of ¥9.0 billion (US\$70.5 million). Sixty-five percent of sales were of semiconductor manufacturing equipment, 22 percent were of electronic components, and the remaining 13 percent were of computer systems. Tokyo Electron's export sales accounted for 52 percent of revenue for fiscal year ended September 1990.

R&D expenditure totaled ¥4.8 billion (US\$33.7 million) for year ended September 1990, an increase of 55 percent over the previous year's figure of ¥3.1 billion (US\$24.2 million). Capital expenditure for year ended September 1990 totaled ¥6.1 billion (US\$42.8 million), an increase of nearly 30 percent over the previous year's figure of ¥4.7 billion (US\$36.6 million). Tokyo Electron employed 1,819 people the end of September 1990.

Due to the lack of complete financial information, no financial statements are included in this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductor Equipment

Because the introduction of highly integrated semiconductors requires rapid technological progress, success depends on the timely introduction of advanced processing technology into the market. The Company's strategy is to apply its skills as a trading enterprise with an extensive information network to identify the trends and seize the major portion of the market through the timely introduction of international products. Secondly, the Company plans to improve products to meet user specifications and back them up with reliable after-sales service.

Products in the Semiconductor Equipment division include photolithography/clean, doping/thermal processing, deposition, inspection/measurement/repair, and test equipment produced with various manufacturers through joint ventures.

Computer Systems

TEL offers complete systems of factory automation equipment used in the design, production, and inspection stages of semiconductor manufacturing, printed circuit boards, and machinery/equipment. Products in the Computer Systems Division include mechanical CAE/CAD/CAM/CAT systems, specified application

equipment, scientific and technical computers, and electrical CAE/CAD/CAM/CAT systems.

Electronic Parts and Components

Products in the Electronic Parts and Components Division include semiconductors, integrated circuits, discrete devices, and electronic components such as connectors, IC sockets, and switching power supplies.

Manufacturers of the mentioned electronic components include Advanced Micro Devices, Fujitsu, Western Digital, Winchester Electronics, and VLSI Technology, to name a few.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1990 SALES OFFICE LOCATIONS

North America—1
Europe—1
Asia/Pacific—9

MANUFACTURING LOCATIONS

Asia/Pacific

TEL Kyushu Ltd., Japan
Semiconductor production equipment, including coaters/developers and LCD production equipment
TEL Sagami Ltd., Japan
Oxidation/diffusion furnace systems and LP-CVD systems
TEL Tohoku Ltd., Japan
Various semiconductor equipment
TEL Yamanashi Ltd., Japan
Semiconductor production equipment including wafer probers, coater/developers, plasma-etching equipment, and ozone strip equipment

SUBSIDIARIES

North America

TEL America Inc. (United States)

Europe

TEL Service Europe B.V. (Netherlands)

Asia/Pacific

TEL Kyushu Ltd. (Japan)
TEL Sagami Ltd. (Japan)
TEL Tohoku Ltd. (Japan)
TEL Tokyo Electron FE (Japan)
TEL Yamanashi Ltd. (Japan)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

IIR Corporation

TEL is marketing test equipment manufactured by IIR. The CXI-5400 is an automatic system for testing assembled surface-mount technology (SMT)-type printed circuit boards.

Ultra Network Technologies Inc.

TEL will distribute Ultra Network Technologies networking systems to Fujitsu, which will support Ultra's gigabit-per-second network on its M-series mainframes and VP-series supercomputers.

Structural Dynamics Research Corporation

TEL began marketing I-DEAS Level V, an enhanced version of the I-DEAS CAE software, from Structural Dynamics Research.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Tokuo Kubo
Chairman of the board

Toshio Kodaka
President

Noboru Fuse
Senior managing director

Zenju Kasama
Senior managing director

Akira Inoue
Senior managing director

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Tokyo Ohka Kogyo Co., Ltd.

1-403, Kosugi-cho, Nakahara-ku
Kawasaki City, Kanagawa Prefecture, Japan

Telephone: (044) 722-7181

Fax: (044) 733-0398

Dun's Number: Not Available

Date Founded: 1940

CORPORATE STRATEGIC DIRECTION

Established in 1940, Tokyo Ohka Kogyo Co., Ltd., offers a wide range of products including electronics materials, chemical products, synthetics, photopolymer printing plates, offset printing plates, and related processing equipment. Tokyo Ohka's consolidated revenue was ¥43,914 million (US\$342.4 million) for fiscal year ended March 31, 1989. Consolidated net income totaled ¥5,357 million (US\$41.8 million) for fiscal 1989. Photoresists accounted for 35 percent of sales, chemical products 28 percent, processing equipment 14 percent, printing materials 14 percent, and other products 9 percent. Expenditure for R&D totaled ¥1,377 million (US\$10.7 million) for fiscal 1989.

No financial statements are included in this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

In 1968, Tokyo Ohka developed the OMR81, the first negative semiconductor photoresist made in Japan. The Company later developed the positive photoresist OFPR series, the electron-beam photoresist OEPR series for VLSI manufacturing, and the ODUR series for deep ultraviolet (UV) irradiation. Currently, Tokyo Ohka offers a full line of negative and positive photoresists for diverse applications. In addition to photoresists, the Company provides developers, strippers, and rinsing solutions as well as processing equipment, which includes etching machines, ashing machines, and photoresist coating machines. Tokyo Ohka developed a fully automatic single-wafer processing plasma etching machine in 1977 and followed this with a full line of semiconductor processing equipment. The Company also offers a wide array

of photoresists for use in printed circuit board (PCB) manufacturing and chemical milling applications.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

Asia/Pacific

Kumagaya Ohka Co., Ltd., Japan
Chemicals

Sudama Denshi Kogyo Co., Ltd., Japan
Materials for the electronics industry

Tokyo Alumetal Kogyo Co., Ltd., Japan
Plates for offset printing

Yamanashi Photopoly Ohka Co., Ltd., Japan
Photopolymer printing plates

SUBSIDIARIES

North America

Ohka America, Inc. (United States)

Europe

Ohka (UK), Ltd. (United Kingdom)

PRINCIPAL INVESTORS

Information is not available.

**ALLIANCES, JOINT VENTURES, AND
LICENSING AGREEMENTS**

Information is not available.

FOUNDERS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Takeo Ito

Chairman of the board of directors and president

Dr. Hisashi Nakane

Vice president

Hatsuo Matsumoto

Executive director

Union Carbide Corporation

39 Old Ridgebury Road
Danbury, Connecticut 06817-0001

Telephone: (203) 794-6440

Fax: (203) 794-2826

Dun's Number: 00-128-9008

Date Founded: 1917

CORPORATE STRATEGIC DIRECTION

Incorporated in 1917, Union Carbide Corporation is a worldwide leader in industrial technology and is one of the 50 largest US industrial corporations. The Company designs, manufactures, and markets chemicals and plastics, industrial gases and related products, metals and carbons, batteries, home and automotive products, and specialty products. Union Carbide is divided into three specific business groups: Union Carbide Chemicals and Plastics Company Inc., representing 66 percent of total sales; Union Carbide Industrial Gases Inc., representing 25 percent of total sales; and UCAR Carbon Company, Inc., representing 9 percent of total sales. Seventy-five percent of UCAR's business and 17 percent of Industrial Gases' business is dependent upon the steel industry.

Total revenue for fiscal year 1989 grew 5.1 percent to \$8.7 billion* from \$8.3 billion in fiscal year 1988. Net income decreased 13.4 percent to \$573.0 million for fiscal year 1989 from \$662.0 million for fiscal year 1988. Union Carbide employs 45,987 people worldwide.

Union Carbide sales are produced principally through its direct sales force. Although domestic sales dominate the percentage of total revenue generated, international sales have slowly been increasing at a constant pace of 2 to 3 percent over the past five years. In fiscal year 1989, domestic sales accounted for 66.2 percent and international sales accounted for 33.8 percent of total revenue. Europe represented 12.0 percent and Latin America 11.0 percent of international sales. Union Carbide is currently focusing and building on trading and sales activities abroad.

In fiscal years 1989, 1988, and 1987, Union Carbide respectively spent \$181.0 million, \$159.0 million, and \$159.0 million on R&D. These figures respectively

total 2.0 percent, 1.9 percent, and 2.3 percent of total revenue. Sponsored primarily by Union Carbide, R&D activities are conducted to develop new products, processes, or services, and improve existing ones. The Chemicals and Plastics group has eight facilities within the United States and four internationally. The Industrial Gases group has five domestic facilities and two internationally. The UCAR Carbon Company's R&D activities are carried on primarily in Parma, Ohio.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Chemicals and Plastics

Union Carbide was one of the founders of the US petrochemical industry when it started to manufacture ethylene and other coproducts and derivatives. Since then, Union Carbide Chemicals and Plastics Company Inc. has branched out into developing numerous other chemicals and plastics. It is the world's largest producer of ethylene oxide/glycol. Its UNIPOL process is the lowest-cost process for polyethylene production and is widely licensed throughout the world. Union Carbide is also the largest producer of oxygenated solvents in the United States and is the leader in oxo-alcohols process technology. Union Carbide produces the following product groups: ethylene oxide and derivatives, polyethylene, solvents and coatings materials, and other specialty chemicals. The

*All dollar amounts are US dollars.

ethylene oxide and derivatives group consists of ethylene glycol for antifreeze, polyester fiber and PET resins, surfactants for detergents, ethanolamines, and ethyleneamines. This group also produces both high-volume and specialty polyethylene resins for many plastic products: film and wrap, bags, pipes, containers and drums, wire and cable insulation, and a variety of molded products. Solvents and coatings materials consist of alcohols, acetates, acrylates, latex, coatings resins, and glycol ethers. Other specialty chemicals produced by Union Carbide are water-soluble polymers for personal care, silicones, polyvinyl acetate for additives to plastics, UCON fluids for hydraulic and heat transfer fluids and for lubricants, acrolein, and gluteraldehyde for biocide and custom intermediates.

Industrial Gases

Union Carbide Industrial Gases Inc. is the largest producer of oxygen, nitrogen, argon, hydrogen, helium, and specialty gases in the United States, Canada, and Brazil, as well as one of the three largest

producers throughout the world. Numerous areas utilize industrial gases: chemicals, steel and aluminum production, electronics, food freezing, rubber and plastic production, metalworking and welding, medicine, oil and gas extraction, pulp and paper, glass production, aerospace, and environmental cleanup.

Carbon Products

UCAR Carbon Company accounts for the smallest portion of Union Carbide Corporation's business; however, within its field, UCAR is the world's largest producer of graphite electrodes and other carbon and graphite products for the basic metals industries.

Further Information

For more information on Union Carbide's business segments, please contact Dataquest's Semiconductor Equipment and Materials Service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$6,390.0	\$6,343.0	\$6,914.0	\$8,324.0	\$8,744.0
Percent Change	-	(0.74)	9.00	20.39	5.05
Capital Expenditure	\$501.0	\$524.0	\$502.0	\$671.0	NA
Percent of Revenue	7.84	8.26	7.26	8.06	NA
R&D Expenditure	\$181.0	\$148.0	\$159.0	\$159.0	\$181.0
Percent of Revenue	2.83	2.33	2.30	1.91	2.07
Number of Employees	52,117	50,292	43,119	43,992	45,987
Revenue (\$K)/Employee	\$122.61	\$126.12	\$160.35	\$189.22	\$190.14
Net Income	(\$581.0)	\$496.0	\$232.0	\$662.0	\$573.0
Percent Change	-	185.37	(53.23)	185.34	(13.44)
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	\$2,241.00	\$2,277.00	\$2,141.00	\$2,085.00	
Quarterly Profit	\$201.00	\$186.00	\$139.00	\$47.00	

NA = Not available

Source: Union Carbide Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	73.41	71.81	69.11	69.17	66.25
International	26.59	28.19	30.89	30.83	33.75
Canada	4.90	3.80	4.30	5.15	5.30
Europe	10.11	11.78	12.67	11.16	12.04
Latin America	7.45	8.18	9.23	9.33	10.99
Others	4.13	4.43	4.69	5.19	5.42

Source: Union Carbide Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	100.00	100.00
Indirect Sales	0	0

Source: Dataquest (1990)

1990 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

Chemical and Plastics Manufacturing

North America

Acushnet, Massachusetts
Precision coating equipment
Alsip, Illinois
Latexes
Bensenville, Illinois
Printed circuit chemicals
Bound Brook, New Jersey
Coatings resins, phenolic resins, phenoxy resins,
polyethylene compounding, synthetic thickeners
Clear Lake, Wisconsin
Conformal coating services
Cowansville, Quebec, Canada
Polyethylene film
Edison, New Jersey
Lanolin derivatives
Garland, Texas
Latexes
Henderson, Kentucky
Dielectric fluid
Indianapolis, Indiana
Coating and bonding systems
Institute, West Virginia
Carbowax polyethylene glycol, hydroxethyl
cellulose, polyethyleneoxide, ketones, tergitol
surfactants
Mamaroneck, New York
Lanolin derivatives
Montreal East, Quebec, Canada
Chemicals
Moses Lake, Washington
Polycrystalline silicon
Prentiss, Canada
Ethylene oxide and glycol
Seadrift, Texas
Alkanolamines, ethylene oxide and glycol, glycol
ethers, olefins, polyethylene, polypropylene,
tergitol surfactants

Sistersville, West Virginia
Antifoams and emulsions, organofunctional silanes
and silicone surfactants, silicone fluids
Somerset, New Jersey
Latexes
South Charleston, West Virginia
Alkylalkanolamines, brake fluids, ketones,
miscellaneous specialty products, niac polyols and
catalysts, propylene glycol, coatings resins, ucon
fluids
Sunnyvale, California
Photoresists
Taft (Star Plant), Louisiana
Polyethylene
Taft, Louisiana
Acrolein and derivatives, acrylic monomers,
ultraviolet curing equipment, alkylene amines,
cycloaliphatic epoxides, ethylene oxide and glycol,
glycol ethers, olefins
Texas City, Texas
Olefins, organic acids and esters, alcohols, tergitol
surfactants, vinyl acetate, coatings resins
Torrance, California
Latexes
Tucker, Georgia
Latexes
Washougal, Washington
Crystal products

Europe

Northampton, United Kingdom
Conformal coatings
Solingen, Germany
Photoresists
Termoli, Italy
Organofunctional silanes
Vilvoorde, Belgium
Lanolin derivatives

Asia/Pacific

Ekala, Sri Lanka
Latex
Jakarta, Indonesia
Latex
Jurong, Singapore
Latex
Kowloon, Hong Kong
Latex silicones
Nonthaburi, Thailand
Latex
Seoul, South Korea
Photoresists
Seremban, Malaysia
Latex, silicones

ROW

Aratu, Brazil
 Hydroxyethyl cellulose
 Barranquilla, Colombia
 Silicones
 Bayamon, Puerto Rico
 Latexes
 Buenos Aires, Argentina
 Silicones
 Cubatao, Brazil
 Polyethylene
 Guayaquil, Ecuador
 Latexes
 Sao Paulo, Brazil
 Silicones

Gaseous and liquid hydrogen
 Prentiss, Canada
 Industrial gases
 Sarnia, Ontario, Canada
 Industrial gases
 Sault Ste. Marie, Ontario, Canada
 Industrial gases
 Selkirk, Manitoba, Canada
 Industrial gases
 Tonawanda, New York
 Air separation equipment
 Torrance, California
 Specialty gases
 Tracy, Canada
 Industrial gases
 Ulysses, Kansas
 Gaseous and liquid helium

Industrial Gases Manufacturing

Domestic facilities for the manufacturing of industrial gases are spread over 100 plants, some of which are located at customer facilities throughout the United States. The following are principal manufacturing facilities for products other than oxygen, nitrogen, and argon.

North America

Bushton, Kansas
 Gaseous and liquid helium
 East Chicago, Indiana
 Specialty gases
 Fort Saskatchewan, Alberta, Canada
 Industrial gases
 Houston, Texas
 Specialized industrial services
 Indianapolis, Indiana
 Coatings service
 Kansas City, Missouri
 Coatings service
 Kearney, New Jersey
 Specialty gases
 Montreal, Quebec, Canada
 Industrial gases
 Niagara Falls, New York
 Gaseous and liquid hydrogen
 North Haven, Connecticut
 Coatings service
 Norwood, Massachusetts
 Membrane systems
 Oakville, Ontario, Canada
 Industrial gases
 Ontario, California

Europe

Antwerp, Belgium
 Industrial gases
 Biebesheim, Germany
 Industrial gases
 Creil, France
 Industrial gases
 Geneva, Switzerland
 Coatings service
 Gijon, Spain
 Industrial gases
 Navarro, Italy
 Coatings service
 Oevel, Belgium
 Industrial gases
 Ratigen, Germany
 Coatings service
 Southam, United Kingdom
 Coatings service
 St. Etienne, France
 Coatings service
 Swindon, United Kingdom
 Coatings service

Asia/Pacific

Changwon City, South Korea
 Industrial gases and coatings service
 Giheugn, South Korea
 Industrial gases
 Kozuki-Cho, Japan
 Coatings service
 Okegawa, Japan
 Coatings service

ROW

Brazil

Industrial gases, air separation equipment, welding,
and related products

Carbon Manufacturing

North America

Clarksburg, West Virginia

Graphite specialties

Clarksville, Tennessee

Graphite electrodes

Cleveland, Ohio

Specialty inorganic materials

Columbia, Tennessee

Graphite electrodes

Irving, California

Graphite tooling

Lawrenceburg, Tennessee

Carbon and graphite products

Niagara Falls, New York

Calcined coal

Robinson, Illinois

Calcined petroleum coke

Welland, Ontario, Canada

Graphite electrodes

Yabucoa, Puerto Rico

Graphite electrodes

Europe

Aigueblanche, France

Graphite electrodes

Calais, France

Graphite electrodes

Caserta, Italy

Graphite electrodes

Forno Allione, Italy

Graphite electrodes

Pamplona, Spain

Graphite electrodes

Sheffield, United Kingdom

Graphite electrodes and graphite products

Asia/Pacific

Kozuki-Cho, Japan

Specialty inorganic materials

ROW

Candeias, Brazil

Carbon cathodes, graphite electrodes

SUBSIDIARIES

North America

Union Carbide Canada Ltd. (Canada)

Union Carbide Caribe Inc. (United States)

Union Carbide Communications Co. Inc. (United States)

Union Carbide Eastern Inc. (United States)

Union Carbide Engineering and Hydrocarbons Service Co. Inc. (United States)

Union Carbide Engineering and Technology Services (Africa and Middle East) Inc. (United States)

Union Carbide Ethylene Oxide/Glycol Co. (United States)

Union Carbide Europe Inc. (United States)

Union Carbide Finance Corp. (United States)

Union Carbide Foreign Sales Corp., Virgin Islands (United States)

Union Carbide Grafito Inc. (United States)

Union Carbide Imaging Systems Inc. (United States)

Union Carbide Industrial Services Co. (United States)

Union Carbide Inter-America Inc., Delaware (United States)

Union Carbide Inter-America Inc., New Jersey (United States)

Union Carbide International Capital Corp. (United States)

Union Carbide International Sales Corp. (United States)

Union Carbide Middle East Ltd. (United States)

Union Carbide Pan America Inc. (United States)

Union Carbide Petrochemical International (FCS) Corp., Virgin Islands (United States)

Union Carbide Polyolefins Development Co. Inc. (United States)

Union Carbide Puerto Rico Inc. (Puerto Rico)

Union Carbide Southern Africa (USA) Inc. (United States)

Union Carbide Subsidiary C Inc. (United States)

Union Carbide Turkey Inc. (United States)

Europe

Union Carbide Austria GmbH (Austria)

Union Carbide Benelux N.V. (Belgium)

Union Carbide Deutschland GmbH (Germany)

Union Carbide France S.A. (France)

Union Carbide Hellas Ltd. (Greece)

Union Carbide Iberica S.A. (Spain)

Union Carbide Italia S.p.A. (Italy)

Union Carbide M.S. S.p.A. (Italy)

Union Carbide Navarra S.A. (Spain)
 Union Carbide Norden AB (Sweden)
 Union Carbide Services Ltd. (United Kingdom)
 Union Carbide U.K. Ltd. (United Kingdom)

Asia/Pacific

Union Carbide Asia Ltd. (Hong Kong)
 Union Carbide Formosa Co. Ltd. (Taiwan)
 Union Carbide India Ltd. (India)
 Union Carbide Indonesia P.T. (Indonesia)
 Union Carbide Japan K.K. (Japan)
 Union Carbide Korea Ltd. (South Korea)
 Union Carbide Pakistan Ltd. (Pakistan)
 Union Carbide Philippines (Far East) Inc. (Philippines)
 Union Carbide Services Eastern Ltd. (Hong Kong)
 Union Carbide Thailand Ltd. (Thailand)

ROW

Union Carbide Agricultural Products Ltd. (Zimbabwe)
 Union Carbide Argentina S.A.I.C.S. (Argentina)
 Union Carbide Commercial Chile Ltda. (Chile)
 Union Carbide Commercial Nicaragua S.A. (Nicaragua)
 Union Carbide do Brasil Ltda. (Brazil)
 Union Carbide Land & Investment Ltd. (Zimbabwe)
 Union Carbide Management Services Ltd. (Zimbabwe)
 Union Carbide Mexicana S.A. (Mexico)
 Union Carbide Overseas Finance Corp. N.V. (Netherlands Antilles)
 Union Carbide Ranches Ltd. (Zimbabwe)
 Union Carbide South Africa Ltd. (South Africa)
 Union Carbide Zimbabwe Ltd. (Zimbabwe)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Guardsman Products

Guardsman Products was given the rights to develop, produce, and sell the UNICARB paint system from Union Carbide Chemicals and Plastics.

Elekeiroz do Nordeste Industrias Quimicas

A joint venture calls for production of 80,000 metric tons per year of butanol and 2-ethylhexanol in Brazil.

1989

Mitsubishi Petrochemical Company Limited

Under the agreement, Mitsubishi acquired a license to construct a worldwide polypropylene plant using the UNIPOL PP technology jointly developed by Union Carbide and Shell Chemical. Union Carbide acquired an option to obtain a license and sublicensing rights for the use of Mitsubishi's family of high-activity polypropylene catalysts.

Kanegafuchi Chemical Industry Co.

A joint venture calls for the production of silicon polymer.

Sekisui America

Union Carbide and Sekisui America jointly formed Hexatec Polymers to make toner resins for North and South American markets. Hexatec Polymers will supply custom styrene-acrylic resins for toners used in copying machines and laser printers.

Ivax

Union Carbide and Ivax jointly formed Baker Cummins Dermatologicals to manufacture and market dermatological products.

ENIQ

Union Carbide and ENIQ will construct an oxochemicals plant in Camacari, Brazil, to begin production of butanols and 2-ethylhexanol by 1992.

DNA Plant Technology

Union Carbide and DNA Plant Technology jointly formed Agri-Diagnostics Association to manufacture and market on-site test kits to detect diseases, contaminants, and pollutants in agricultural areas.

Wei T'o Associates

Wei T'o licensed its paper-preservation technology to Union Carbide.

Schenectady Chemicals

Union Carbide licensed its phenolic washed resins technology to Schenectady Chemicals, which will supply the resins to Union Carbide's customers after Union Carbide stops production of the resins in Bound Brook, New Jersey.

1988

UOP Inc.

A joint venture was established with UOP, Inc., a subsidiary of Allied-Signal Inc. The joint venture, called UOP, will help strengthen Union Carbide's position as a supplier of technology, products, and services to the petroleum refining, petrochemical, and gas-processing industries.

1987

Nan Ya Plastics

Nan Ya Plastics was licensed to use the low-pressure oxo technology Union Carbide jointly licensed with Davy-McKee and Johnson-Mathey for a new plant in Taiwan.

MERGERS AND ACQUISITIONS

1989

Argi-Diagnostic Associates

Union Carbide partly acquired Agri-Diagnostic, a developer and marketer of kits for detecting contaminants and agricultural pollutants.

BP Chemicals

BP Chemicals sold its silicone surfactant business to Union Carbide.

KEY OFFICERS

Robert D. Kennedy

Chairman, president and chief executive officer

Joseph E. Geoghan

Vice president and general counsel

John B. Powers

Vice president, Strategic Planning

Cornelius C. Smith, Jr.

Vice president, Community & Employee Health, Safety & Environmental Protection

J. Clayton Stephenson

Vice chairman, chief financial and administrative officer

H. William Lichtenberger

Vice president and president, Chemicals & Plastics Business Group

John R. MacLean

Vice president and president, Industrial Gases Business Group

Robert P. Krass

Vice president and president, Carbon Products Business Group

PRINCIPAL INVESTORS

Delaware Management Company Inc.—5.7 percent

FOUNDERS

Information is not available.

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985*	1986	1987	1988	1989
Total Current Assets	\$4,426.0	\$2,414.0	\$2,555.0	\$2,883.0	\$2,787.0
Cash	24.0	38.0	201.0	146.0	142.0
Receivables	1,114.0	1,085.0	1,294.0	1,413.0	1,474.0
Marketable Securities	406.0	261.0	0	0	0
Inventory	831.0	746.0	827.0	1,032.0	932.0
Other Current Assets	2,051.0	284.0	233.0	292.0	239.0
Net Property, Plants	\$4,527.0	\$4,379.0	\$4,344.0	\$4,416.0	\$4,584.0
Other Assets	\$717.0	\$778.0	\$993.0	\$1,142.0	\$1,175.0
Total Assets	\$9,670.0	\$7,571.0	\$7,892.0	\$8,441.0	\$8,546.0
Total Current Liabilities	\$2,382.0	\$1,881.0	\$1,811.0	\$2,455.0	\$2,328.0
Long-Term Debt	\$1,713.0	\$3,057.0	\$2,863.0	\$2,295.0	\$2,080.0
Other Liabilities	\$1,556.0	\$1,628.0	\$1,971.0	\$1,855.0	\$1,755.0
Total Liabilities	\$5,651.0	\$6,566.0	\$6,645.0	\$6,605.0	\$6,163.0
Total Shareholders' Equity	\$4,019.0	\$1,005.0	\$1,247.0	\$1,836.0	\$2,383.0
Common Stock	212.0	205.0	209.0	214.0	142.0
Other Equity	199.0	961.0	1,140.0	1,216.0	(52.0)
Retained Earnings	3,774.0	2,061.0	2,098.0	2,605.0	2,293.0
Less: Treasury Stock	(166.0)	(2,222.0)	(2,200.0)	(2,199.0)	0
Total Liabilities and Shareholders' Equity	\$9,670.0	\$7,571.0	\$7,892.0	\$8,441.0	\$8,546.0
Income Statement	1985*	1986	1987	1988	1989
Revenue	\$6,390.0	\$6,343.0	\$6,914.0	\$8,324.0	\$8,744.0
US Revenue	4,691.0	4,555.0	4,778.0	5,758.0	5,793.0
Non-US Revenue	1,699.0	1,788.0	2,136.0	2,566.0	2,951.0
Cost of Sales	\$4,597.0	\$4,343.0	\$4,773.0	\$5,465.0	\$5,875.0
R&D Expense	\$181.0	\$148.0	\$159.0	\$159.0	\$181.0
SG&A Expense	\$735.0	\$740.0	\$779.0	\$822.0	\$924.0
Capital Expense	\$501.0	\$524.0	\$502.0	\$671.0	NA
Pretax Income	(\$906.0)	\$212.0	\$391.0	\$1,128.0	\$878.0
Pretax Margin (%)	-	3.34	5.66	13.55	10.04
Effective Tax Rate (%)	43.90	30.20	34.00	38.90	NA
Net Income	(\$581.0)	\$496.0	\$232.0	\$662.0	\$573.0
Shares Outstanding, Millions	202.8	127.7	132.2	137.6	141.6
Per Share Data					
Earnings	(\$2.78)	\$4.78	\$1.76	\$4.88	\$4.07
Dividend	\$1.13	\$1.50	\$1.50	\$1.15	NA
Book Value	\$19.82	\$7.87	\$9.43	\$13.34	\$16.83

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1985*	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	1.28	1.41	1.41	1.17	1.20
Quick (Times)	0.89	0.95	0.95	0.75	0.80
Fixed Assets/Equity (%)	435.72	348.36	348.36	240.52	192.36
Current Liabilities/Equity (%)	187.16	145.23	145.23	133.71	97.69
Total Liabilities/Equity (%)	653.33	532.88	532.88	359.75	258.62
<i>Profitability (%)</i>					
Return on Assets	-	5.75	3.00	8.11	6.75
Return on Equity	-	19.75	20.60	42.95	27.16
Profit Margin	(9.09)	7.82	3.36	7.95	6.55
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	2.83	2.33	2.30	1.91	2.07
Capital Spending % of Revenue	7.84	8.26	7.26	8.06	NA
Employees	52,117	50,292	43,119	43,992	45,987
Revenue (\$K)/Employee	\$122.61	\$126.12	\$160.35	\$189.22	\$190.14
Capital Spending % of Assets	6.62	6.64	6.36	7.95	NA

*1985 is restated. In addition, 1985 includes certain reclassifications to conform to the 1986 presentation. Amounts for 1985 were adjusted to reflect the stock dividend in March 1986.
 NA = Not available

Source: Union Carbide Corporation
 Annual Reports and Forms 10-K
 Dataquest (1990)

Varian Associates, Inc.

611 Hansen Way
Palo Alto, California 94303
Telephone: (415) 493-4000
Fax: (415) 493-0307
Dun's Number: 00-912-0817

Date Founded: 1948

CORPORATE STRATEGIC DIRECTION

Varian Associates, Inc., together with its subsidiaries, is engaged in the research, development, manufacture, and marketing of various products and services for the fields of communications, defense, industrial production, scientific and industrial research, health care, and environmental monitoring. The Company's principal lines of business are electron devices and systems and equipment including analytical instruments, semiconductor equipment, and medical and industrial products.

Varian's operations are grouped into two segments: Electron Devices and Systems and Equipment. The Electron Devices and Systems segment includes a broad line of electron devices and systems used in broadcasting, communications, and other commercial and military applications. The Equipment segment includes analytical instruments widely used in the fields of chemistry, physics, biology, life sciences, and metallurgy; semiconductor equipment used for semiconductor wafer fabrication; and medical and industrial products including linear accelerators used for cancer therapy and industrial testing and inspection, as well as vacuum pumps and systems, gauges, and leak detectors used in a variety of industrial applications.

Total revenue increased by 15 percent to \$1.34 billion* in fiscal 1989 from \$1.17 billion in fiscal 1988. Net earnings increased 14 percent to \$31.5 million in fiscal 1989 from \$27.8 million in fiscal 1988. Varian employs 12,100 people worldwide.

Research and development expenditure totaled \$83 million in fiscal 1989, representing 6 percent of revenue.

*All dollar amounts are in US dollars.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on distribution channels is not available. Table 3, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Electron Devices and Systems Segment

Varian's Electron Devices and Systems segment is organized around two major areas of activity, Electron Devices and Systems. Electron Devices, the larger of the two, holds world leadership positions in microwave, power grid, and special-purpose electron tubes, and has an expanding position in gallium arsenide (GaAs)-based solid-state components and night vision devices. The Systems area includes power amplifiers and other systems used in satellite communications, high-power transmitters for radar, radio and television broadcasting, and other communications applications, as well as electronic countermeasures and instrumentation. Approximately one-half of the segment's sales are for defense applications, including electronic countermeasures, radar, and missile guidance. About one-third of its sales are for communication applications, including radio and television broadcasting and satellite communications. Industrial and medical markets, such as X-ray generation and imaging, also are served.

Equipment Segment

The Company's largest business segment, Equipment, is organized around three major groups, Semiconductor Equipment, Analytical Instruments, and Medical and Industrial Products.

The Semiconductor Equipment Group manufactures process equipment used to make semiconductor devices such as integrated circuits. The major product lines are ion implantation and sputter deposition. Varian is a leader in the development, manufacture, and application of equipment utilizing ion implantation and sputter-coating in semiconductor wafer processing. Backlog for this business amounted to \$125 million and \$113 million in fiscal 1989 and 1988, respectively.

The Analytical Instruments Group manufactures, sells, and services a variety of scientific instruments for analyzing chemical substances. The substances analyzed include metals, inorganic materials, organic compounds, polymers, natural substances, and biochemicals. The products include liquid and gas chromatographs, nuclear magnetic resonance (NMR) spectrometers, ultraviolet visible and atomic absorption spectrophotometers, and associated data products. Typical applications are biochemical research, measurement of the chemical composition of mixtures, studies of the chemical structures of pure compounds, quality control of manufactured materials, chemical analysis of natural products, and the satisfaction of environmental and regulatory chemical measurement needs. The major markets served are the pharmaceutical and chemical industries, chemical

and life science academic research, government laboratories, and specific areas of the health care industry. Backlog for this business amounted to \$56 million and \$49 million in fiscal 1989 and 1988, respectively.

The Medical and Industrial Products Group manufactures linear accelerators, simulators, supplies, and systems. Linear accelerators are used in cancer therapy and for industrial radiographic applications. Varian's leading CLINAC series of accelerators, marketed to hospitals and clinics worldwide, generate therapeutic X-rays and electron beams for cancer treatment. LINATRON linear accelerators are used in industrial applications for x ray examination of heavy metallic structures for quality control and materials irradiation for sterilization. Backlog for this business amounted to \$236 million and \$222 million in fiscal 1989 and 1988, respectively.

Further Information

For more information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	\$935,888.0	\$891,139.0	\$982,776.0	\$1,170,558.0	\$1,343,632.0
Percent Change	-	(4.78)	10.28	19.11	14.79
Capital Expenditure	-	-	-	-	-
Percent of Revenue	-	-	-	-	-
R&D Expenditure	\$72,211.0	\$82,290.0	\$80,726.0	\$80,222.0	\$83,071.0
Percent of Revenue	7.72	9.23	8.21	6.85	6.18
Number of Employees	11,900	11,600	11,900	11,800	12,100
Revenue (\$K)/Employee	\$78.65	\$76.82	\$82.59	\$99.20	\$111.04
Net Income	\$26,122.0	(\$14,870.0)	\$21,365.0	\$27,758.0	\$31,519.0
Percent Change	-	(156.93)	(243.68)	29.92	13.55
1989 Calendar Year	Q1	Q2	Q3	Q4	
Quarterly Revenue	\$358.62	\$333.50	\$364.10	\$317.70	
Quarterly Profit	\$12.03	\$9.10	\$10.00	\$7.60	

Source: Varian
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	80.14	77.20	76.42	75.35	77.40
International	19.86	22.80	23.58	24.65	22.60
Japan	6.00	4.00	4.00	6.00	6.00
Europe	9.00	12.00	14.00	12.00	10.00
Asia/Pacific	3.00	4.00	2.00	3.00	4.00
ROW	2.00	3.00	3.00	3.00	2.00

Source: Varian
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

North America

Tempe, Arizona

Activities of the Tempe Electronics Division include printed circuit board assembly.

Fremont, Palo Alto, and Santa Clara, California

Thin Film Technology Division is located in each of these cities. Activities include the production of integrated processing systems, chemical vapor deposition (CVD) systems, sputtering systems, molecular beam epitaxy systems, and memory disk sputtering systems.

Palo Alto, California

The Microwave Power Division, Traveling-Wave Tube Division, Coupled Cavity Tube Division, Electro Optical Sensors Division, NMR Instrument Division, and Radiation Division are located in Palo Alto, California. Activities include the production of klystrons, gytrons, traveling-wave tubes, coupled cavity tubes, klystode tubes, night-vision devices, NMR spectrometers, and medical and industrial linear accelerators.

San Carlos, California

Activities of the Eimac, San Carlos Division include the production of power-grid tubes and ancillary hardware, and X-ray subsystems.

Santa Clara, California

The Solid State Microwave Division, III-V Device Center, Microwave Equipment Division, and Varian-TEL Ltd. are located in Santa Clara. Activities include the production of solid-state oscillators, amplifiers and subsystems, GaAs and indium-phosphide devices and integrated devices, GaAs foundry, power amplifiers and transmitters, power supplies, and semiconductor manufacturing equipment.

Sunnyvale and Walnut Creek, California

Activities of the Walnut Creek Instrument Division include the production of gas and liquid chromatographs, data systems, and laboratory information management systems.

Beverly, Massachusetts

Activities of the RF Subsystems Division include production of RF and IF/log amplifiers, microwave signal processing equipment and subsystems.

Beverly and Gloucester, Massachusetts

An Extron Division is located in both cities. Activities include the production of ion implantation equipment and rapid thermal processing equipment.

Georgetown, Ontario

The Canada Microwave Division's activities include the production of power supplies, klystrons, traveling-wave tubes, and millimeter-wave tubes.

Dallas, Texas

Activities of the Continental Electronics Division include the production of high-power transmitters and power amplifiers.

Salt Lake City, Utah

Activities of the Eimac, Salt Lake Division involve the production of power-grid tubes, cavity amplifiers, oscillators, and X-ray tubes.

Europe

Cambridge, England

Activities of Varian TVT Ltd. include the production of UHF, VHF, and FM transmitters and systems.

Crawley, England

Activities of Varian-TEM Ltd. include the production of cancer therapy planning simulators.

Asia/Pacific

Melbourne, Australia

Activities of the Varian Techtron Pty. Ltd. include the production of atomic absorption and UV-Vis spectrometers.

SUBSIDIARIES

North America

Analytichem International Inc. (United States)

Mansfield Insurance Co. (United States)

Varian Associates Ltd. (United States)

Varian Canada Inc. (Canada)

Varian China Ltd. (United States)

Varian Export Corp. (United States)

Varian Instruments Ltd. (United States)
 Varian Instruments of Puerto Rico Inc. (United States)
 Varian Investment Corp. (United States)
 Varian Microwave Equipment Ltd. (United States)
 Varian Pacific Inc. (United States)
 Varian Realty Inc. (United States)
 Varian Semiconductor Equipment Co. Inc. (United States)
 Varian U.K. Ltd. (United States)

Europe

N.V. Varian Benelux S.A. (Belgium)
 Varian AB (Sweden)
 Varian AG (Switzerland)
 Varian Benelux B.V. (The Netherlands)
 Varian Electronics ApS (Denmark)
 Varian FSC B.V. (The Netherlands)
 Varian GmbH (Austria)
 Varian GmbH (Germany)
 Varian International AG (Switzerland)
 Varian SA (France)
 Varian S.p.A (Italy)
 Varian-TEM Ltd. (United Kingdom)
 Varian TVT Ltd. (United Kingdom)

Asia/Pacific

Varian Australia Pty. Ltd. (Australia)
 Varian Pty. Ltd. (Australia)
 Varian Taiwan Ltd. (Taiwan)
 Varian Techtron Pty. Ltd. (Australia)

ROW

Varian Industria e Comercia Ltd. (Brazil)
 Varian S.A. (Mexico)

dynamic random-access memory (DRAM) chips and 32-bit microprocessors.

ASEA Brown Boveri

Varian signed a letter of understanding with ASEA Brown Boveri AG (ABB) of Baden, Switzerland, under which Varian will assume installation and service responsibilities for ABB radiotherapy equipment. Under the arrangement, Varian would also purchase certain related ABB technology, including rights to its newly developed Dynaray-ID imaging system.

Finnigan Corporation

Varian and Finnigan Corporation entered into an agreement under which Varian will purchase from Finnigan the basic technology and knowledge to manufacture ion trap mass detectors used with Varian's gas chromatographs in varied analytical applications. Additionally, Varian will pay unspecified royalties on units manufactured under Finnigan patents. Varian will distribute worldwide a version of Finnigan's ITS 40 gas chromatograph/ion trap mass detection system, which is manufactured exclusively by Finnigan.

1988

Tokyo Electron (TEL)

Varian and TEL entered into an agreement under which Varian will exclusively distribute, sell, and service TEL's semiconductor products in the United Kingdom, the United States, and several European markets. In addition, Varian will distribute the TEL photoresist coater/developer, Clean Track Mark II, which is used for Mb DRAM production, and the TEL Diffusion Furnace/LPCVD System.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Tokyo Electron

Varian and Tokyo Electron (TEL) entered into a joint venture, a semiconductor equipment company called Varian-TEL, to produce a vertical diffusion furnace system. The system is focused on fabricating lines that produce products such as 4Mb

MERGERS AND ACQUISITIONS

1989

Watkins-Johnson

Varian acquired Watkins-Johnson's line of space communications equipment. Varian will merge the Watkins-Johnson traveling-wave tube, power supply, amplifier, and exploratory products into its Microwave Equipment Division product lines.

Machlett Laboratories

Varian acquired Machlett Laboratories, which makes X-ray and power grid tubes. Most of Machlett's equipment will be relocated to Varian's Eimac Division facilities in San Carlos, California, and Salt Lake City, Utah. Machlett was previously a subsidiary of Raytheon.

KEY OFFICERS

J. Tracy O'Rourke

Chairman of the board and chief executive officer

Allen J. Lauer

Senior vice president and president, Analytical Instruments

Al D. Wilunowski

Vice president and president, Electron Devices

Alan J. Bennet

Vice president, Research

Stanley Z. Cole

Vice president and director, Patents and Licensing

Richard M. Levy

Senior vice president and president, Semiconductor Equipment

John J. Cooper

Vice president and general counsel

Gary E. Simpson

Vice president, Corporate Communications

Ernest M. Felago

Vice president, Human Resources

PRINCIPAL INVESTORS

Battermarch Financial Management—9.4 percent

Neuberger and Berman—8.9 percent

Pioneering Management Corp.—7.0 percent

Prudential Insurance Co. of America—6.1 percent

Table 3
Comprehensive Financial Statement
Fiscal Year Ending September
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	\$473,830.0	\$505,420.0	\$537,448.0	\$589,922.0	\$643,237.0
Cash	13,491.0	7,978.0	27,937.0	11,539.0	-
Receivables	188,474.0	190,403.0	205,242.0	252,469.0	263,738.0
Marketable Securities	-	-	-	-	-
Inventory	213,899.0	211,819.0	230,754.0	245,455.0	285,725.0
Other Current Assets	57,966.0	95,220.0	73,515.0	80,459.0	93,774.0
Net Property, Plants	\$246,849.0	\$254,272.0	\$255,719.0	\$241,660.0	\$252,771.0
Other Assets	\$24,127.0	\$30,463.0	\$36,437.0	\$24,247.0	\$35,273.0
Total Assets	\$744,806.0	\$790,155.0	\$829,604.0	\$855,829.0	\$931,281.0
Total Current Liabilities	\$247,133.0	\$304,480.0	\$327,568.0	\$336,477.0	\$414,201.0
Long-Term Debt	\$46,188.0	\$50,824.0	\$3,814.0	\$35,179.0	\$54,914.0
Other Liabilities	\$22,256.0	\$23,921.0	\$25,806.0	\$33,171.0	\$34,885.0
Total Liabilities	\$315,577.0	\$379,225.0	\$357,188.0	\$404,827.0	\$1,129,799.0
Total Shareholders' Equity	\$429,229.0	\$410,930.0	\$438,116.0	\$451,002.0	\$427,281.0
Converted Preferred Stock	-	-	-	-	-
Common Stock	21,313.0	21,448.0	21,966.0	21,674.0	19,896.0
Other Equity	155,488.0	157,476.0	168,437.0	159,537.0	111,356.0
Retained Earnings	252,428.0	232,006.0	247,713.0	269,791.0	296,029.0
Total Liabilities and Shareholders' Equity	\$744,806.0	\$790,155.0	\$795,304.0	\$855,829.0	\$931,281.0
Income Statement	1985	1986	1987	1988	1989
Revenue	\$935,888.0	\$891,139.0	\$982,776.0	\$1,170,558.0	\$1,343,632.0
U.S. Revenue	750,000.0	688,000.0	751,000.0	882,000.0	1,040,000.0
Non-U.S. Revenue	185,888.0	203,139.0	231,776.0	288,558.0	303,632.0
Cost of Sales	\$643,209.0	\$646,212.0	\$676,382.0	\$809,635.0	\$961,728.0
R&D Expense	\$72,211.0	\$82,290.0	\$80,726.0	\$80,222.0	\$83,071.0
SG&A Expense	\$167,198.0	\$181,463.0	\$197,263.0	\$211,032.0	\$232,305.0
Capital Expense	-	-	-	-	-
Pretax Earnings	\$54,137.0	(\$40,173.0)	\$31,895.0	\$43,378.0	\$50,829.0
Pretax Margin (%)	5.78	(4.51)	3.25	3.71	3.78
Effective Tax Rate (%)	30.00	(63.00)	33.00	36.00	38.00
Net Earnings	\$26,122.0	(\$14,870.0)	\$21,365.0	\$27,758.0	\$31,519.0
Shares Outstanding, Millions	21.3	21.5	22.0	21.7	19.9
Per Share Data					
Earnings	\$1.19	(\$0.70)	\$0.98	\$1.27	\$1.53
Dividend	-	-	-	-	-
Book Value	\$20.14	\$19.12	\$19.94	\$20.81	\$21.48

Table 3 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending September
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
<i>Liquidity</i>					
Current (Times)	1.92	1.66	1.64	1.75	0.62
Quick (Times)	1.05	0.96	0.94	1.02	0.34
Fixed Assets/Equity (%)	57.51	61.88	58.37	53.58	59.16
Current Liabilities/Equity (%)	57.58	74.10	74.77	74.61	243.40
Total Liabilities/Equity (%)	73.52	92.28	81.53	89.76	264.42
<i>Profitability (%)</i>					
Return on Assets	-	(1.94)	2.64	3.29	3.53
Return on Equity	-	(3.54)	5.03	6.24	7.18
Profit Margin	2.79	(1.67)	2.17	2.37	2.35
<i>Other Key Ratios</i>					
R&D Spending % of Revenue	7.72	9.23	8.21	6.85	6.18
Capital Spending % of Revenue	0	0	0	0	0
Employees	11,900	11,600	11,900	11,800	12,100
Revenue (\$K)/Employee	\$78.65	\$76.82	\$82.59	\$99.20	\$111.04
Capital Spending % of Assets	0	0	0	0	0

Source: Varian
 Annual Reports and Forms 10-K
 Dataquest (1990)