ARC STUDY

by ARC Advisory Group

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THOUGHT LEADERS FOR MANUFACTURING & SUPPLY CHAIN

Control Valve Worldwide Outlook

MARKET ANALYSIS AND FORECAST THROUGH 2008

Project Team:
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ARC Advisory Group

Market Forecast Updates

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ARC Consultant Biography

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Research Areas of Expertise

Control Valves, Actuators, & Positioners (CVAP); Plant Asset Management (PAM); Building Automation Systems (BAS); Field Devices, Oil & Gas, Chemical, Food & Beverage.

Responsibilities and Experience

David is on the Field Device and A-Team Study teams. David focuses on Control Valves, Actuators, & Positioners (CVAP), Building Automation Systems (BAS), and field devices.

David has been with ARC for more than 10 years. Prior to ARC, David worked for more than three years as a component and systems analyst with The Foxboro Company. During this time, David evaluated electronic components and systems, performed failure analysis, generated analytical reports, created component specifications and conducted customer presentations of the company's Intelligent Automation (I/A) Series and Spectrum 200 distributed control systems. As a component and systems analyst, David played a key role in the quality assurance of many I/A and Spectrum 200 distributed control systems and components requested for use in Foxboro products.

Education

David is a graduate of Northeastern University with a BS in Electrical Engineering.

ARC Research Reports and Publications

David has authored and reviewed many market research reports for ARC. ARC publications include:

- Plant Asset Management Worldwide Outlook
- Building Automation Systems Worldwide Outlook
- Building Automation Systems North American Outlook
- Chemical Industry Plant-Level Expenditures Outlook

- Oil & Gas Industry Plant-Level Expenditures Outlook
- Pharmaceutical Industry Plant-Level Expenditures Outlook
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- Web Sales for Automation Worldwide Outlook
- Comprehensive Facilities Management Strategies Using Integrated Building Automation Systems
- Strategies to Drive Manufacturing Efficiency to the Production Floor
- Control Valve Strategies
- Variable Speed Drive Strategies

Other Published Work

- **Ultrasonic Flowmeters Get the Nod**, August 1998, *Control*

About ARC Advisory Group

Founded in 1986, ARC Advisory Group has grown to become the Thought Leader in Manufacturing and Supply Chain solutions. For even your most complex business issues, our analysts have the expert industry knowledge and firsthand experience to help you find the best answer. We focus on simple, yet critical goals: improving your return on assets, operational performance, total cost of ownership, project time-to-benefit, and shareholder value.

ARC Advisory Group

THOUGHT LEADERS FOR MANUFACTURING & SUPPLY CHAIN

ARC Consultant Biography

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Research Areas of Expertise

Field devices: Flow meters of magnetic; variable area; vortex; coriolis and ultrasonic type, radar and ultrasonic level instruments, pressure and temperature transmitters, control valves, actuators & positioners (CVAP), steam conditioning valves, liquid and gas analyzers and peristaltic pumps.

Responsibilities and Experience

Narayan Gokhale is part of the field device consulting team at ARC covering the process automation industry with a focus on Worldwide as well as Chinese markets. He is responsible for writing market outlook studies, insights and custom analysis of temperature, pressure, flow and level instruments along with final control elements such as control valves and intelligent pumps.

Narayan has 13 years experience in the areas of sales, marketing, exports and business development of various instrumentation products and systems.

Narayan joined ARC in June 2003. Prior to ARC, for a year and half, he was working with a major Control System Integrator of Rockwell Automation in India as Manager (Exports and Business Development). He handled key responsibility for their growth initiatives, in terms of geographic expansion as well as penetration in to new business areas. He was responsible for initiating their business in the regions of Middle East and South East Asia. In addition, he helped the company, venture in to new business areas such as Manufacturing Execution Systems (MES), Plant and Enterprise Asset Management Systems, US FDA Validation Services, and Safety Instrumented Systems. He also initiated strategic tie-ups with important consulting and service providing companies.

Before that, Narayan was in the UAE (United Arab Emirates) for more than three and a half years. He was responsible for sales and business development of GLI liquid analyzers, Welker Engineering gas samplers, BP Solar photovoltaic solar power systems for industrial and telecom applications and other process instruments as well as electromechanical products.

Narayan began his career with a major control and instrumentation company in India and was with them for over seven years. He was responsible for sales and marketing of the following field devices - Krohne flow and level instruments, Moore Products pressure and temperature transmitters, single / multi loop controllers and DCS, Arca Regler control valves and steam conditioning valves and Zellweger Analytics liquid analyzers. In addition, he was involved in sales of custom-built control systems for various applications and gas analyzers. Among other products handled by him are Watson Marlow Bredel peristaltic pumps, Shinkawa vibration monitoring systems and Lowe Engineering Steam and Water Analysis Systems (SWAS).

Education

Narayan holds a Bachelor of Engineering (B.E.) degree with a post graduation (M.B.A.) in Marketing Management.

ARC Research Reports and Publications

Recent ARC publications co-authored by Narayan include:

- Temperature Transmitter Worldwide Outlook
- Control Valve Worldwide Outlook
- Control Valve China Outlook
- Magnetic Flowmeter China Outlook

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Our analysts follow technology and industry events on a daily basis. They have a broad range of expertise in such areas as e-business, enterprise applications, integration strategies, and industrial automation, including; control systems, drives, sensors, actuators, networks, computers, software, and services.

ARC maintains one of the most in-depth databases in the world on technologies, standards, and the products and capabilities of hundreds of automation and software companies. This database is based on thousands of interviews, user surveys, and company visits. Our global network of industry contacts is an invaluable asset in discerning long-term trends from fads.

Our list of available products and services continue to expand as ARC continues to invest in new technologies and resources to meet the demands of our customers. For more details about ARC Advisory Group and how we can further assist you, please contact one of our regional offices nearest you or visit our website: www.ARCweb.com.

Continuous Advisory Services

ARC's Advisory Services deliver a comprehensive portfolio of knowledge-based products and services that keep you ahead of the latest developments in e-business, IT, enterprise applications, and plant systems. Our analysts sift through the clamor of the market hype delivering clear, concise, supplier-neutral summaries of key events and technologies. A low client to analyst ratio ensures quick direct access to those who can provide the intelligence you need.

Market Information Services

The rapid pace of business today creates a constant demand for fresh market intelligence. ARC is the premier provider of worldwide market analysis,

forecasts, and strategic reports for a wide range of e-business, enterprise application, and automation solutions. ARC's market outlook studies are known for the most comprehensive assessment of the marketplace, including market shares of the leading suppliers and a five year forecast for key market segments.

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Each year ARC analysts write unbiased reviews of hundreds of software and solution providers around the world. This market intelligence, coupled with private discussions with our experienced analysts, provides invaluable insight to our financial clients.

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Our independent, objective, and knowledgeable analysts can assist in the evaluation of your M&A initiatives, providing market intelligence that is often unavailable to your in-house staff. Our partnership with several investment firms completes our offering, providing you with a full range of due diligence and partner search services.

Partner Search Services

Finding the right partner in a new application area or in a country or region you are not familiar with can be a very time consuming and challenging task. With an extensive network of industry contacts, we can assist you in identifying dependable strategic partners.

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Each year ARC hosts a number of forums and conferences in major cities around the world. These forums provide an excellent opportunity for corporate executives to network with their peers and gather industry intelligence to fine tune their strategic vision for the future.

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At times, you may have an immediate need for personal intelligence. Our consulting services provide you with the opportunity of applying ARC's demonstrated experience in the collection and synthesis of information into knowledge to meet your specific needs.

Chapter 1
Executive Overview

The automation landscape is changing from a product driven market to a knowledge driven economy. Both CVAP suppliers and manufacturers now recognize the need to use process knowledge to enhance plant operational excellence. Control valves are becoming intelligent components of digital control system architectures. The evolution of positioners, from an accessory of control valve assemblies, to digital valve controllers is empowering control valves to provide field level data to enable Plant Asset Management (PAM) and Real-time Process Optimization (RPO) initiatives.

Driven by the increasing appetite for data transparency, control valves are finding more importance in the new plant architecture.

With the worldwide economy showing signs of recovery, manufacturing companies are beginning to invest in upgrading and modernizing their facilities. Manufacturers are increasingly adopting optimizing initiatives such as Collaborative Process Automation Systems (CPAS) and Collaborative Asset Lifecycle Management (CALM). Such developments are spurring the growing appetite for process information to drive business related solutions. Driven by the increasing appetite for data transparency, control valves are finding more importance in the new plant architecture.

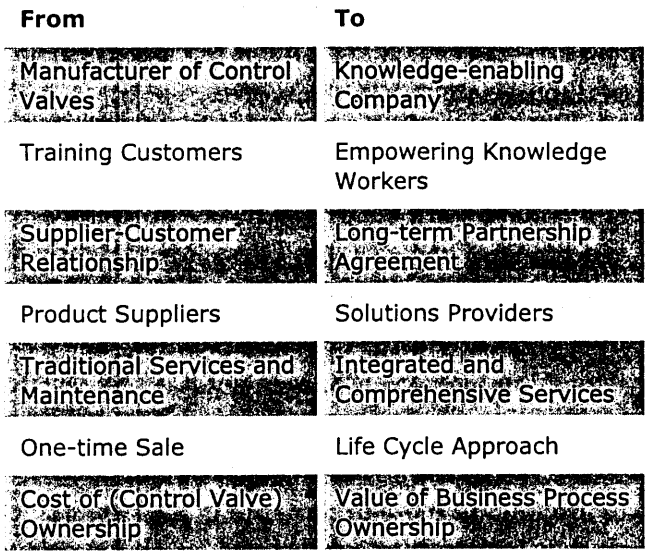
CVAP Suppliers Reposition Themselves as Knowledge-enabling Companies

CVAP suppliers are repositioning themselves from valve manufacturing companies to knowledge-enabling companies capable of supporting customers as partners in planning, maintaining, and development of production processes. Increasing use of digital technology in production plants and processes is providing CVAP suppliers opportunities to collaborate with customers and develop new business concepts.

Manufacturing companies need CVAP suppliers' help to improve return on human assets by empowering knowledge workers with performance intelligence for decision support. CVAP suppliers are responding by providing valve diagnostics and software tools, which provide access to real-time knowledge of operational performance and allow manufacturers to make informed decisions based on facts. Empowering knowledge workers with performance intelligence is the core of most collaborative manufacturing

strategies and is a perfect complement to Real-time Performance Management (RPM) initiatives.

Many CVAP suppliers now offer innovative valve solutions and services that add value by improving performance, productivity, and regulatory compliance. CVAP suppliers continue to devote resources towards development of innovative products by embedding intelligence, open communication protocols, and relevant web technologies in deliverables.



CVAP Business: Supplier Repositioning

CVAP suppliers are moving away from a traditional "reactive" maintenance & service approach to a "proactive" integrated & comprehensive services concept that requires a customized approach. Suppliers are complementing their existing capabilities and adding new forms of services. Rather than focusing only on technology, CVAP suppliers are integrating hardware, software, and services to form a tailor-made business concept suitable for customers' needs to demonstrate long-term commitment to customers and win loyalty. A shift from the one-time sales approach to a life cycle concept helps CVAP suppliers create new ways to develop and maintain customer relationships. CVAP suppliers are seeking to establish long-term partnerships with key customers. Long-term partnership agreements add value to both parties by combining suppliers' expertise and customers' needs. Analysis of the customers' value chain forms the basis of such agreements.

CVAP suppliers are projecting the total value of process ownership as a new competitive advantage that can influence customer investment decisions. Hence, more CVAP suppliers are assuming ownership of customers' business processes, especially maintenance and repair. Such agreements free manufacturers' valuable resources from day to day tasks and allow them to focus on core competencies. Manufacturers are realizing in-house services have a cost associated with them and, in some cases, carry a premium. Manufacturers are increasingly outsourcing maintenance and repair service functions to CVAP suppliers. Both CVAP suppliers and manufacturers are still adjusting to this transition. The success of these initiatives

depends on the ability of CVAP suppliers to leverage information provided by diagnostics software and historical trends from intelligent field devices.

Suppliers Focus on Information- Related Solutions to Improve Plant Operations

Growing importance of PAM (Plant Asset Management) is increasing demand for additional process information. Asset management initiatives increase demand for data transparency to make informed decisions regarding maintenance, operational performance, and financial return of plant assets. Access to this data often requires industry and process knowledge as well as information stored in intelligent digital positioners. To benefit from growing opportunities in asset management, CVAP suppliers must expand beyond their traditional product mentality and begin offering dynamic information management solutions.

To benefit from the growing opportunities in asset management, CVAP suppliers must expand beyond their traditional product mentality and begin offering dynamic information management solutions.

Growing adoption of Real-time Process Optimization (RPO) strategies is further compelling manufacturers to invest in information-management valve solutions. For years, poor control valve performance has hampered manufacturers' ability to obtain tight loop control in critical control loops. As control valve assemblies increasingly incorporate information-management solutions, correcting for control valve stickiness (dead time) becomes easier, resulting in optimally tuned loops with far less error.

Intelligent valve assemblies are also being used in Safety Instrumented Systems (SIS). SIS is gaining importance due to increasing regulatory demand in the process industries, which require secure operations. New safety standards demand manufacturers increase the frequency of safety valve testing. To meet the escalating safety requirements, manufacturers are turning to intelligent valve assemblies as a means to test safety valves automatically on a regular basis to confirm and document proper functionality. Intelligent valve assemblies provide manufacturers a Valve Degradation Analysis and a time and date stamp on all tests and reports, which is mandatory for complying with the requirements of statutory authorities.

Scope

This study is intended to serve as an effective planning guide for Control Valve, Actuator, and Positioner (CVAP) suppliers and new entrants to the

business. By providing strategic market information, ARC studies aim to assist suppliers develop business plans for marketing and development. ARC studies also help manufacturers make purchase decisions by providing an in depth analysis of the CVAP market and its leading suppliers.

This study provides an in-depth analysis of the worldwide CVAP marketplace including quantitative assessment of market size, segmentations, and forecasts trends. ARC's analysis segments the market by product features, nature of supply, regions, industries, distribution channels, and customer types. The study also evaluates qualitative strategies of the leading global suppliers to the market.

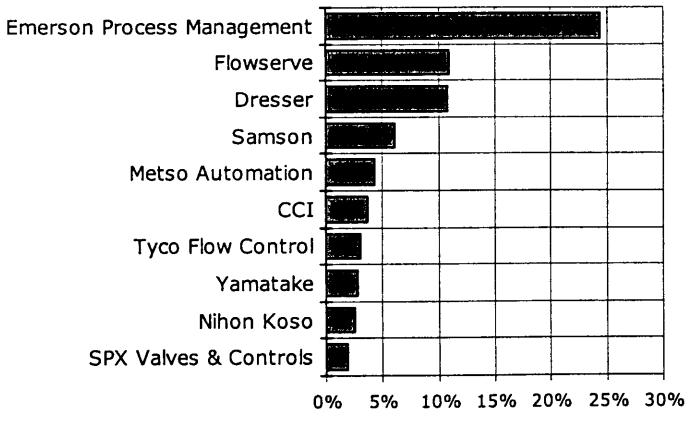
This study will help answer many questions facing suppliers including:

- How large is the worldwide CVAP market?
- Who are the leading suppliers? What are their market shares?
- Which industries offer the greatest growth potential?
- What are the short-term and long-term prospects in the CVAP business?
- What networking standards will predominate in the future?

Market Size and Structure

Despite promises of improving global economic conditions and increasing demand for valve intelligence to optimize manufacturing operations, control valve suppliers continue to struggle, especially in North America. High-growth markets in developing regions, such as China and India, have not been able to fully compensate for cutbacks in North America and Japan.

Control valve suppliers face the challenge of expanding business in an environment dominated by investment-wary manufacturers. Additionally, CVAP suppliers face the challenge of transforming product-push oriented cultures into service-oriented businesses that help customers with comprehensive solutions. There is an awareness of the challenges that lie ahead and a discernable trend among leading suppliers towards redefining themselves as solutions providers.



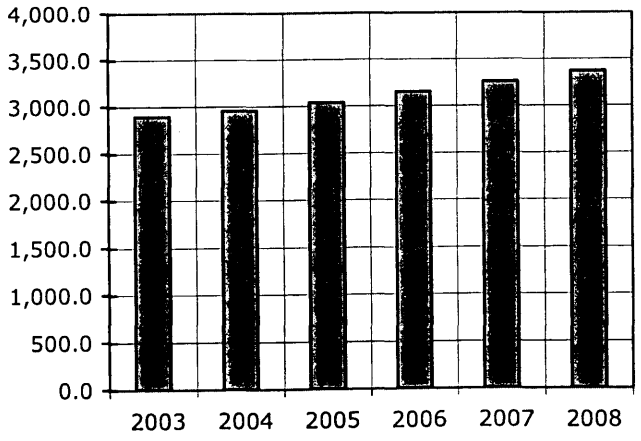
Leading Suppliers of Control Valves Worldwide

CVAP suppliers are strengthening their solutions capabilities by expanding the scope and content of their current strategic partnerships and establishing new partnerships. In addition, CVAP suppliers are shifting their focus from valve manufacturing to information management. Manufacturers are increasingly turning to CVAP suppliers capable of supporting them as partners in planning, maintaining, and development of production processes. CVAP suppliers who successfully manage this transition will emerge stronger in the new knowledge-based economy.

Considerable appreciation of the Euro over the US$ is adversely affecting European CVAP suppliers, since most of the countries outside Europe peg their local currencies to the US$. Saturated market conditions and high labor costs of Western Europe further compound these problems.

Market Analysis and Forecast

From a regional perspective, most of the growth over the next five years will come from Asian countries, such as India and China. Russia is also a promising market. The share of North America in the worldwide CVAP market is decreasing and the trend will continue over the forecast period, as developing countries continue expanding their manufacturing base. EMEA continues to remain relatively flat with some growth occurring in Eastern Europe and countries formerly part of the Soviet Union. Due to economic and political turmoil, Latin America will experience subdued growth over the forecast period.



Total Shipments of Control Valves Worldwide (Millions of US Dollars)

From an industry perspective, infrastructure requirements for new energy sources are the key growth driver. Growing need for clean, cheap fuel to generate electricity to feed growing economic activities of developing countries is stoking demand for LNG, CNG, and GTL. These new energy sources are fuelling demand for a storage, transportation, and distribution infrastructure, which requires additional control valve purchases.

Strategies and Recommendations for Success

Project the Value of Control Valves Beyond Simple Final Control Elements

Manufacturing operations are regaining importance in overall corporate strategies, where earlier resources were devoted to plant information systems and ERP systems. CVAP suppliers should project the news that the role of control valves has expanded beyond simple final control elements to the point where they are now integral elements of Real-time Performance Management (RPM) and PAM architectures. As manufacturers embark on RPM strategies, CVAP suppliers must alert them to the importance of intelligent valve assemblies in achieving their goals.

CVAP suppliers should continuously highlight how control valve efficiency directly affects profits and that plant managers should not overlook the role control valve plays in optimizing processes. To strengthen control valves' position in process control, CVAP suppliers should challenge the current practice of focusing most resources on DCS in a bid to improve production efficiency. No amount of sophisticated electronics in an automation system can correct problems with a valve. Without proper valve operation, manufacturers cannot achieve high yields, manufacture quality products, maximize profits, or conserve energy. Optimizing control valve efficiency depends on correct control valve selection for application, proper storage and protection, proper installation techniques, and an effective predictive maintenance program.

CVAP suppliers should encourage manufacturers to install digital positioners on critical control valves, especially those valves involved in loops utilizing Advanced Process Control (APC). Improving valve performance is one of the most critical steps manufacturers can take to become more profitable. Otherwise, continuing poor control valve performance will negate the potential benefits of APC controllers.

Educate Manufacturers to Help Reduce Total Cost of Valve Ownership

CVAP suppliers should effectively integrate and utilize "training" as an important deliverable in their quest to become knowledge-enabling companies. Training a manufacturer often helps CVAP suppliers create long-term goodwill with the manufacturer and an internal influence within a customers' organization. Manufacturers trained by suppliers often become loyal customers.

When left to them, manufacturers often specify, choose, install, and commission control valves incorrectly from the beginning. Hence, most manufacturers are not fully benefiting from process optimization, diagnostic software, and asset management strategies. About a third of process loops are not functioning properly due to improper sizing and selection of control valves.

CVAP suppliers must constantly drive home the point that performance of control systems depends largely on proper selection, sizing, installation, and maintenance of final control elements. Manufacturers need to understand specifying valves correctly from the beginning goes a long way towards making plants run better.

CVAP suppliers have an opportunity to sell control valve products by convincing manufacturers to consider the importance of taking a life cycle approach to control valve selection in their pursuit of optimizing manufacturing operations. CVAP suppliers must highlight that choosing the lowest priced valve and installing it improperly can negatively influence manufacturing operations and lower profit margins.

Leverage Service Offerings to Help Customers Optimize Valve Assets

Manufacturers no longer have vast pools of engineering expertise. Hence, they are looking for intelligent products, software, and services to keep their plants running. With hardware no longer offering a competitive differentiator, CVAP suppliers must utilize the opportunity to provide software and service offerings as well as vertical industry expertise to compensate for losses experienced in the hardware business. Coupled with areas requiring high domain expertise, software and service offerings can generate high margin business for CVAP suppliers.

CVAP suppliers should actively gear up to assume more MRO services and demonstrate their ability to provide long term maintenance and implementation support. A growing share of service revenues in the CVAP business implies manufacturers are willing to entrust more MRO responsibilities to CVAP suppliers. Some manufacturers are also experimenting with the idea of outsourcing all valve maintenance activities.

Due to enormous costs associated with maintaining control valves, ARC sees long term support and implementation issues taking precedence with manufacturers. CVAP suppliers should highlight their domain expertise

and their willingness to take responsibility for the entire application even if it means maintaining valves and instruments made by competitors. In these cases, success is measured, not by the lowest purchase price, but by the highest achieved lifecycle benefit.

To succeed in today's extremely competitive CVAP business, it is imperative CVAP suppliers collaborate with manufacturers in developing lifecycle management strategies that help manufacturers reap the maximum value from control valves. Lifecycle management strategies, such as ARC's Collaborative Asset Lifecycle Model (CALM) help manufacturers achieve the optimum balance between short-term benefits of reducing downtime by delaying nonessential maintenance activities and long-term benefits of extending the useful lifetime of valves by proactively managing their health. CVAP suppliers should urge manufacturers to consider valve lifecycle management as a key element to any asset management program. An effective valve-lifecycle management strategy allows timely response to business issues that have a direct effect on the company's bottom line.

CVAP suppliers should equip themselves to provide "valve audit" services similar to "energy audit" services provided by many equipment suppliers. In doing so, CVAP suppliers can collaborate with manufacturers to identify the health of all valves in a plant, identify critical valves, and devise asset management solutions. Leveraging such services can facilitate CVAP suppliers in reaching the installed base of competitors; provide an opportunity to take installed base from a competitor. Most importantly, by adopting such an approach, CVAP suppliers do not have to fight price wars and resort to price cutting that negatively affects their bottom-line. Such an approach can improve a CVAP supplier's spare parts business and maintenance contracts. Additional after sale business gained through such an approach often compensates for the loss of margin typically necessary to win large projects.

Complement Core Competencies with Strategic Partnerships

Having a focus on technology alone is not enough to be successful in today's market conditions. In response to emerging demands, CVAP suppliers must take a multi-dimensional and multi-disciplinary view of business development models, which includes a combination of factors including technology, services, and changing market conditions. To accomplish this, CVAP suppliers must develop strategic partners to help

provide customers multiple options. The need to design, develop, and manufacture everything a supplier sells is no longer important.

Many valve-focused suppliers find themselves without intelligent products, such as valve diagnostics and asset management software, which are essential deliverables in the portfolio of today's successful CVAP supplier. CVAP suppliers in this boat should consider strategic alliances or outsourcing so they can concentrate on their core competency of common manufacturing processes and operations & supply chain synergies.

Best-in-class suppliers of actuators, positioners, and software & services can collaborate with valve-focused suppliers as OEM customers in lieu of an end user and can increase sales while blocking the competition. This business is very similar to participating in a niche market that requires custom modifications to products in order to meet specific requirements. By providing solutions to OEM and small niche markets that value differentiation, CVAP suppliers can lockup a significant portion of the production capacity while increasing margins associated with the value of customization.

Tailor Industry-Specific Solutions

CVAP suppliers should equip themselves with innovative CVAP solutions for the storage, transportation, and distribution infrastructure of LNG, CNG and GTL. Growing need for cheap & clean fuel to generate electricity in the developing countries is fuelling a huge demand for new energy sources. This sector is witnessing large-scale foreign participation in new projects. Application-specific solutions for this niche market have huge business potential for CVAP suppliers.

CVAP suppliers should design and develop regulatory compliant products for environment protection such as new valve packing systems. In addition to complying with stringent regulations, CVAP suppliers must also provide the necessary set-up for third-party testing, which manufacturers generally insist on. Regulatory compliance by statutory authorities is fuelling replacement market growth, whereas custom specifications by large manufacturers are driving new project business.

Designing regulatory compliant products for the hygiene industry is another industry-specific approach. Control valves for aseptic and sterile processes in the pharmaceutical and food industries require specific materials, finishes, fittings, and other requirements beyond a typical commodity product.

Set up Subsidiaries in the Emerging Regions

BRIC - Brazil, Russia, India, and China are the countries offering CVAP suppliers the highest long-term growth potential. CVAP suppliers, however, must establish a worldwide infrastructure to capitalize on this growth potential. As more manufacturers consolidate, CVAP suppliers are finding it increasingly difficult to participate in domestic opportunities without an international sales and technical support infrastructure. Consolidation of manufacturers is reducing the pool of available customers while expanding their worldwide presence. Global manufacturing companies are increasingly complementing domestic plant production with overseas production facilities. In some cases, manufacturers are moving their entire production operations to developing regions to benefit from lower labor costs.

To capitalize on growth prospect in developing regions, CVAP suppliers should consider establishing either manufacturing or sales and service subsidiaries within each region. Some CVAP suppliers have lost market opportunities due to a lack of local facilities in developing regions. Low work force costs in developing countries helps serve regional clients at local price levels, while sales and service subsidiaries help win business.

Multi-national firms setting up "Greenfield" projects in developing regions often use the same automation products worldwide and favor suppliers that can provide product worldwide. Multi-national manufacturers also prefer CVAP suppliers with local sales and service subsidiaries that give them the comfort of support, service, and a long-term commitment worldwide. CVAP suppliers who do not have an international presence will find it difficult to receive an invitation to bid from multi-national manufacturers. Establishing an active presence in developing countries, where new project construction is located, and where project engineering & design is performed, is critical to success.

Chapter 2
Scope

This study is intended to serve as an effective planning guide for Control Valve, Actuator, and Positioner (CVAP) suppliers and new entrants to the business. By providing strategic market information, ARC studies aim to assist suppliers develop business plans for marketing and development. ARC studies also help end users make purchase decisions by providing an in depth analysis of the CVAP market and its leading suppliers.

This study helps suppliers and users stay on top of technological changes. Control valves are at the heart of process optimization and plant asset-management strategies and CVAP technologies are adapting to the new needs of the market. ARC has conducted similar studies of the CVAP market for many years. The knowledge, experience, background, and contacts developed over the years help validate information, improve analysis, and contribute to accurate forecasts.

This study highlights key business and technology trends in the CVAP business and provides strategic market intelligence to assist suppliers in forecasting and planning.

Key Issues Researched

This study provides an in-depth analysis of the worldwide CVAP marketplace including quantitative assessment of market size, segmentations, and forecasts trends. ARC's analysis segments the market by product features, nature of supply, regions, industries, distribution channels, and customer types. The study also evaluates qualitative strategies of the leading global suppliers to the market.

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- How large is the worldwide CVAP market?
- Who are the leading suppliers? What are their market shares?
- Which industries offer the greatest potential for growth?
- What are the short-term and long-term prospects for the CVAP business?
- Which major issues do CVAP suppliers face?
- What networking standards will predominate in the future?

Market Size and Forecast Definitions

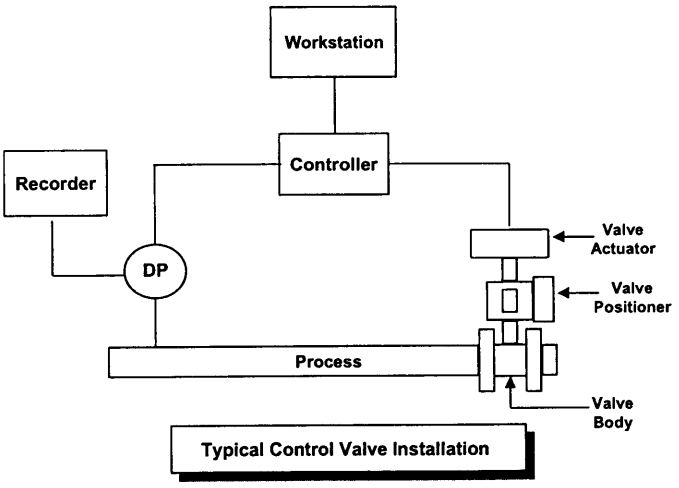
ARC derives market size figures from its extensive in-house databases and in-depth interviews with leading suppliers. The base year market size, 2003, is defined in terms of shipments by industry participants, not by bookings or orders. Margins earned by distributors and other sales channels are excluded. Average Selling Price (ASP) reflects factory level pricing.

A combination of factors, including user projections of future demand and ARC's assessment of the growth potential for each segment form the basis of ARC forecasts. Five-year forecasts in this study show long-term trends in the CVAP market. However, the outlook for any business can dramatically change due to the rapidly changing technology and global economic environment. Therefore, we recommend clients obtain the latest updates from ARC before making any important decisions.

Key Product Classifications and Market Segments

A control valve regulates the rate of fluid flow as the position of the valve plug or disk is changed by an actuator. Control valves are used to maintain a process variable as close as possible to the desired set point.

A control valve installation consists of a valve body, actuator, positioner and accessories. The body includes a bonnet assembly and trim-parts. Its design withstands fluid pressure, allows fluid flow, provides pipe-connecting ends, and supports seating surfaces and a valve closure member. Actuators are pneumatic, hydraulic, or electrically powered devices that provide the force to open and close the valve. Positioners monitor and control true actuator movement to maintain a desired set-point. Accessories include electro-pneumatic transducers, pressure regulators, hand wheels and limit switches.



Typical Control Valve Installation

Included	Excluded
All control valves sold including those packaged by third party suppliers.	Non-control valves, such as on/off valves, self-regulating valves, safety valves, and relief valves.
Modulating actuators sold for use with control valves	On/Off actuators Modulating actuators sold for other purposes including dampers, louvers, and other final control elements.
Positioners sold for use with control valves	Positioners sold for other purposes.
Engineering, maintenance and training services provided by the control valve business unit of suppliers	Engineering services provided by separate business units, other than control valve business unit within a company, as part of large turnkey projects
Accessories and spare parts sold by suppliers for use with control valves, including electro-pneumatic transducers.	Handheld programming terminals and operator interface devices.
Software provided by the control valve and third party suppliers.	

Scope of CVAP Study by Product

Classification by Hardware, Software and Services

ARC segments the CVAP market by the nature of supply in terms of hardware, software, and services. Hardware revenues include the CVAP assembly as a whole; most notably valve bodies, valve actuators, valve positioners, and accessories. Hardware revenues also include valve actuators or positioners shipped separately. Software refers to sizing, control, programming, supervisory software and custom software related to control valve sales.

Suppliers provide project and maintenance services to users. This facilitates users to focus on their core competencies and look to suppliers to assume single point accountability to suit their needs and provide supplier-initiated maintenance and upgrade programs to preserve their investment. Project services include project-engineering, application engineering, application software development, and project management. Maintenance services include installation, startup, and commissioning. Maintenance services also include non-contract maintenance and operations services. Non-contract maintenance services include engineering, programming, training, and network management. Operations services include performance enhancement services.

Classification by Valve Type

ARC differentiates control valves by movement of the valve-closure member. The two main categories ARC uses to define valve type are linear and rotary valves. In linear/sliding-stem valves, the flow closure member (valve plug) moves in a straight-line to permit or restrict flow. The most common linear valve has a globe type construction that includes single ported, double ported, two-way, and three-way valve bodies. In rotary control valves, the flow closure member (full ball, partial ball, disk or plug) rotates in the flow stream to control the capacity of the valve. The most common rotary control valves include butterfly valve, V-notch/segmented V-notch ball, eccentric-disk, and eccentric-plug valve bodies.

Type	Members
Linear (Sliding Stem)	Globe valves, Gate valves, Diaphragm valves
Rotary	Butterfly valves, Ball valves, Plug valves

Valve Types

Classification by Actuator Type

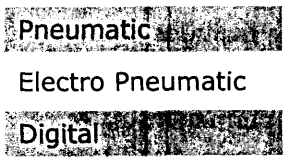
ARC has divided actuators into three main types: pneumatic, electric, and other actuators. Pneumatic actuators are diaphragm or piston based. Diaphragm-based actuators use air supply from controller or positioner, and include various styles, such as, direct acting, reverse acting, and reversible. Piston-based actuators use high-pressure plant air, and are double acting, to give maximum force in both directions. Electric actuators use an electric motor and some form of gear reduction to move the valve. Other types of actuators include hydraulic and electro hydraulic actuators.

Actuator Type	Power Source	Major Variants
Pneumatic	Compressed air/gas	Piston, Diaphragm, Vane
Electric	Motors or Solenoids	Single Phase, Three Phase
Others		
Hydraulic	Compressed Liquids	Cylinder, Rack & Pinion
Mechanical	Varies	Levers, etc
Manual	Man Power	Hand wheels

Control Valve Actuators by Type

Classification by Positioner Type

ARC has segmented valve positioners into three main types: pneumatic, electro pneumatic, and digital. Pneumatic positioners receive a pneumatic signal and supply the valve actuator with the air pressure required to move the valve to the desired position. Electro pneumatic positioners accept 4-20 mA as input signal and translate it to the required air pressure. Digital positioners have microprocessors that provide expanded functionality. Digital positioners feature two-way digital communication that provides feedback to a control or monitoring system on issues such as stem wear and other diagnostic tasks. They can also have advanced capabilities such as embedded PID control.



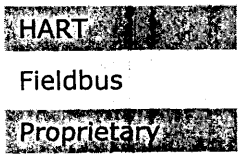
Positioner Types

Digital Positioners by Communication Protocol

Digital positioners use HART, Foundation Fieldbus, Profibus, Proprietary digital, and "other" communication protocols. HART superimposes a serial digital signal over a 4-20mA control signal to communicate with the microprocessor embedded in the digital positioner. Bidirectional communication is available using HART without affecting the analog signal. HART can be used in multi drop applications as long as an analog signal is not used.

The general term "Fieldbus" refers to all standard, multi-drop, multi-layered digital communication protocols currently vying for industry recognition. This category includes open digital communications such as Profibus and Foundation Fieldbus.

The "Proprietary Digital" category predominantly consists of closed proprietary digital protocols such as Honeywell DE, Foxboro Fox-Comm and Yokogawa Brain. The "Other Digital" category consists of protocols such as ASI, Devicenet, Ethernet/IP, Interbus, Modbus, Lonworks and other such protocols mostly used in discrete industries.



Communication Protocols

Distribution Channels and Customer Types

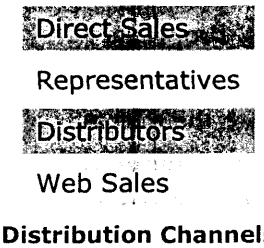
ARC analyses market share by entities involved in the sale and purchase of an automation product. ARC groups these entities into two sets, those that sell or resell the product, referred to as "distribution channels", and those that purchase the product, referred to as "customer types". This definition ensures total unit shipments are the same for both sets.

Distribution channels do not use, change, or modify the product, though they may package it with other products or brand label products. Customer types either use the product as is, or modify and add value to it. Customers add value to a product either by using it as a component in another product or by configuring it into a system along with other products.

Classification By Distribution Channel

ARC's segmentation of distribution channels (or sellers) includes direct sales, independent representatives, distributors, and Web sales. Direct sales channels are sales made through a supplier's in-house, permanent sales staff. Independent representatives sell products from different companies within an exclusive territory using their relations with customers. Independent representatives do not stock products but sell on commission.

Distributors take ownership and stock, sell, and support a variety of products within a territory such as control valves, temperature, pressure, flow, level transmitters, and other measurement and control devices.



Distribution Channels

From a purchasing point of view, distributors who stock brands from competing suppliers and can help purchasers compare brands are more attractive. However, purchasers prefer to deal directly with suppliers when they are able to negotiate more favorable terms, a portion of the distributor's margin, or maintain confidential custom design information by doing so.

Distributors are keenly sensitive to unique market demands in their region. Some distributors package configured systems with control components from several suppliers in a manner similar to system integrators. Distributors designed configured systems when it helps them gain competitiveness or higher margins.

Suppliers generally draw legal relationship agreements with distributors and independent sales representatives for product sales. From the supplier point of view, these channels are more effective for small or widely dispersed accounts, when direct sales cannot be justified economically. Conversely, suppliers use direct sales for large or captive accounts.

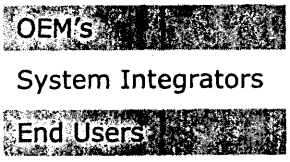
Web sales represent shipments made based on orders transacted entirely over the Internet.

Classification by Customer Type

ARC has segmented the CVAP market into the following customer types (or purchasers): consumers or "end users" of the product, original equipment manufacturers or "OEMs", and "system integrators". All distribution channels sell to one or more of these customer types.

OEMs or Original Equipment Manufacturers are high volume customers for all types of control products. OEMs incorporate control valves as a part of the equipment they produce and sell. For example, water & wastewater treatment plant manufacturers purchase control valves as components of their equipment.

System integrators add value by integrating control valves with other components, software, wiring, application engineering, or domain knowledge, to create systems for clients. System integrators leverage application expertise, knowledge about integrating disparate technologies, and the value they provide to end users, by taking single-point responsibility for overall system performance. Suppliers also depend on system integrators to smooth out fluctuations in demand for project services. These factors ensure that system integrators also have a role to play, especially in complex applications or when products need programming or configuring to suit an application.



Customer Types

End users purchase control valves for use in their own plants.

Key Industry Segments

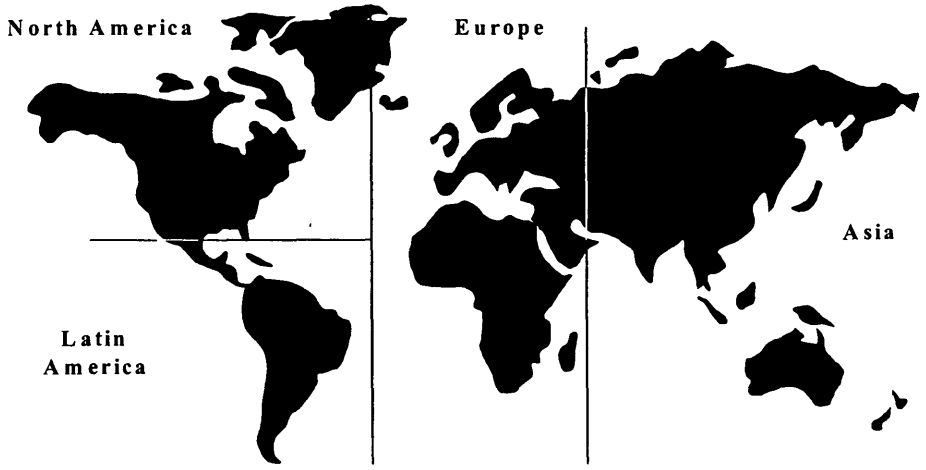
Control valves find use in a variety of industries and applications, ranging from process control to Emergency Shut-Down (ESD) valves in safety systems. This study contains analysis of control valves in the process and hybrid industries as listed in Figure 2-1.

Process industries are typically continuous process industries such as oil & gas and chemicals, which use control valves extensively. The characteristic of these industries is continuous material flow and fewer product variations.

Hybrid industries include industries that combine batch processes and discrete applications, such as packaging. The main industries of this type are pharmaceuticals & cosmetics and food & beverages.

Key Regional Segments

Geographically, ARC has divided the marketplace into four major segmentations: North America, Latin America, EMEA, and Asia. North America consists of the United States and Canada. Latin America is comprised of Central America, Mexico, and South America. EMEA consists of Western Europe, Eastern Europe, CIS, Africa, and the Middle East. Asia consists of Japan, China, India, Taiwan, South East Asia, Korea, and Australia.



Geographic Segmentations

Key Currency Factors

To eliminate changes in market size due to ongoing currency variations, ARC uses average exchange rates over a 12-month period running from October 1 to September 30 for the leading currencies. Each year, ARC updates the exchange rates used in our market analysis and forecasts to portray the most realistic picture of the market possible. When comparing ARC reports from different years, customers must take into account the ongoing changes in exchange rates that occur from year to year and use the exchange rates given in each study to convert back to local currencies. All ARC forecasts are prepared in current US dollars and are based on the assumption that the current inflation rate of approximately 3 percent will continue throughout the period covered by this report.

Country	National Currency (Abbreviation)	Exchange Rate National Currency units per US Dollar ($)
European Union	Euro (€)	.85
Japan	Yen (¥)	110

Average Currency Exchange Rates Used In ARC Market Studies

Figure 2-1

Standard Industry Code Classifications - Process Industries

Process Industries	SIC Code	NAICS Code	NACE Code
Cement & Glass	32	327	26.1-26.8
Chemical & Petrochemicals	28 (except 283 & 284)	325 (except 3254 and 3256)	24.1, 24.2, 24.3, 24.5, 24.6, 24.7
Electric Power (Generation , T&D)	491, 4931	2211	40.1
Food & Beverage	20, 21	311, 312	15.1-15.9, 16.0
Metals (Primary Production)	33	331	27.1-27.5, 37.1
Mining	10, 12, 14	212	10.1-10.3, 12, 13.1-13.2
Oil & Gas (Exploration, Production)	13	211, 213111, 213112	11.1, 11.2
Oil & Gas (Pipelines)	46, 492	486, 2212	40.2, 60.3
Oil & Gas (Refining)	29	324	23.1, 23.2
Pharmaceutical & Cosmetics	283, 284	3254, 3256	24.4, 24.5
Pulp & Paper	26	322	21.1, 21.2
Textiles	22	313, 314	17.1-17.7
Water & Wastewater	494, 495	2213	41, 90

Figure 2-2
Standard Industry Code Classifications - Discrete Industries

Discrete Industries	SIC Code	NAICS Code	NACE Code
Aerospace & Defense	372 & 376	3364	35.3
Apparel, Footwear & leather products	23, 31	315, 316	18.1-18.3, 19.2-19.3
Automotive	371, 375, 379	336	34.1-34.3, 35.4-35.5
Building Automation	15, 3534, 3564	3339, 3384	45.4
Electrical	36 (except 365,366,367)	335	31.1-31.6
Electronics & Semiconductors	357, 365, 366, 367	3341, 3342, 3343, 3344, 3346	30.0, 32.1-32.3
Fabricated Metal Products	34	332	28.1-28.7
Furniture & Wood Products	24, 25	3219, 3371, 3372	20.1-20.5, 36.1
*Machinery	35 (except 357)	333	29.1-29.7
Medical Products	384, 385	3391	33.1
Plastic & Rubber Products	30	326	25.1, 25.2
Printing & Publishing	27	511, 323	22.1, 22.3
Other Discrete	381, 382, 386, 387, 39	3345, 3399	33.2-33.5, 36.2-36.6

***"While most machinery manufacturers fall under this segment, there is also a large quantity of OEM equipment that ARC accounts for within the respective end user industries, which is excluded from the Machinery Industry. For example, controllers purchased as OEM components for food processing or food packaging machinery is included in the figure for the food & beverage industry and is not included in Machinery."**

Figure 2-3

Standard Industry Code Classifications - Service Industries

Service Industries	SIC Code	NAICS Code	NACE Code
Retail - Food & Beverage	54	445	52.2
Retail - Other	52, 53, 55, 56, 57, 58, 59	44 (except 445), 45	52 (except 52.2)
Wholesale/Distributor - Food & Beverage	514	4224, 4228	51.3
Wholesale/Distributor - Other	50, 51 (except 514)	42 (except 4224, 4228)	51 (except 51.3)
Transportation & logistics	42, 44, 45, 47	481, 482, 483, 484, 488, 492, 493	60.2, 61.1-61.2, 62.1-62.2, 63.1-63.4, 64.1

Figure 2-4
Typical Questionnaire for Market Data Collection

Control Valve Worldwide Data for: 2003 Base Year ARC Analyst Narayan Gokhale

Scope: Includes Control Valves, Actuators, Positioners (CVAP), Accessories, Software & Services
Excludes On/off valves, safety valves, relief valves, self actuating valves and actuators / positioners sold for use with anything other than Control Valves

Note: i) Please respond with **shipments** (not orders), **Value in Million US $** and **Thousand Units** for **Jan** to **Dec 2003**
ii) Some cells have explantory comments

Please fill in blue areas (use 'Tab' key)

Your Company Name

Key Contact Person for Qualitative followup questions: **Name** **Phone** **e-mail**

		2003 US $m	2004 Expected Growth %
A.	**Control Valve Products & Services**		
B.	**% Change since 2002:**	0.0%	

			2003 % $s	2004 Growth %	2003 US $m
1.	**Regional** Distribution:	**US & Canada**			$ -
		Europe, Middle East & Africa			$ -
		Japan			$ -
		China			$ -
		Rest of Asia & Pacific Rim			$ -
		Latin America & Mexico	100.0%		$ -

			2003 % $s	2004 Growth %	2003 US $m
2.a	NAICS Code **End User Industry** Distribution - Process				
	327	**Cement & Glass**	0.0%		$ -
	325 (except 3254 and 3256)	**Chemical & Petrochemicals**	0.0%		$ -
	2211	**Electric Power (Generation , T&D)**	0.0%		$ -
	311, 312	**Food & Beverage**	0.0%		$ -
	331	**Metals (Primary Production)**	0.0%		$ -
	212	**Mining**	0.0%		$ -
	211, 213111, 213112	**Oil & Gas (Exploration, Production)**	0.0%		$ -
	486, 2212	**Oil & Gas (Pipelines)**	0.0%		$ -
	324	**Oil & Gas (Refining)**	0.0%		$ -
	3254, 3256	**Pharmaceutical & Cosmetics**	0.0%		$ -
	322	**Pulp & Paper**	0.0%		$ -
	313, 314	**Textiles**	0.0%		$ -
	2213	**Water & Wastewater**	0.0%		$ -
2 b.		**Discrete / Others**	100.0%		$ -

			2003 % $s	2004 Growth %	2003 US $m
3.	**HW, SW & Services:**	**Hardware**	0.0%		$ -
		Software	0.0%		$ -
		Project Services	0.0%		$ -
		Non-Contract Maintenance Services	100.0%		$ -

Figure 2-4 (Continued)

Typical Questionnaire for Market Data Collection

			2003 % $s	2004 Growth %	2003 US $m
4.	Sales **Channels**:	**Web Sales**	0.0%		$ -
		Direct	0.0%		$ -
		Independent Sales Representatives	0.0%		$ -
		Distributors	100.0%		$ -

			2003 %$s	2004 Growth %	2003 US $m
5.	**Customer Type**	**End Users**	0.0%		$ -
		OEMs	0.0%		$ -
		Systems Integrators	100.0%		$ -

			2003 % $s	2004 Growth %	2003 US $m
6.	Control Valve Business by **Type**:	**Valves**	0.0%		$ -
		Actuators	0.0%		$ -
		Positioners	0.0%		$ -
		Accessories	100.0%		$ -

			2003 % $s	2004 Growth %	2003 US $m
7.	Control Valve Business by **Valve Body Type**:	**Linear- Globe**	0.0%		$ -
		Gate	0.0%		$ -
		Diaphragm	0.0%		$ -
		Others	0.0%		$ -
		Rotary- Butterfly	0.0%		$ -
		Ball	0.0%		$ -
		Plug	0.0%		$ -
		Others	100.0%		$ -

8	Total **Valves Units** for **Base year:**		**Thousands of Units**
9	Total **Actuator Units** for **Base year:**		**Thousands of Units**

			2003 % $s	2004 Growth %	2003 US $m
10	Control Valve Actuator Business by **Type**:	**Pneumatic**	0.0%		$ -
		Electric	0.0%		$ -
		Other	100.0%		$ -

			2003 % Units	2004 Growth %	2003 Units (k)
11	Control Valve **Actuator Units** by **Type**:	**Pneumatic**	0.0%		0.0
		Electric	0.0%		0.0
		Other	100.0%		0.0

12	Total **Positioner Units** for **Base year:**		**Thousands of Units**

			2003 % $s	2004 Growth %	2003 US $m
13	**Positioner** Business by **Type**:	**Pneumatic**	0.0%		$ -
		Electropneumatic	0.0%		$ -
		Digital	100.0%		$ -

			2003 % Units	2004 Growth %	2003 Units (k)
14	**Positioner Units** by **Type**:	**Pneumatic**	0.0%		0.0
		Electropneumatic	0.0%		0.0
		Digital	100.0%		0.0

			2003 % $s	2004 Growth %	2003 US $m
15	Communication **Protocols** of Digital Positioners	**HART**	0.0%		$ -
		Foundation Fieldbus	0.0%		$ -
		Profibus	0.0%		$ -
		Proprietary Digital	0.0%		$ -
		Other Digital	100.0%		$ -

Chapter 3
Market Shares

Despite promises of improving global economic conditions and increasing demand for valve intelligence to optimize manufacturing operations, control valve suppliers continue to struggle, especially in North America. High-growth markets in developing regions, such as China and India, have not been able to fully compensate for the drop in North America and Japan.

Control valve suppliers face an environment dominated by investment-wary manufacturers. Additionally, suppliers face the challenge of transforming product-push oriented cultures into service-oriented businesses that help customers with comprehensive solutions. There is an awareness of the challenges that lie ahead and a discernable trend among the leading suppliers towards redefining themselves as solutions providers.

PAS Suppliers Divest Valve Businesses

In a reversal of a trend during the mid 1990s, many of the leading PAS suppliers are divesting their valve businesses. Despite these divestures, many leading PAS suppliers choose to hang on to their valve positioner businesses. Over the past few years, Siemens divested its valve actuator business to AUMA, Invensys sold its Flow Control business to Flowserve, and ABB divested its valve business along with its Oil & Gas business unit.

Valve body manufacturing activities require an entirely different manufacturing set-up, skill set, and operational competencies than valve positioners and other field devices. The need for plant information is changing the automation landscape from product driven to knowledge driven. This is transforming the role of positioners, which is evolving from a valve accessory to intelligent valve controllers connected to plant-wide fieldbus networks. Valve positioners are a critical element in two of the leading business strategies reshaping the manufacturing environment today, namely Plant Asset Management (PAM) and Real-time Process Optimization (RPO). The valve positioner business fits in well with the business of other field devices including pressure, temperature, flow, and level transmitters, which many PAS suppliers have already developed a strong core competency in design, development, and manufacturing. Many PAS suppliers, however, are realizing that manufacturing 'pig iron' is not necessarily such a good fit for their business.

Mergers & Acquisitions Cool Off in 2003

Over the last three years, many control valve suppliers have enhanced their market shares through acquisition, particularly Dresser, Flowserve, SPX, and Tyco. In order to integrate their new businesses and improve customer focus, many suppliers are undertaking internal reorganizations, streamlining manufacturing operations, establishing and exploiting synergy between various valve companies, and consolidating product portfolios. 2003, however, saw a considerable slow down in mergers & acquisitions as valve suppliers focused on rationalizing consolidated product lines. Despite the slow down, there were a couple select acquisitions during 2003 designed to complement businesses and fill gaps in either product ranges or geographical presence.

Purchasing Companies	Acquired Businesses	Objective
CCI	Fluid Kinetics, USA	Core Competency Enhancement
Rotork	Deanquip, Australia	Geographical Expansion

Recent Acquisitions

CCI (Control Components Incorporated) acquired Fluid Kinetics, a premier supplier of customized industrial silencers to the power, oil & gas, and industrial gases market. This acquisition strengthens CCI's position to provide superior noise solutions to meet its customers' unique needs, since noise control is major design criterion in severe-service applications. The combination of Fluid Kinetics' in-depth silencer expertise and CCI's severe service knowledge and experience will enhance CCI's market leadership in these applications.

Another recent acquisition is Rotork's acquisition of Deanquip Valve Automation of Australia. Deanquip Valve is a well-established fluid-power valve actuator products company with a strong presence in Australia, which Rotork can use as a springboard for expanding into neighboring Asian markets.

Suppliers Embark on Strategic Partnerships

For many suppliers, expanding solutions capabilities through acquisitions is not a preferred strategy. Hence, many companies are strengthening their solutions capabilities by expanding the scope and content of their strategic partnerships. These partnerships range from technology transfers, to product co-development, to sharing common distribution channels.

CVAP Supplier	Partner	Objective	Area
CCI	Nihon Koso	Technology Transfer, Sales & Distribution	Severe-service Applications
Dresser	Yokogawa	Product Co-development	Digital Valve Positioners
Emerson	MRO Software	Leveraging Specialization	Asset Management
Flowserve	Honeywell	Product Co-development	Digital Valve Positioners
Metso Automation	Arca Regler	Complementary Product Range	Linear Valves
Metso Automation	E & H	Technology Transfer, Product Co-development, Sales & Distribution	Asset Management
Samson	E & H	Sales & Distribu-tion	Collaboration in Brazil

Strategic Partnerships

CCI's partnership with Nihon Koso improves its chances of penetrating into the Japanese market. Nihon Koso benefits from the partnership by gaining access to CCI's severe-service technologies.

Dresser's partnership with Yokogawa and Flowserve's partnership with Honeywell are both mainly designed for product co-development. Both partnerships aim to develop and market digital valve positioners with Foundation Fieldbus.

Emerson's partnership with MRO Software to provide value added services complements its product range of field devices, DCS, and final control elements well. In addition, this partnership helps Emerson enhance its position in the developed countries, where having a focus on maintenance, repairs, and operations is the only way to win business.

Metso Automation's partnership with Arca Regler of Germany unifies Metso's range of rotary valves with Arca'a linear valves, when manufacturers insist on a single source supply. In turn, Arca Regler benefits from Metso's rotary valves and domain knowledge of the pulp & paper industry.

Metso Automation's joint venture with E & H is to develop life cycle management strategies and technologies for field devices including control

valves. In addition, the companies operate joint sales & service companies in Switzerland and Finland.

Samson and Endress & Hauser (E & H) have had a strategic alliance in place since 1997 for sales and distribution in Brazil. This partnership is of importance to both companies since Brazil, the largest Latin American country, is a market with strong long-term growth potential.

CVAP Suppliers Shift Focus to Information Management

CVAP suppliers are shifting their focus from valve manufacturing to information management. Manufacturers are increasingly turning to suppliers they feel are capable of supporting them partners in planning, maintaining, and development of their production processes. Suppliers who successfully manage this shift in emphasis within their organizations will emerge stronger in the new knowledge-based economy. For suppliers mostly weaned on a product and hardware-oriented business model shifting towards a knowledge-based business model is proving to be a big challenge.

Despite the challenges, CVAP suppliers must successfully navigate the shift toward information management to remain competitive. Declining hardware prices and dwindling volumes in traditional control valve markets of developed regions continue to exert severe pressure on profit margins. Repositioning themselves from product suppliers to information management companies is the only way for CVAP suppliers to offset eroding margins.

European Suppliers Battle a Strong Euro, High Labor Costs and Stagnant Market

Considerable appreciation of Euro over the US$ in the recent past has adversely affected European CVAP suppliers since most of the countries outside Europe peg their local currencies to the US$. To remain competitive, most European suppliers are following two strategies. One strategy is to outsource control valves from China, a country that offers twin advantages: low labor costs and a currency pegged to the US$. The second strategy is to shift some of their production activities to Eastern European countries and leverage two benefits: improve their cost competitiveness owing to low labor costs and use the geographic proximity as an advantage to gain business opportunities from Russia and former CIS countries.

New market dynamics are creating new challenges for European CVAP suppliers. Leading challenges facing European CVAP suppliers include

synergizing various manufacturing units and optimizing supply chain operations. Saturated market conditions of Western Europe further compound these problems.

Leading Suppliers

Emerson Process Management's Fisher Controls

Fisher Controls leads the worldwide CVAP market. Fisher benefits from its ability to offer a complete range of CVAP products and special purpose valves. An equally strong range of valve diagnostics software and PAM tools complements this hardware. This, combined with Fisher's reputation for strong service and support capabilities and the dominance of other Emerson field device brands including Rosemount, Micro Motion, Rosemount Analytical, Brooks, and Saab Radar, poses a serious challenge for other CVAP suppliers attempting to bag major new project business. Fisher Controls also benefits from a strong and loyal network of independent representatives in the US.

Another important factor contributing to Fisher's dominant position in this business is introduction of innovative concepts based on cutting-edge technologies. Fisher Controls' investment in research & engineering facilities across North America, Europe, and Asia includes various laboratories for simulation & analysis, acoustics, instrument development & software, cryogenic testing, dynamic performance, materials, high temperature steam, flow, cycle life, experimental stress and vibration. These facilities have patented innovative products including FIELDVUE Instrumentation, ENVIRO-SEAL valve packaging systems, Whisper Trim, Whisper Flo, and Valve Link software.

Continuously tracking market trends and talking to manufacturers to understand their current and future needs are other important ingredients of Fisher Controls' strategy. The resulting customer loyalty is a key component of Fisher's strategy to maintain market share.

Another important strategy is integration of Fisher valves with FIELDVUE digital valve controllers as an integral component of the PlantWeb digital architecture. Tangible benefits for manufacturers including improved process control, increased plant availability, enhanced safety and environmental regulation, and diagnostic information resulting from this integration is another factor in Fisher Controls' success.

By positioning itself as a single source supplier for process control solutions with its field devices, Delta V control system, and asset optimization tools, Emerson has taken more than its share of large projects. With the addition of corporate purchasing agreements, Fisher Controls offers procurement economies that small suppliers cannot match.

Flowserve

Flowserve's success is due, in large part, to its worldwide presence and large installed base, which includes many name brands acquired from IFC (Invensys Flow Control) in 2002. The acquisition of IFC broadened Flowserve's product range, improved the company's visibility in the market, and further enhanced its position as a provider of complete valve and flow control solutions. New Flowserve brand names attributable to this acquisition included Gestra, McCanna, NAF/Naval, Schmidt Armaturen, Worcester Controls, Argus/Rotadisk, Edward Vogt, Limitorque, Eckardt, and PMV.

Valtek, Kammer, Sereg, Worcester Controls, Limitorque, and PMV are the powerful brands that comprise Flowserve's CVAP product range and fulfill a variety of application needs in the major industries. This product range, combined with strong brand recognition and proven track record, makes Flowserve a strong supplier in the CVAP market.

Flowserve's global business alliance with Honeywell continues to reap benefits for both companies. The alliance between the two companies synergizes Honeywell's expertise in process automation with Flowserve's control valves and intelligent flow control solutions. The alliance helps both companies pursue global automation projects and joint product development.

In the recent past, Flowserve's growth initiatives have come through strategic acquisitions of other valve companies. Since 1990, Flowserve has acquired over 23 companies. Flowserve believes its growth strategy through acquisitions results in long-term benefits including increasing the company's customer base, broadening its product offerings, and providing entry into new markets by capturing operating synergies.

Recognizing the growing need to provide complete valve solutions, Flowserve began a push to improve its position in repairs, maintenance, and diagnostic capabilities for valves, piping systems, and instrumentation

in 2000 through acquisitions. The most important acquisition in this regard was the company's acquisition of Innovative Valve Technologies (Invatec).

Dresser

Loyal customers with a large base of installed Masoneilan CVAP products contribute to Dresser's strong position in the worldwide CVAP market. Dresser's control valve business is spearheaded by the Masoneilan brand name. Dresser's presence in over 100 countries and a base of 25 manufacturing units complement its strategy of becoming a single source supplier for all types of valves for major process industry segments, resulting in a strong position for winning large international projects. Dresser hopes to maintain its technical leadership by leveraging its strong brand names and ability to provide complete solutions to the process industries.

To better exploit operating synergies, Dresser reorganized its flow control business during 2003. This reorganization led to the formation of a new business unit, Dresser Flow Solutions, to look after the control valve, pressure relief valve, on/off valve, metering, regulation, and piping specialty product lines. Dresser hopes the reorganization will improve the company's customer focus and increase the efficiencies of its manufacturing and supply chain operations. Dresser also hopes to increase its focus on innovation and build upon design, engineering, and project management capabilities through the reorganization. The new business unit facilitates the management of all valve businesses, many of which share common customers and common manufacturing processes.

To benefit from the growing natural gas market, Dresser recently acquired Becker Precision Equipment. The acquisition of Becker Precision Equipment, which manufactures control valves, specialty regulators, and control instrumentation for the natural gas industry, allows Dresser to further consolidate its position in the rapidly growing worldwide market for natural gas solutions.

Samson

Samson's ability to remain a key player in the worldwide CVAP market for so long is a result of the company's strength in its home market of Germany and its strategy to achieve increased market share through a combination of organic and inorganic growth. Samson remains true to its core competency, control valve and regulator technology. Unlike many suppliers, Samson continues to remain independent and invest in technologies related

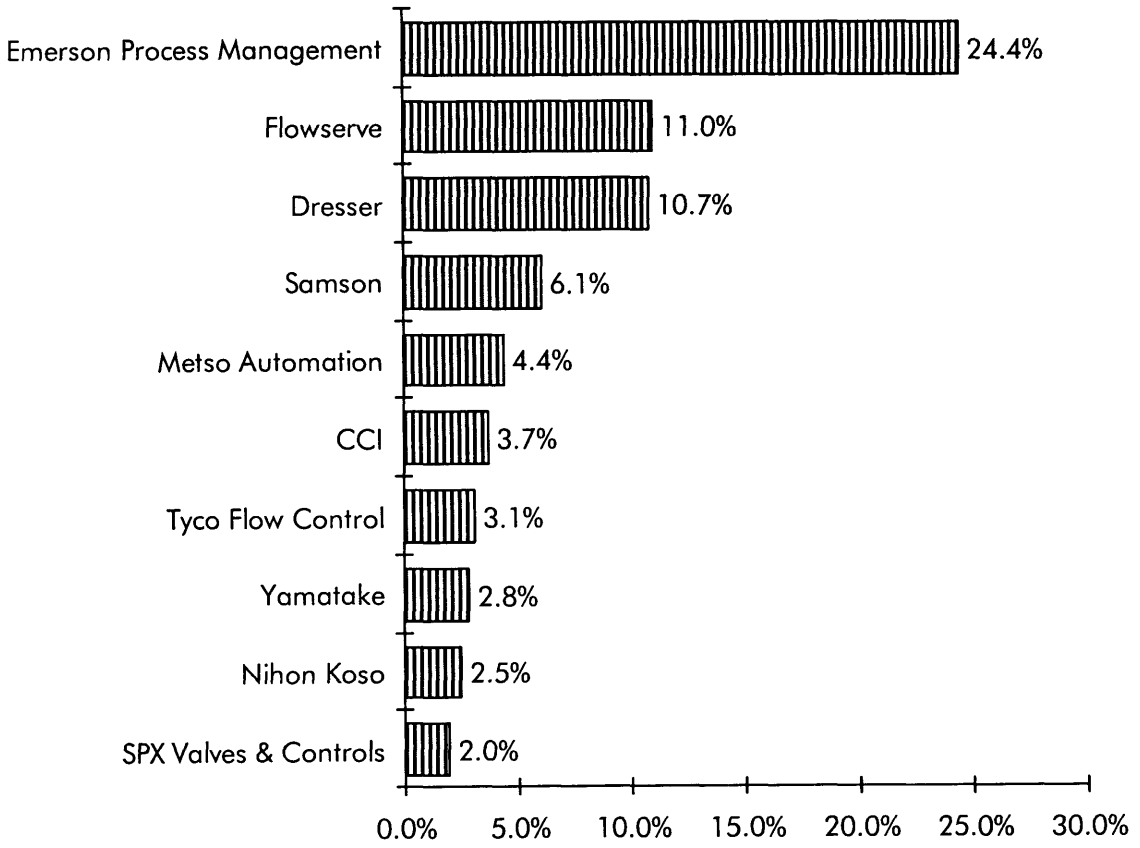
to application-specific control valves and valve diagnostic software to increase the value of control valves beyond simple final control elements. These initiatives have led to consistent organic growth for the company and Samson states the basis of this success is its co-operation between R & D, design, and production departments, as well as its practical engineering approach and continuous dialog with customers.

Samson also benefits from its successful policy of inorganic growth through acquisitions aimed at filling gaps in its product line. In 1995, Samson acquired Pfeiffer to strengthen its position in the chemical industry. Pfeiffer specializes in PTFE and PFA lined rotary valves and valves of precious metals. The acquisition of Vetec provided Samson with the addition of rotary plug valves to its product portfolio. The acquisition of Starline of Italy provided Samson the addition of rotary ball valves to its product portfolio. The acquisition of rack & pinion actuator business of Air Torque, Italy improved Samson's actuator product range.

Forging global partnerships is another important part of Samson's growth strategy. In 1998, the company signed a global partnership agreement with Endress+Hauser (E+H) in line with its policy of establishing strategic alliances with partners that best complement the company's product range.

Figure 3-1
Leading Suppliers of Control Valves

2003 Revenues = $ 2,898.5 Million

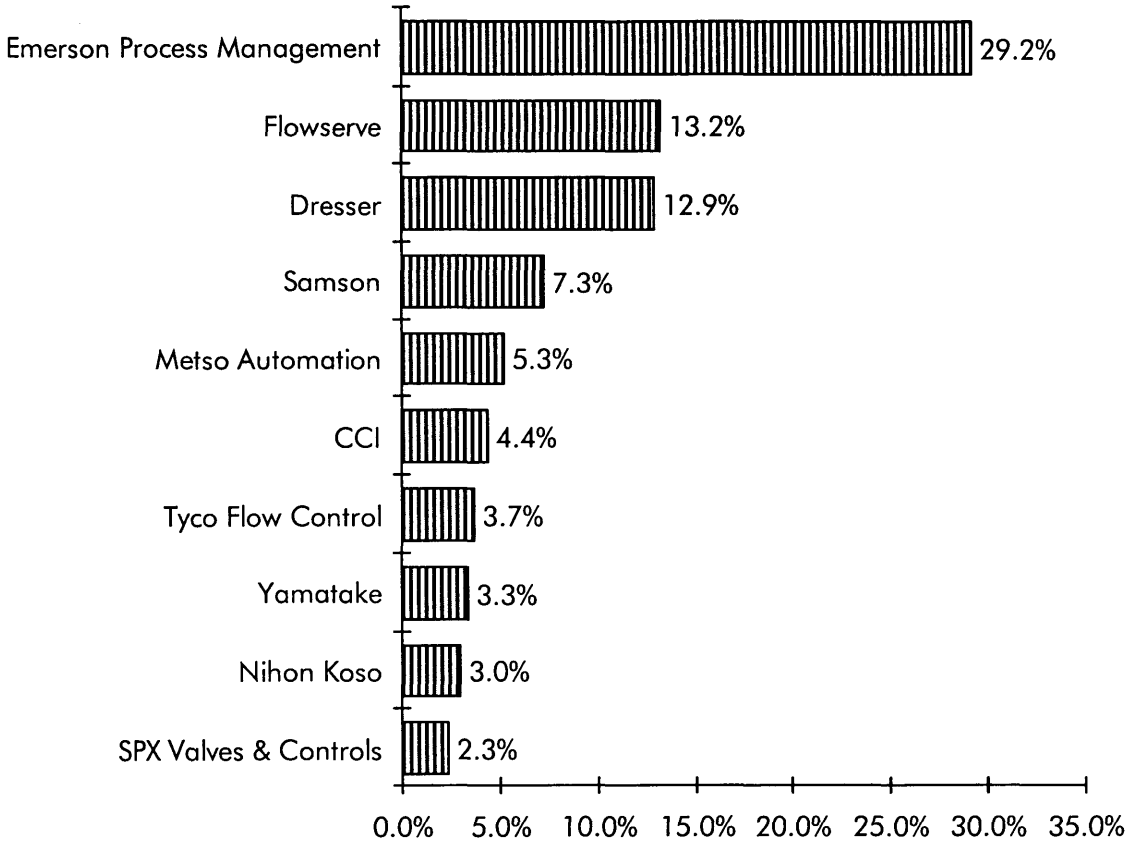


Third Party = 16.6 Percent

Other = 12.9 Percent

Figure 3-2
Leading Suppliers of Control Valves Excluding Third Parties

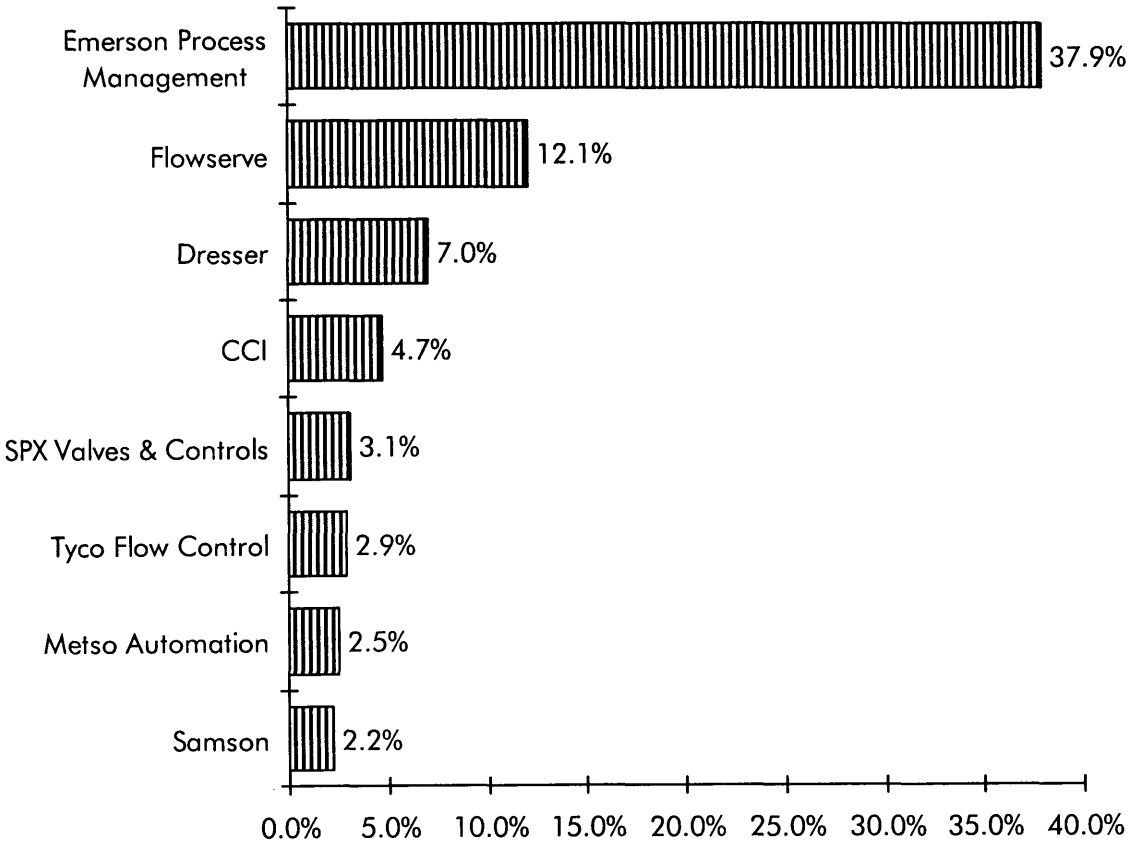
2003 Revenues = $ 2,416.5 Million



Other = 15.5 Percent

Figure 3-3
Leading Suppliers of Control Valves in North America

2003 Revenues = $ 1,024.5 Million

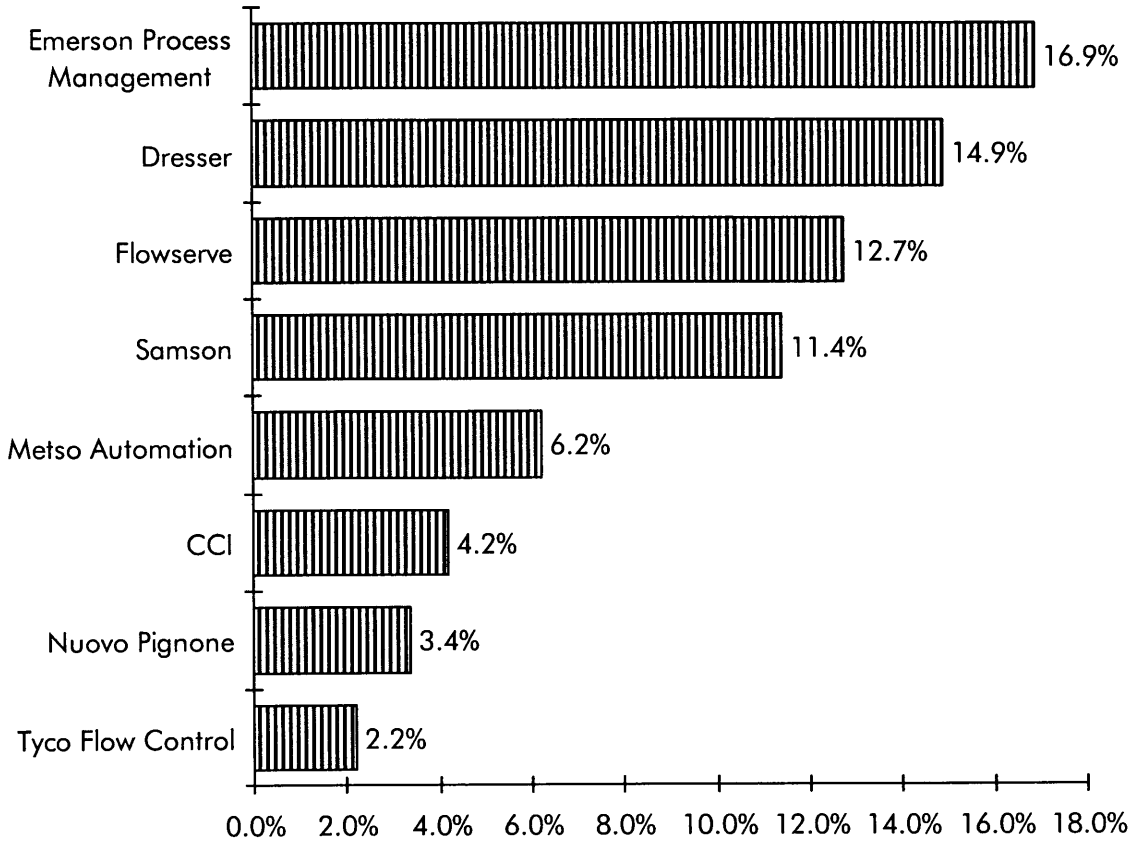


Third Party = 16.7 Percent

Other = 10.9 Percent

Figure 3-4
Leading Suppliers of Control Valves in EMEA

2003 Revenues = $ 1,023.8 Million

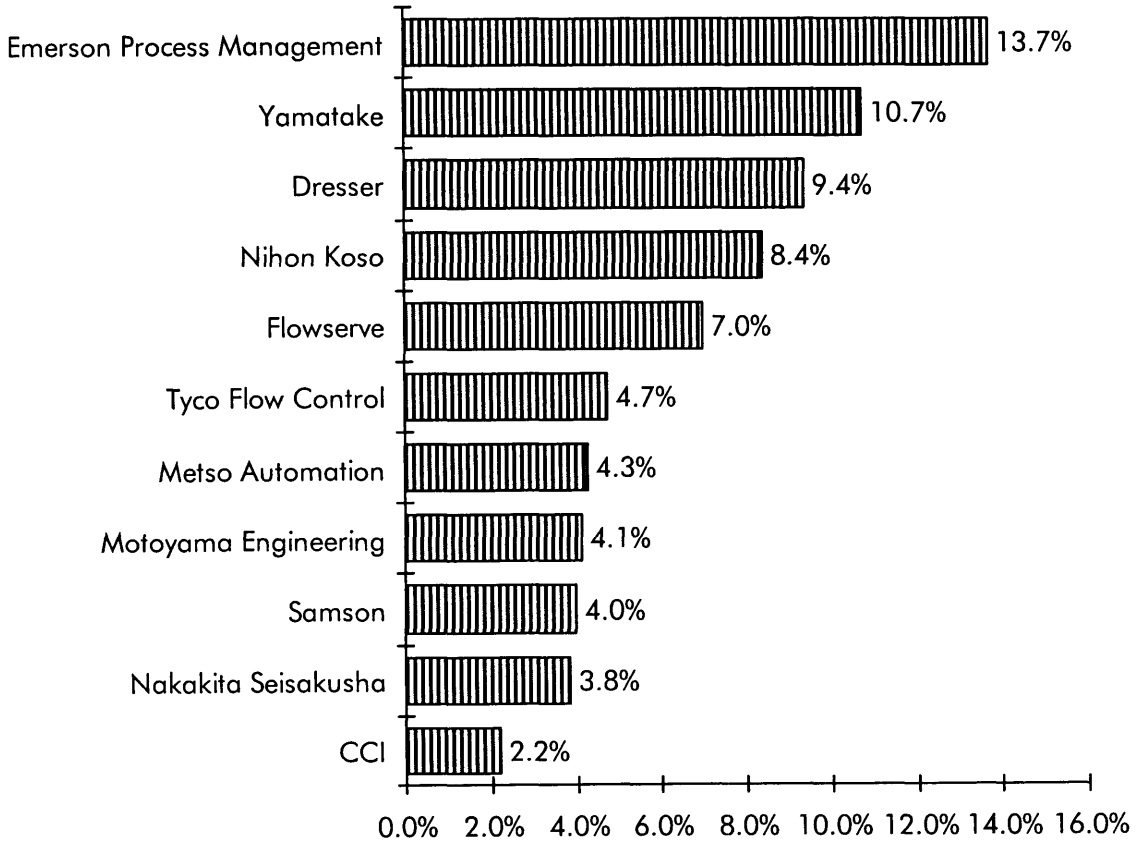


Third Party = 16.7 Percent

Other = 11.4 Percent

Figure 3-5
Leading Suppliers of Control Valves in Asia

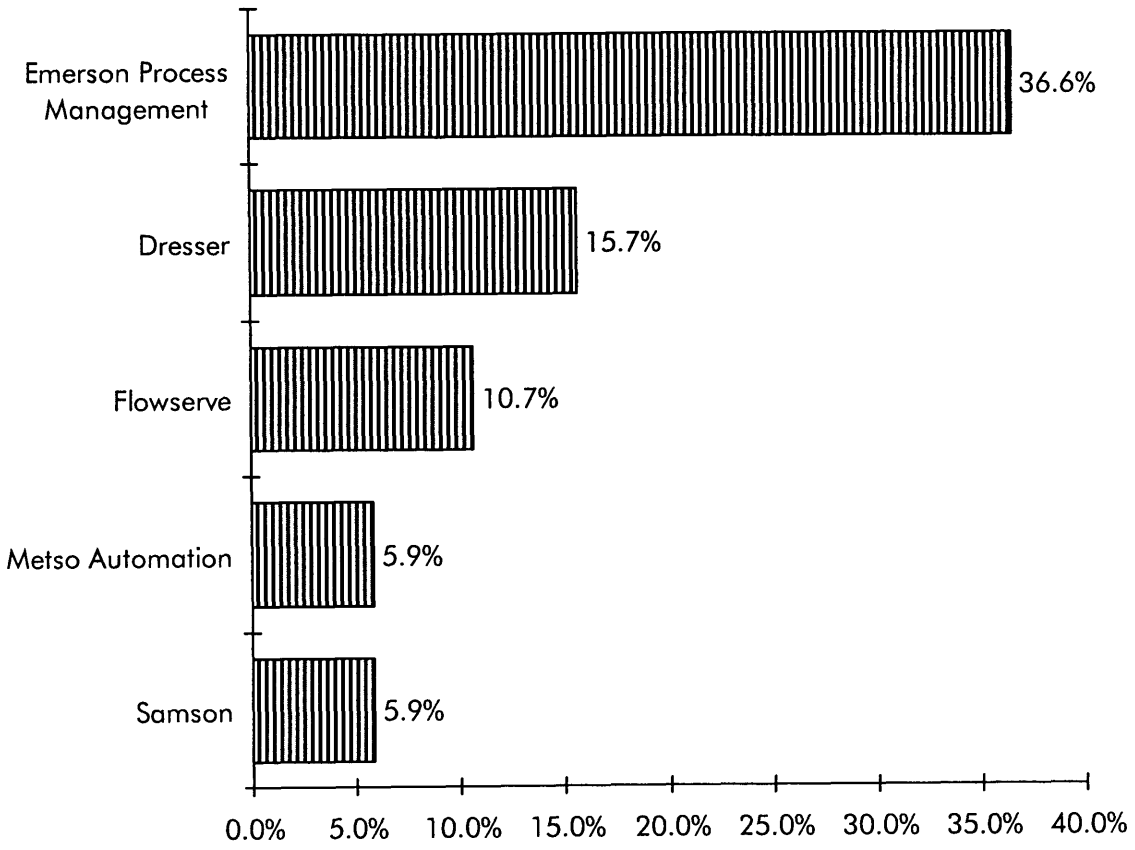
2003 Revenues = $ 730.9 Million



Third Party = 16.8 Percent
Other = 11.1 Percent

Figure 3-6
Leading Suppliers of Control Valves in Latin America

2003 Revenues = $ 119.3 Million

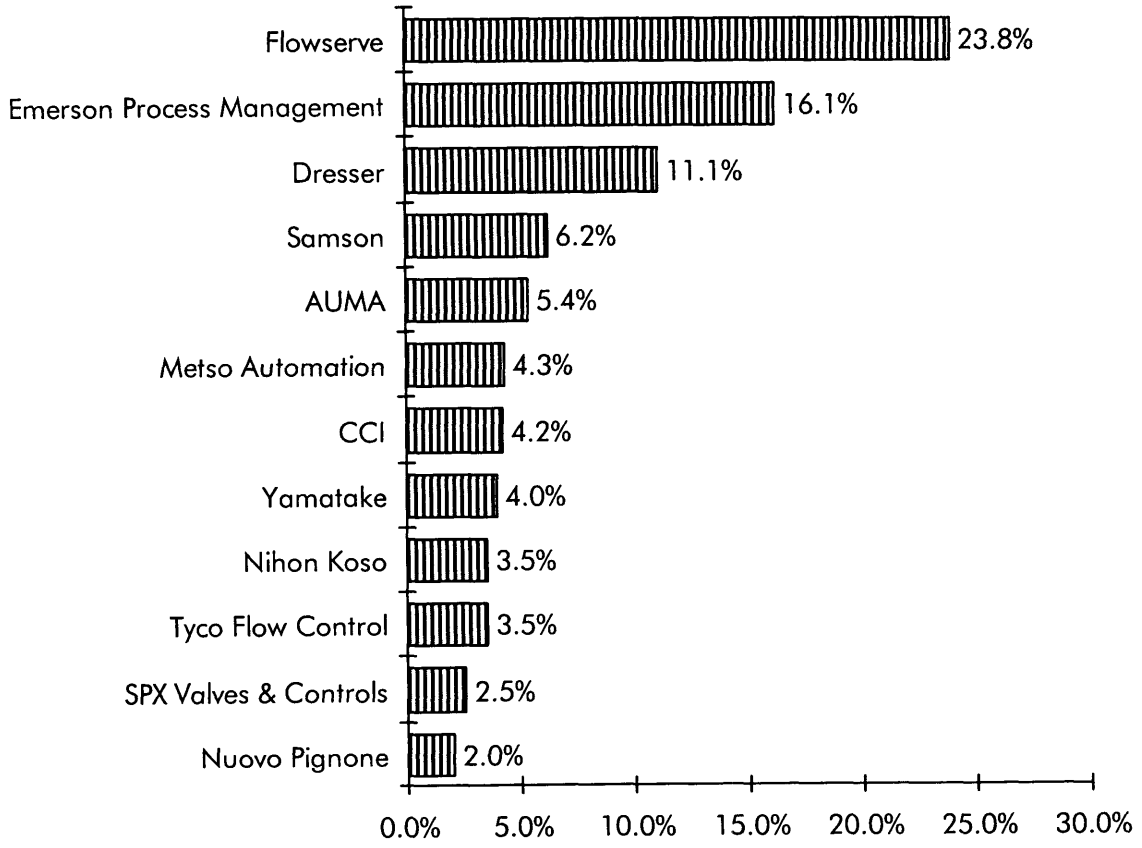


Third Party = 14.5 Percent

Other = 10.8 Percent

Figure 3-7
Leading Suppliers of Control Valve Actuators

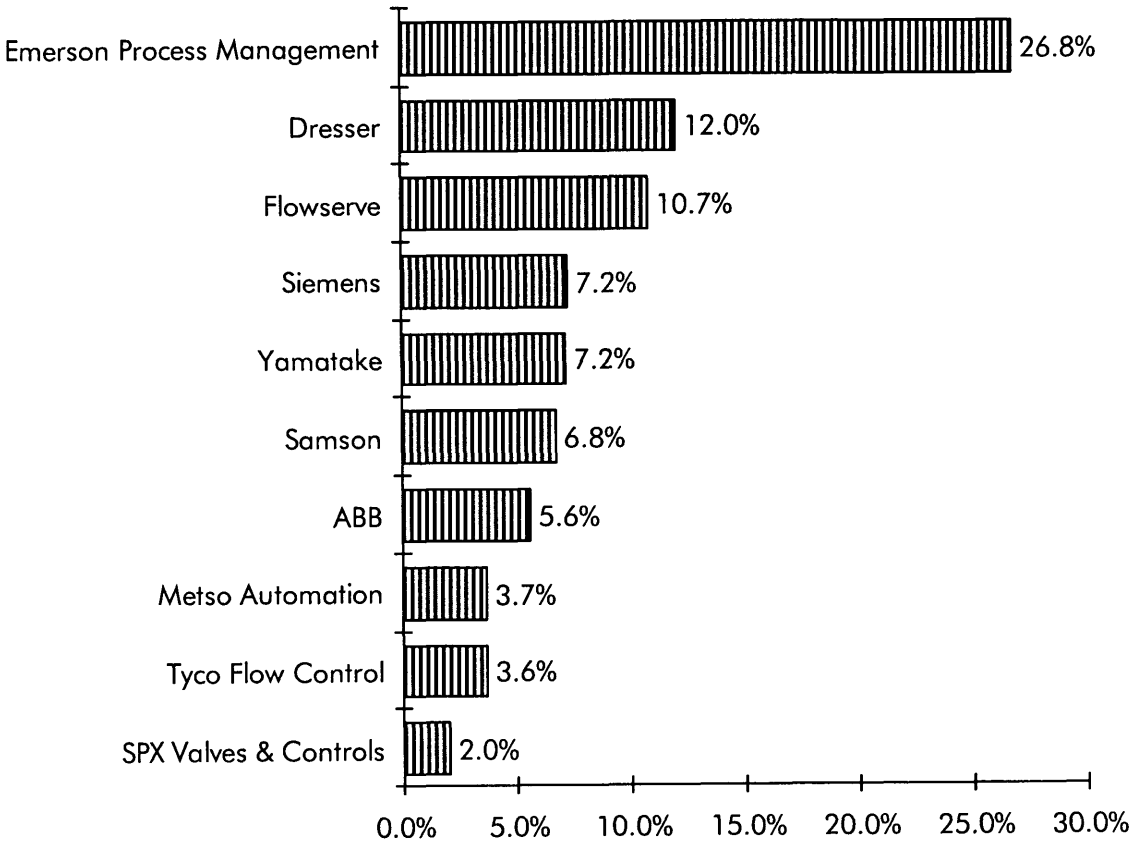
2003 Revenues = $ 507.1 Million



Other = 13.4 Percent

Figure 3-8
Leading Suppliers of Control Valve Positioners

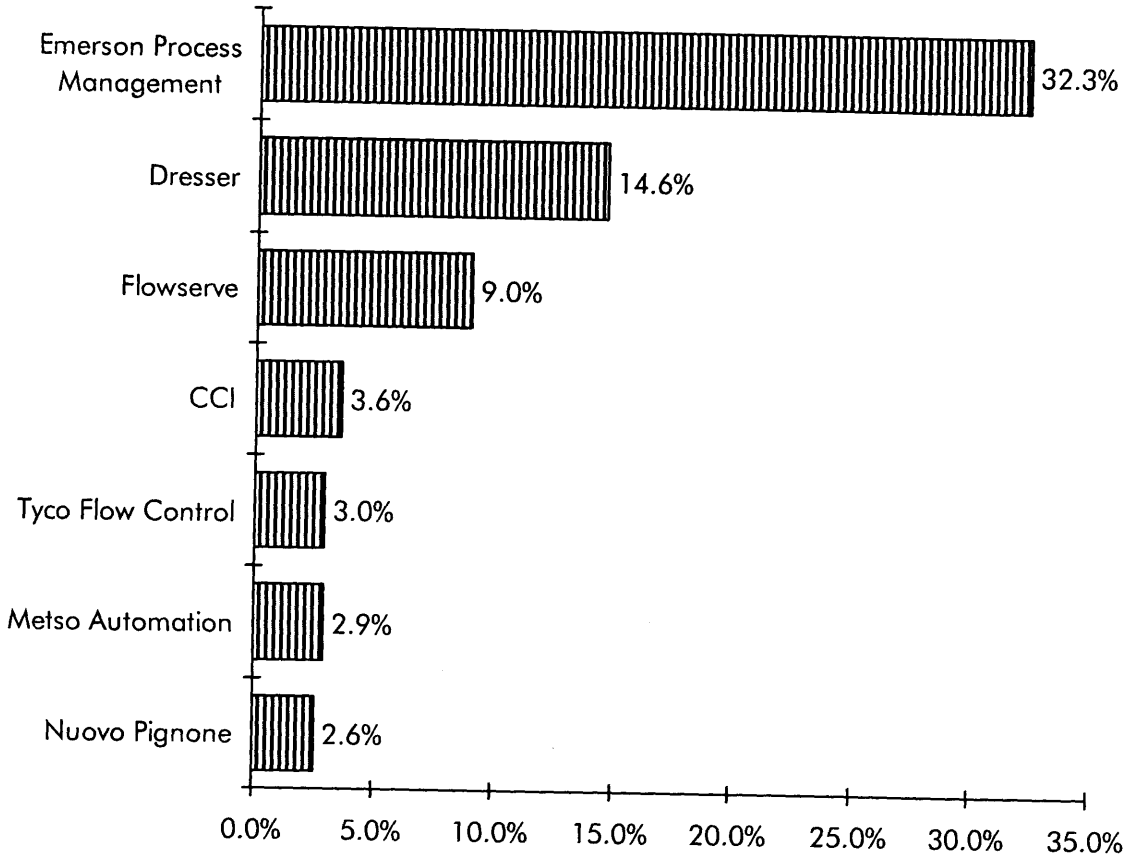
2003 Revenues = $ 414.3 Million



Other = 14.3 Percent

Figure 3-9
Leading Suppliers of Control Valves to the Oil & Gas Industry

2003 Revenues = $ 745.2 Million

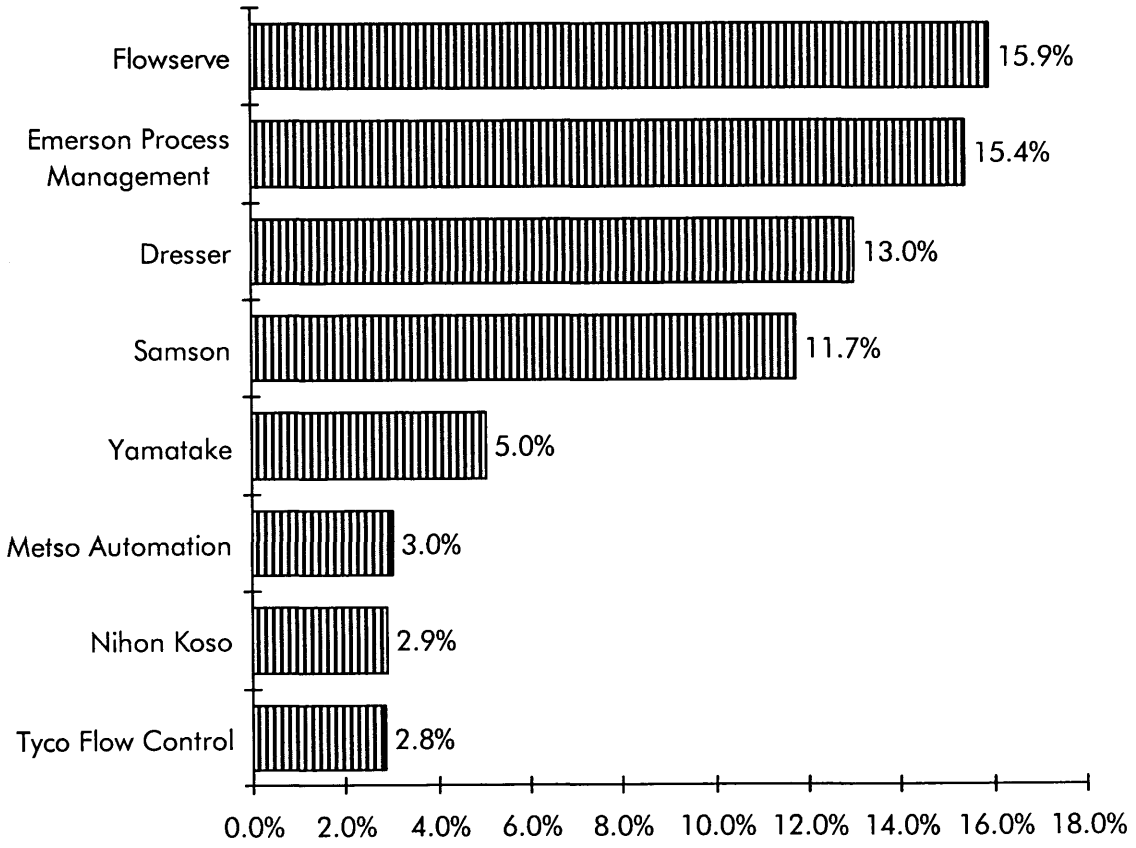


Third Party = 16.5 Percent

Other = 15.5 Percent

Figure 3-10
Leading Suppliers of Control Valves to the Chemical Industry

2003 Revenues = $ 719.0 Million

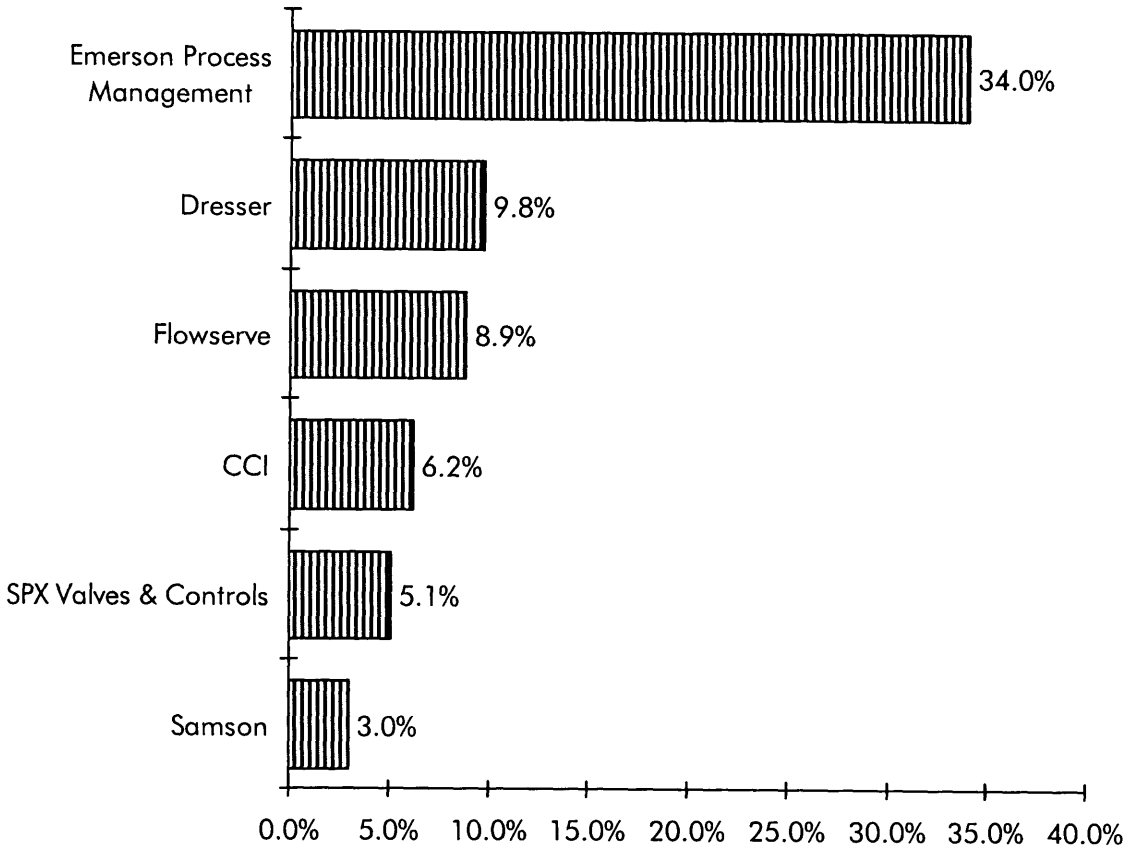


Third Party = 16.8 Percent

Other = 13.4 Percent

Figure 3-11
Leading Suppliers of to the Electric Power Industry

2003 Revenues = $ 573.1 Million



Third Party = 16.8 Percent

Other = 16.2 Percent

Chapter 4
Market Analysis and Forecast

Long-term business prospects remain reasonably bright in the global Control Valve, Actuator, and Positioner (CVAP) market due to MRO (Maintenance, Repair and Operations) business opportunities in developed regions and new projects business in developing countries. In the short-term, however, CVAP markets in NA, EMEA, and Japan continue to struggle. In these regions, suppliers face the challenge of expanding business in an environment dominated by manufacturing companies still wary of committing fresh investments. On the other hand, developing countries, such as Russia, India, and China, offer growth opportunities through new projects business. China is the fastest growing market for control valves globally. Suppliers who evaluate their strengths & weaknesses and reposition their strategies in line with these ever-changing market realities stand to gain from these opportunities.

ARC believes that the future growth of the control valve market would be spurred by the ability of valve suppliers to provide value-added services along with intelligent valve supplies.

An opportunity is also emerging for control valve suppliers to enhance their service revenues by leveraging their skills in offering maintenance, repair, and upgrade services. The notion of intelligent automation, which started at the supervisory level, has become pervasive at the final control element level. This is helping suppliers to expand the control valves, actuators, and positioners (CVAP) market by meeting the hitherto unfulfilled needs of users to better control the processes. With users seeking to maximize the returns from their plant assets through Collaborative Production Management (CPM) strategies and optimize their maintenance spending through Plant Asset Management (PAM) strategies, there is an increasing interest in intelligent CVAP assemblies.

Factors Contributing to Growth

China and India Lead Growth

Expansive economic growth in some of the developing regions, such as India and China, will help offset flat market growth in developed regions. China and India's dynamic economies are the main driving factor behind growth occurring in CVAP investments worldwide. China's production is skyrocketing, reflecting its strong economic growth and signaling its up-

coming status as a major global manufacturing force. China, the fastest growing economy in the world, is expanding its industrial infrastructure at breakneck speed to meet growing demand from increasing consumption. Large chemical & petrochemical plants, grass root oil & gas refineries, and new power plants are fueling much of the CVAP market growth in China.

New Energy Sources Fuel Demand

The oil & gas industry, one of the largest consumers of CVAP products and services, is growing to meet energy and power demands of developing countries with a large population eager to raise their standard of living. Growing demand for energy in developing countries is causing this sector to open up to increasingly large-scale foreign participation. Growing need for clean, cheap fuel to generate electricity to feed their country's growing economic activities is stoking demand for LNG, CNG, and GTL. Demand for new energy sources is fuelling demand for storage, transportation, and a distribution infrastructure, which requires additional control valve purchases.

Manufacturers Embrace Innovative Products and Services

Manufacturers are increasingly embracing innovative concepts and solutions that reduce installation time and cost. CVAP suppliers continue to make their deliverables more user friendly, cost effective, and regulatory compliant in line with user needs and market trends. Simultaneously, suppliers are providing enough flexibility in their products to allow manufacturers to configure the solution that best fits their application. These innovations are taking place in all components of a valve assembly - valve bodies and trims, special purpose valves, actuators, positioners, software, and services. As manufacturers increasingly embrace innovative valve products and solutions, their investments will help fuel overall CVAP market growth.

Manufacturers adopt Ready-to-use, Modular, Control Valve Assemblies

Control valve designs now have two major considerations, modularity and interchangeability. These two factors dictate design considerations because manufacturers often choose a CVAP supplier based on factors such as ex-stock availability, reparability, cost, and brand reputation. Suppliers are increasingly designing ready-to-use assemblies to lower total cost of ownership. Component interchangeability, due to reduced product complexity,

substantially lowers purchasing, parts inventory, and maintenance costs for manufacturers.

Fisher Controls' new Design GX series is a ready-to-use control valve and actuator assembly supplied along with digital valve controller for calibration and tuning. The valve body configuration determines actuator sizing without extra engineering. Similarly, Metso Automation offers nelesCV, which is an integrated package with three matched components, a process specific valve, a double diaphragm actuator, and an intelligent valve controller. As manufacturers increasingly embrace modular, ready-to-use valve products, their investments will help fuel overall CVAP market growth.

Regulatory Compliance Spurs Growth

Regulatory compliance by statutory authorities is fuelling replacement market growth whereas custom specifications by large manufacturers are driving new project business. The European Pressure Equipment Directive (PED), which came into effect in May 2002, was amongst the first such major regulations. Many control valve suppliers are making design changes in their products to comply with the PED so they can continue doing business in the EU.

The US Environmental Protection Agency's (EPA) recent regulation of keeping emission concentration below mandated limits of 500 ppm is spurring growth of new valve packing systems. Custom specifications are also on the rise, especially for the hydrocarbon processing industries. For example, Shell B.V has its own standards. Suppliers are responding to these growth opportunities by complying with the stringent regulations and providing the necessary set-up for third party testing.

Niche Applications Boost Demand for Special Purpose Valves

The oil & gas and electric power industries, which combined represent nearly one-half of all CVAP sales, are injecting demand for application-specific and special purpose valves. Suppliers have responded by introducing new products. CCI's Rotary DRAG is a tight shutoff soft-seated ball valve for gas transmission applications designed to enhance performance pertaining to pressure reduction, noise, and vibration control. Flowserve's Multi-Z control valve features a multistage trim design that eliminates cavitation and provides extended trim life to handle high-pressure drop for boiler-feed water recirculation applications in the electric power industry.

Fisher Controls' TBX turbine bypass valve is designed for severe steam conditioning applications that require combined pressure and temperature control, and the company's NotchFlo DST control valve's trim is designed to prevent cavitation and clearance flow problems that typically occur in dirty service high-pressure applications such as those found in the power, oilfield, and refinery industries.

Actuators: Integral Controls and Application-Specific Designs Become Popular

Adding controls to actuator assemblies is an initiative gaining growth because it enables manufacturers to configure and use the actuators exactly as their requirement dictates. AUMA has designed actuator controls that are modular systems consisting of function modules, communication interfaces, and diagnostics. Emerson Valve Automation Division's FieldQ is a pre-engineered plug-and-play solution for its pneumatic rack & pinion actuators, by integrating controls to automate rotary valves.

Demand for application-specific actuation systems for niche markets is also growing and suppliers are responding to these growth opportunities. Compressor anti-surge control is one such application. GE Nuovo Pignone and Fisher Controls are successfully utilizing application-specific actuator systems to win business for gas compressor applications. Another example is special actuators for valves on oil & gas pipelines. Rotork is successfully approaching this business with two designs, gas-driven actuators where the motive force for the actuator is the pipeline gas itself and 12/24 V DC powered actuators, both of which are ideal for remote installations.

Fieldbus Enables Growth of Digital Positioners

Increasing demand for fieldbus-based control systems is motivating manufacturers to upgrade to digital positioners. Despite the seemingly slow adoption of Foundation Fieldbus (FF) enabled control systems, it is finally approaching the stage where adoption is accelerating for Greenfield projects, especially in China.

Fieldbus technology is proving to be a growth enabler for digital positioners at the expense of digital positioners that use proprietary protocols and pneumatic positioners. Manufacturers now realize the cost saving benefits of implementing digital protocol standards to enable plant-asset management solutions particularly in the maintenance and operation phase of an asset. By using tools, such as predictive diagnostics and software-based

configuration solutions, manufacturers can reduce maintenance cost and, more importantly, increase production availability.

Digital Positioners Occupy Center Stage of PAM, RPO and SIS Strategies

Growing importance of PAM (Plant Asset Management) in the strategies of manufacturers is increasing demand for digital positioners. Asset management initiatives increase demand for data transparency. Much of the data necessary to make informed decisions regarding maintenance, operational performance, and financial return of plant assets lies in digital positioners.

Growing adoption of Real-time Process Optimization (RPO) strategies is also compelling manufacturers to upgrade to new digital positioners. For many years, poor control valve performance hampered the ability to obtain tight loop control in critical control loops. With final control moving to valve positioners, correcting for control valve stickiness (dead time) from the control loop becomes easily attainable, resulting in an optimally tuned loop with far less error.

Safety Instrumented Systems (SIS) is another important area further driving adoption of digital positioners. SIS is gaining importance due to increasing regulatory demand in the process industries, which require high uptime and secure operations. Due to significant potential for explosions and release of toxic chemicals and gases in these industries, safety regulation of the chemical and oil & gas industries is on the rise. Digital positioners are proving to be a great enabler to predictive maintenance by providing a Valve Degradation Analysis, which is important for critical valves in SIS. Most importantly, digital positioners provide a time and date stamp on all tests and reports, which is mandatory for complying with the requirements of statutory authorities. Many suppliers have designed and introduced testing and monitoring systems for Emergency Shut-Down (ESD) valves. Metso Automation's Neles ValvGuard VG 800 and Fisher's FIELDVUE are key examples.

Suppliers Leverage Valve Diagnostics & Software Capabilities

Suppliers are increasingly leveraging software capabilities to win business. As the power of software increases day by day, so does its ability to drive growth in the CVAP business. Software now forms an integral component of CVAP suppliers' deliverables.

CVAP suppliers are increasingly expanding beyond their traditional roles and venturing into software and diagnostics. Almost all major control valve suppliers today offer a range of software products performing functions such as diagnostics, calibration, plant maintenance, and asset management. CVAP suppliers are focusing on information-related solutions to improve plant operations. With more than 40 percent of plant maintenance budgets directed at field devices and control valves, manufacturing companies continue adopting PAM solutions, which require software-based, intelligent valve positioners.

Valve diagnostic software is evolving to incorporate features that not only enable manufacturers to identify the cause of a problem but also suggest corrective actions. For manufacturers, the key is to know when to repair or replace a control valve before poor performance sets in, or worse, valve failure causes an unscheduled shutdown. In such situations, manufacturers are not interested in statistical valve data. Manufacturers are interested in diagnostics that give them specifics about the problem and recommend a course of action to minimize process disruption. For example, Fisher Controls has added its FIELDVUE digital valve controller with "green-yellow-red" light performance diagnostics capability, which is designed to simplify control valve maintenance by detecting emerging conditions that could lead to valve failure and prioritizing an alert based on colors that denote the alarm's urgency.

Factors Inhibiting Growth

Stagnant Economic Conditions in Developed Regions Hampers Growth

Slow economic growth in North America, Europe, and Japan continues to adversely affect the entire process automation market. Traditional purchasers of control valves in the chemical and petrochemical markets, who are suffering from cyclical industry trends at the bottom of their demand curve, are hesitant to invest in capital equipment including control valves. Hesitance to invest is among the leading factors inhibiting CVAP growth over the next five years. With new projects becoming scarce in developed regions, CVAP suppliers are forced to participate in a largely stagnant replacement market.

Users Prefer a Conservative Approach

"If it isn't broke, don't fix it", is a typical conservative approach manufacturers adopt in order to save short-term costs. Hence, many manufacturers are hesitant to upgrade products and systems overnight, typically waiting for the products to fail before justifying their replacement. In developed regions of the world, where there is little to virtually no plant expansion, it is difficult for suppliers to compel manufacturers to upgrade old CVAP units in working order.

Intelligent Pumps Challenge Control Valves

Food & beverage and pharmaceutical industry companies are increasingly using intelligent pumps, (e.g. peristaltic pumps), as final control elements instead of control valves. Hence, CVAP suppliers are not able to ride on the high growth rates shown by these hybrid industries. Many applications in these industries require final control elements that comply with hygiene regulations and provide better controllability for small flows. It is very difficult for small-sized control valves to meet these requirements cost effectively.

New Greenfield Plants with Large Economies-of-Scale Limit Growth

Large Greenfield plants being set up in developing countries are designed for such large-scale operations that economies of scale in fact are reducing demand for the number of valves in comparison to traditional designs. Consequently, although there is significant Greenfield business to be had in developing countries, the CVAP portion of each project is less than a similar Greenfield project in North America or Europe.

Valve Lifecycle Enhancement Slows Demand

Many manufacturers prefer to extend the life of the existing valve assets, instead of replacing old valves completely. Use of digital valve positioners on old valves enhances their performance up to a point and offers manufacturers an option of waiting longer before purchasing a new valve assembly.

Figure 4-1

Shipments of Control Valves Including Hardware, Software, & Services

(Millions of US Dollars)

CAGR = 3.1 Percent

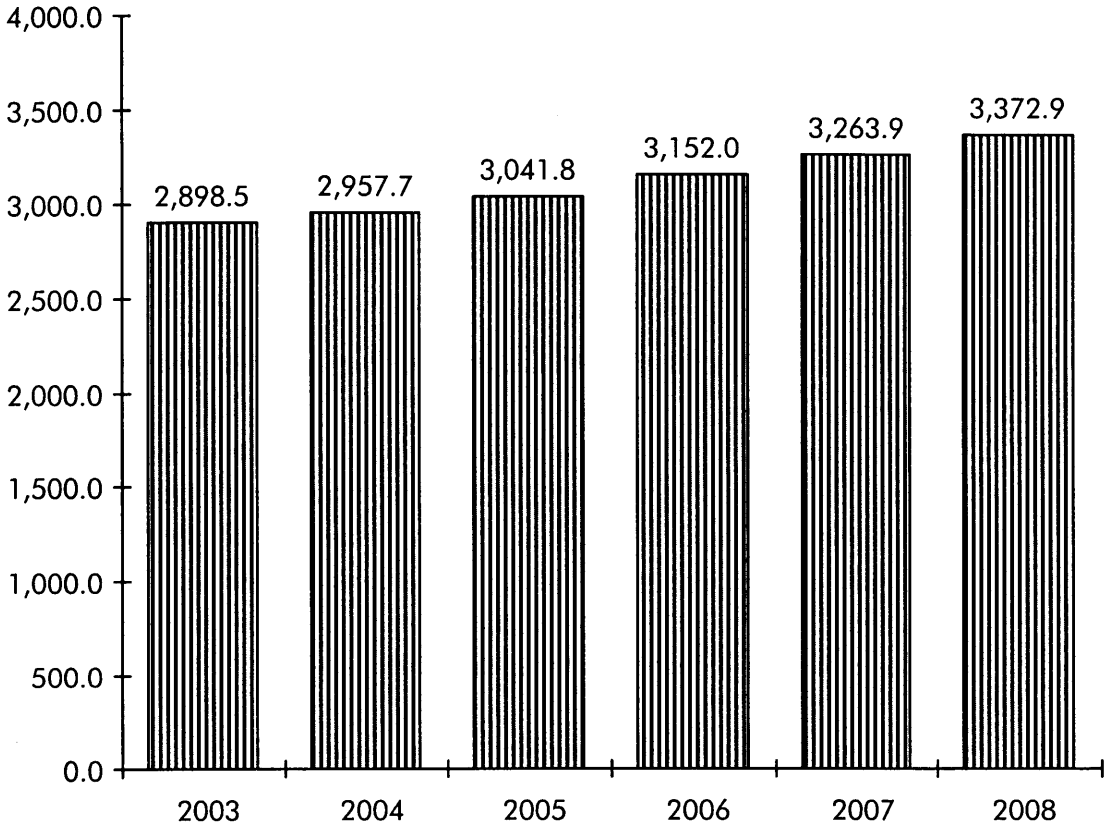


Figure 4-2
Shipments of Control Valves by Geographic Region
(Millions of US Dollars)

	2003	2004	2005	2006	2007	2008	CAGR
North America	1,024.5	1,035.8	1,051.3	1,074.4	1,090.6	1,102.6	1.5%
EMEA	1,023.8	1,039.2	1,062.1	1,093.9	1,115.8	1,128.1	2.0%
Asia	730.9	763.1	805.0	858.2	933.7	1,022.4	6.9%
Latin America	119.3	119.6	123.4	125.5	123.9	119.9	0.1%
Total	2,898.5	2,957.7	3,041.8	3,152.0	3,263.9	3,372.9	3.1%

	2003 Millions of Dollars	Percent	2008 Millions of Dollars	Percent	CAGR
North America	1,024.5	35.3%	1,102.6	32.7%	1.5%
EMEA	1,023.8	35.3%	1,128.1	33.4%	2.0%
Asia	730.9	25.2%	1,022.4	30.3%	6.9%
Latin America	119.3	4.1%	119.9	3.6%	0.1%
Total	2,898.5	100.0%	3,372.9	100.0%	3.1%

Figure 4-3
Shipments of Control Valves by Hardware, Software, and Services
(Millions of US Dollars)

	2003	2004	2005	2006	2007	2008	CAGR
Hardware	2,583.7	2,635.4	2,709.2	2,798.6	2,876.9	2,940.2	2.6%
Software	33.7	35.0	36.5	38.6	41.1	44.3	5.6%
Services	281.1	287.3	296.1	314.9	345.8	388.4	6.7%
Total	2,898.5	2,957.7	3,041.8	3,152.0	3,263.9	3,372.9	3.1%

	2003 Millions of Dollars	Percent	2008 Millions of Dollars	Percent	CAGR
Hardware	2,583.7	89.1%	2,940.2	87.2%	2.6%
Software	33.7	1.2%	44.3	1.3%	5.6%
Services	281.1	9.7%	388.4	11.5%	6.7%
Total	2,898.5	100.0%	3,372.9	100.0%	3.1%

Figure 4-4
Shipments of Control Valves by Component
(Millions of US Dollars)

	2003	2004	2005	2006	2007	2008	CAGR
Valves	1,882.2	1,900.9	1,933.0	1,981.1	2,024.4	2,058.6	1.8%
Actuators	507.1	521.6	541.7	564.6	586.5	604.8	3.6%
Positioners	414.3	435.5	461.4	493.2	532.4	582.9	7.1%
Accessories	94.9	99.6	105.7	113.3	120.6	126.6	5.9%
Total	2,898.5	2,957.7	3,041.8	3,152.0	3,263.9	3,372.9	3.1%

	2003 Millions of Dollars	Percent	2008 Millions of Dollars	Percent	CAGR
Valves	1,882.2	64.9%	2,058.6	61.0%	1.8%
Actuators	507.1	17.5%	604.8	17.9%	3.6%
Positioners	414.3	14.3%	582.9	17.3%	7.1%
Accessories	94.9	3.3%	126.6	3.8%	5.9%
Total	2,898.5	100.0%	3,372.9	100.0%	3.1%

Figure 4-5
Shipments of Control Valves by Component
(Thousands of Units)

	2003	2004	2005	2006	2007	2008	CAGR
Valves	933.3	947.3	968.1	997.2	1,024.1	1,046.6	2.3%
Actuators	981.3	1,009.6	1,047.8	1,090.3	1,131.9	1,166.9	3.5%
Positioners	827.6	852.9	886.8	930.7	987.9	1,062.1	5.1%

Figure 4-6
Average Selling Price of Control Valves by Component
(US Dollars)

	2003	2004	2005	2006	2007	2008	CAGR
Valves	2,017	2,007	1,997	1,987	1,977	1,967	-0.5%
Actuators	517	517	517	518	518	518	0.1%
Positioners	501	511	520	530	539	549	1.9%

Figure 4-7

Shipments of Control Valve Actuators

(Millions of US Dollars)

CAGR = 3.6 Percent

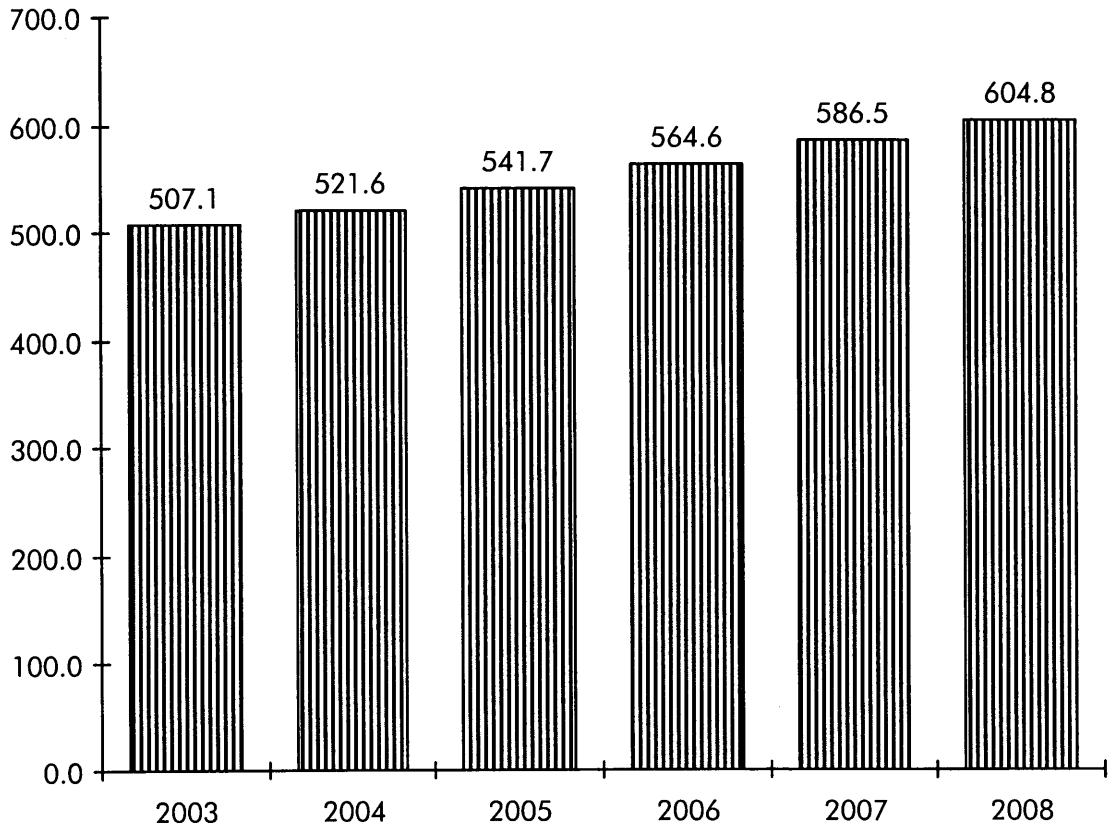


Figure 4-8

Shipments of Control Valve Actuators

(Thousands of Units)

CAGR = 3.5 Percent

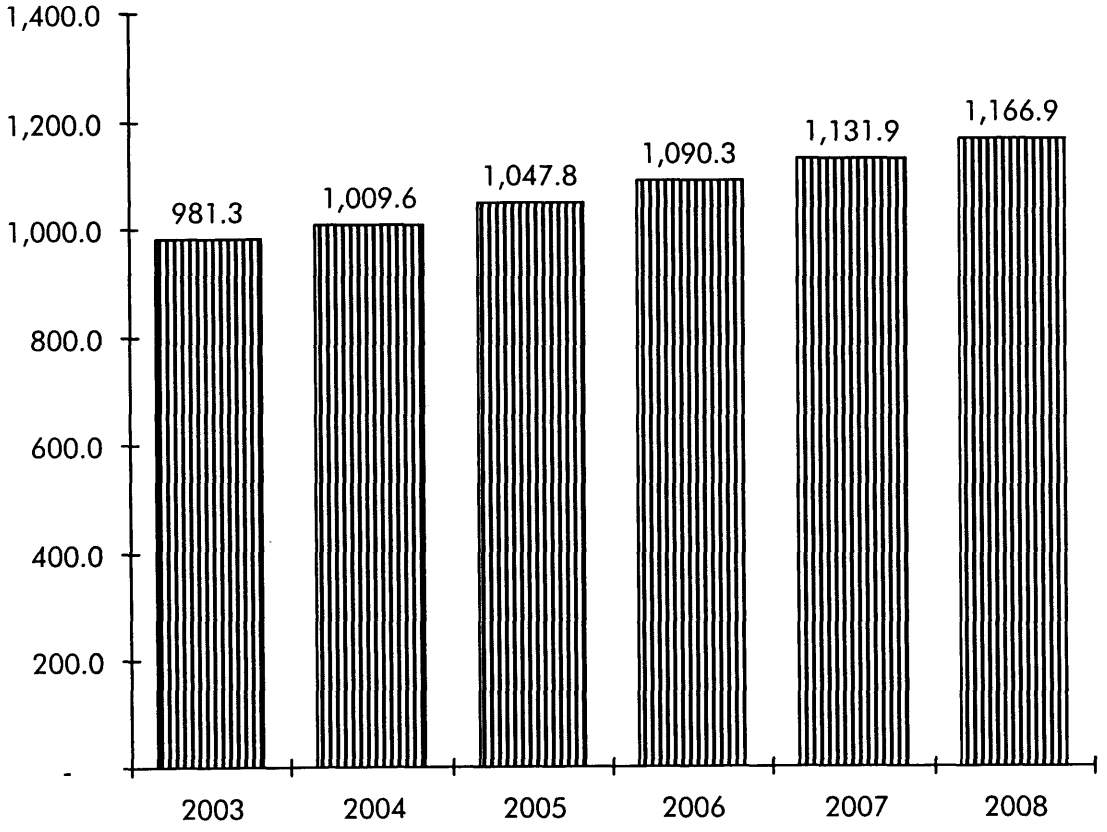


Figure 4-9
Shipments of Control Valve Actuators by Type
(Millions of US Dollars)

	2003	2004	2005	2006	2007	2008	CAGR
Pneumatic	355.4	363.5	374.7	386.9	398.8	408.3	2.8%
Electric	143.3	149.5	158.2	168.5	178.4	187.0	5.5%
Other	8.4	8.6	8.8	9.1	9.4	9.5	2.7%
Total	507.1	521.6	541.7	564.6	586.5	604.8	3.6%

	2003 Millions of Dollars	Percent	2008 Millions of Dollars	Percent	CAGR
Pneumatic	355.4	70.1%	408.3	67.5%	2.8%
Electric	143.3	28.3%	187.0	30.9%	5.5%
Other	8.4	1.6%	9.5	1.6%	2.7%
Total	507.1	100.0%	604.8	100.0%	3.6%

Figure 4-10
Shipments of Control Valve Actuators by Type
(Thousands of Units)

	2003	2004	2005	2006	2007	2008	CAGR
Pneumatic	853.3	874.6	903.5	935.1	966.0	991.2	3.0%
Electric	124.0	130.8	140.0	150.8	161.3	171.0	6.6%
Other	4.0	4.1	4.3	4.5	4.6	4.7	3.3%
Total	981.3	1,009.6	1,047.8	1,090.3	1,131.9	1,166.9	3.5%

	2003 Thousands of Units	Percent	2008 Thousands of Units	Percent	CAGR
Pneumatic	853.3	87.0%	991.2	84.9%	3.0%
Electric	124.0	12.6%	171.0	14.7%	6.6%
Other	4.0	0.4%	4.7	0.4%	3.3%
Total	981.3	100.0%	1,166.9	100.0%	3.5%

Figure 4-11
Average Selling Price of Control Valve Actuators by Type
(US Dollars)

	2003	2004	2005	2006	2007	2008	CAGR
Pneumatic	417	416	415	414	413	412	-0.2%
Electric	1,156	1,143	1,130	1,118	1,106	1,094	-1.1%
Other	2,078	2,066	2,053	2,041	2,029	2,017	-0.6%
Total	517	517	517	518	518	518	0.1%

Figure 4-12

Shipments of Control Valve Positioners

(Millions of Dollars)

CAGR = 7.1 Percent

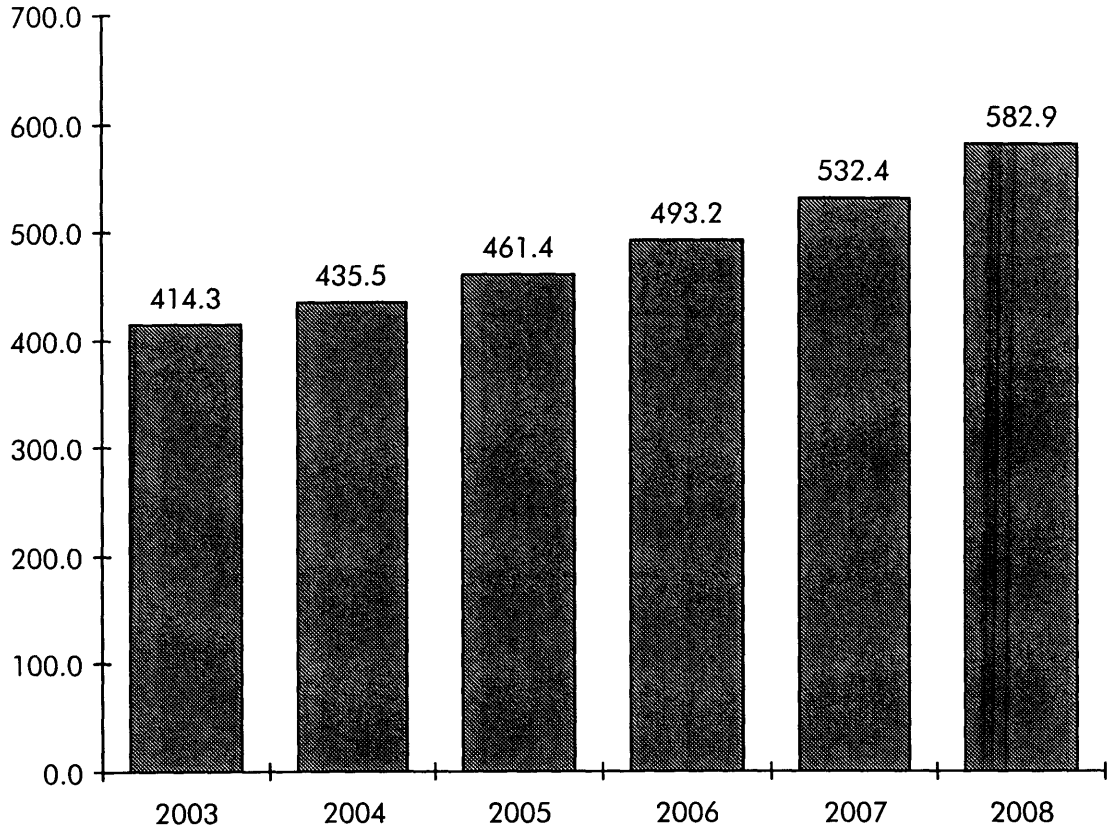


Figure 4-13
Shipments of Control Valve Positioners
(Thousands of Units)

CAGR = 5.1 Percent

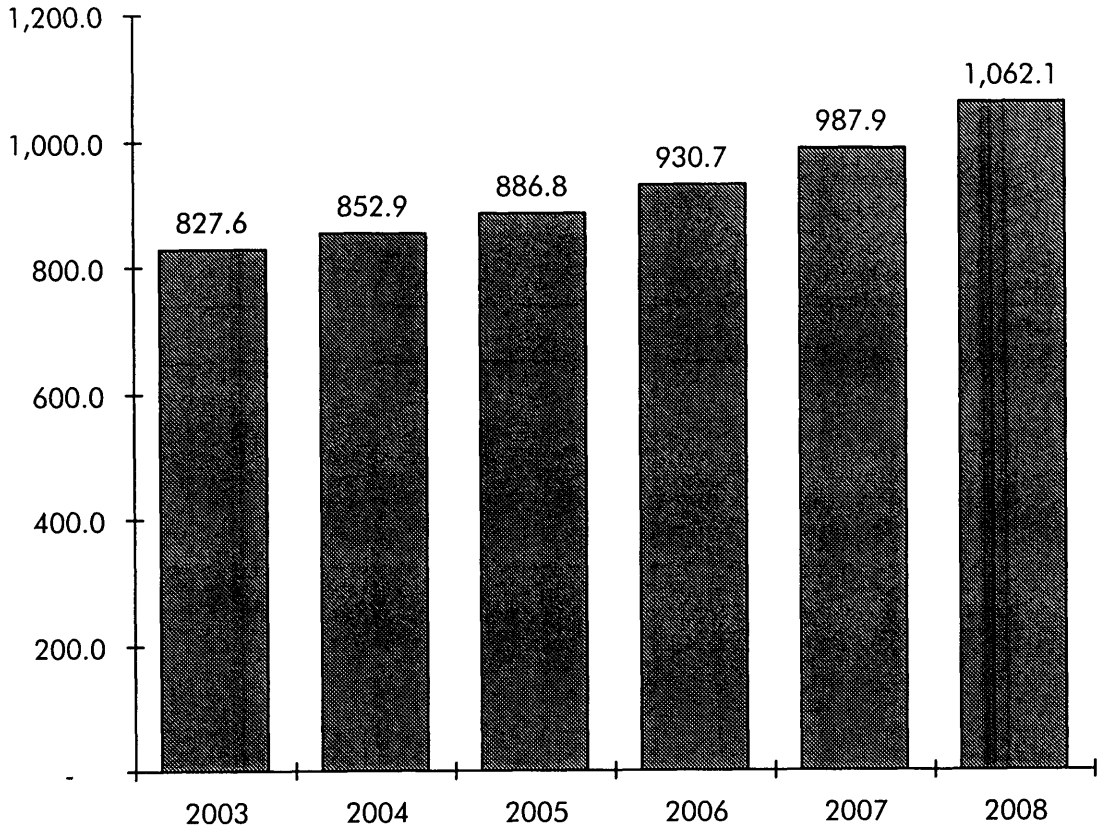


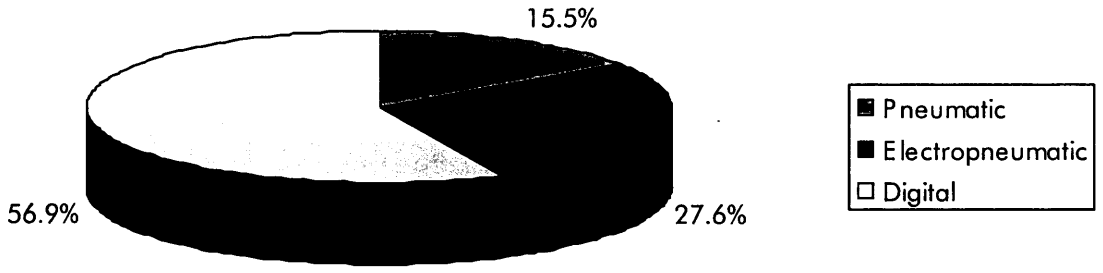
Figure 4-14
Shipments of Control Valve Positioners by Type
(Millions of US Dollars)

	2003	2004	2005	2006	2007	2008	CAGR
Pneumatic	64.2	63.7	63.3	62.8	62.2	61.6	-0.8%
Electro pneumatic	114.4	113.6	112.0	109.1	105.0	99.8	-2.7%
Digital	235.6	258.2	286.1	321.2	365.2	421.4	12.3%
Total	414.3	435.5	461.4	493.2	532.4	582.9	7.1%

	2003 Millions of Dollars	Percent	2008 Millions of Dollars	Percent	CAGR
Pneumatic	64.2	15.5%	61.6	10.6%	-0.8%
Electro pneumatic	114.4	27.6%	99.8	17.1%	-2.7%
Digital	235.6	56.9%	421.4	72.3%	12.3%
Total	414.3	100.0%	582.9	100.0%	7.1%

Figure 4-15
Shipments of Control Valve Positioners by Type
(Millions of Dollars)

2003 = $ 414.3 Million



2008 = $ 582.9 Million

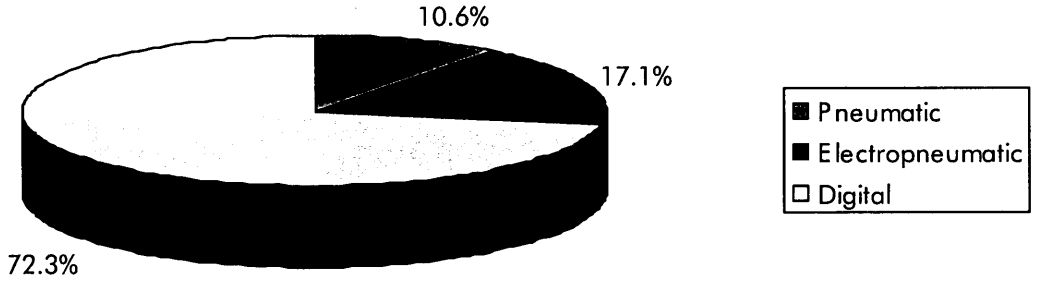


Figure 4-16
Shipments of Control Valve Positioners by Type
(Thousands of Units)

	2003	2004	2005	2006	2007	2008	CAGR
Pneumatic	320.5	319.8	319.1	318.2	316.8	315.2	-0.3%
Electro pneumatic	241.1	240.5	239.9	238.9	237.7	235.5	-0.5%
Digital	266.0	292.6	327.7	373.6	433.4	511.4	14.0%
Total	827.6	852.9	886.8	930.7	987.9	1,062.1	5.1%

	2003 Thousands of Units	Percent	2008 Thousands of Units	Percent	CAGR
Pneumatic	320.5	38.7%	315.2	29.7%	-0.3%
Electro pneumatic	241.1	29.1%	235.5	22.2%	-0.5%
Digital	266.0	32.1%	511.4	48.1%	14.0%
Total	827.6	100.0%	1,062.1	100.0%	5.1%

Figure 4-17
Average Selling Price of Control Valve Positioners by Type
(US Dollars)

	2003	2004	2005	2006	2007	2008	CAGR
Pneumatic	200	199	198	197	196	195	-0.5%
Electro-pneumatic	475	472	467	457	442	424	-2.2%
Digital	886	883	873	860	843	824	-1.4%
Total	501	511	520	530	539	549	1.9%

Figure 4-18
Shipments of Digital Positioners by Communication Protocol
(Millions of US Dollars)

	2003	2004	2005	2006	2007	2008	CAGR
HART	189.4	206.0	223.5	240.8	255.2	260.8	6.6%
Fieldbus	20.3	26.3	36.9	55.3	86.0	137.6	46.7%
Other Digital	26.0	25.9	25.7	25.2	24.0	23.0	-2.4%
Total	235.6	258.2	286.1	321.2	365.2	421.4	12.3%

	2003 Millions of Dollars	Percent	2008 Millions of Dollars	Percent	CAGR
HART	189.4	80.4%	260.8	61.9%	6.6%
Fieldbus	20.3	8.6%	137.6	32.7%	46.7%
Other Digital	26.0	11.0%	23.0	5.5%	-2.4%
Total	235.6	100.0%	421.4	100.0%	12.3%

Figure 4-19
Shipments of Control Valves by Body Type
(Millions of US Dollars)

	2003 Millions of Dollars	Percent	2008 Millions of Dollars	Percent	CAGR
Linear	1,605.8	55.4%	1,534.6	45.5%	-0.9%
Rotary	1,292.7	44.6%	1,838.2	54.5%	7.3%
Total	2,898.5	100.0%	3,372.9	100.0%	3.1%

Figure 4-20
Shipments of Control Valves by Industry
(Millions of US Dollars)

	2003 Millions of Dollars	Percent	2008 Millions of Dollars	Percent	CAGR
Oil & Gas	745.2	25.7%	822.8	24.4%	2.0%
Chemical	719.0	24.8%	845.8	25.1%	3.3%
Pharmaceutical	80.0	2.8%	99.2	2.9%	4.4%
Food & Beverage	90.3	3.1%	144.7	4.3%	9.9%
Pulp & Paper	263.8	9.1%	291.3	8.6%	2.0%
Metals & Mining	95.1	3.3%	106.1	3.1%	2.2%
Electric Power	573.1	19.8%	680.7	20.2%	3.5%
Water & Wastewater	36.2	1.2%	38.2	1.1%	1.1%
Other	295.8	10.2%	344.2	10.2%	3.1%
Total	2,898.5	100.0%	3,372.9	100.0%	3.1%

Figure 4-21
Shipments of Control Valves by Distribution Channel
(Millions of US Dollars)

	2003 Millions of Dollars	Percent	2008 Millions of Dollars	Percent	CAGR
Direct Sales	1,289.3	44.5%	1,458.7	43.2%	2.5%
Independent Reps	1,350.0	46.6%	1,587.9	47.1%	3.3%
Web Sales	27.3	0.9%	59.9	1.8%	17.0%
Distributors	231.9	8.0%	266.3	7.9%	2.8%
Total	2,898.5	100.0%	3,372.9	100.0%	3.1%

Figure 4-22
Shipments of Control Valves by Supplier Type
(Millions of US Dollars)

	2003 Millions of Dollars	Percent	2008 Millions of Dollars	Percent	CAGR
Traditional Suppliers	2,416.5	83.4%	2,738.8	81.2%	2.5%
Third-Party Suppliers	482	16.6%	634.1	18.8%	5.6%
Total	2,898.5	100.0%	3,372.9	100.0%	3.1%

Chapter 5
Supplier Profiles

The following pages provide profiles of the leading suppliers to the Control Valve, Actuator and Positioner (CVAP) market. These profiles analyze the total business of each company as well as the CVAP related portion. Information regarding current model numbers, associated components, communication protocols, and system-level offerings is included. ARC's profiles also include information on served markets and alliances where appropriate. Company annual reports and in-depth discussions with senior company officials are the foundation for these profiles.

ABB

http://www.abb.com

Ownership	Public
Acquisitions	Cellier Engineering, Eutech, Entrelec, Hartmann & Braun, Sensycon
Partnerships	Accenture, Intel, and Microsoft
Key Vertical Industries	Electric Power, Chemical, Oil & Gas, Metals & Mining, Pulp & Paper
Key Product Name(s)	LME, RSD, PME, RHD series actuators TZIM, TZID, TZIDC series positioners
Strengths	Strong global base and wide range of products
Challenges	Repositioning itself as a leading actuator and positioner supplier after divestment of its valve-body business

With a presence in over 100 countries and nearly 120,000 employees, ABB is a leading global supplier to the automation market. Worldwide revenues for the company exceed $18 billion. ABB's product line includes high, medium, and low voltage products, transformers, utility automation and power systems, industrial control, DCS systems and field devices, drives and motors, robots, and turbochargers. The company's short-term goal is to achieve four percent CAGR between 2003 and 2005.

In 2002, ABB reorganized into two groups focused on power and automation technologies. Subgroups within the automation technologies group managed the businesses of industry verticals ABB wanted to focus on besides power, such as automotive and marine. Effective in 2004, ABB announced it would merge the six sub-groups within the automation technologies group into three businesses for market and operational simplicity.

After ABB acquired Elsag Bailey, the big question was how ABB would deal with its different control system platforms. Having so many legacy systems forced ABB to develop an internal migration strategy first. ABB's migration roadmap is firmly rooted in the Industrial^{IT} vision of a common architecture, applications, and control hardware platforms. All recent automation products released by the company fit within its common Industrial^{IT} architecture.

In 2003, ABB formed a new business alliance with Accenture, Intel, and Microsoft for the joint development of plant automation software and hardware solutions. The Industrial IT alliance, announced at the ARC Advisory Group Forum in Orlando, Florida, on "Driving Operational Excellence," focuses on the areas of energy management, materials management, compliance, and asset optimization, and operations maintenance. The alliance aims to develop an industry standard for the rationalization of transactional and real-time manufacturing data through Microsoft .NET and other technologies in conjunction with ABB's expertise in manufacturing automation solutions, Accenture's expertise in consulting, and Intel's pervasive presence in the world of microprocessors.

Control Valves, Actuators, and Positioners

In 2003, ABB divested its control valves and pneumatic actuators business. The company now focuses only on electric actuators, positioners, and I/P converters.

ABB's LME and RSD series linear actuators are available up to 200 kN. PME and RHD series part-turn actuators have operating torque rating between 100 Nm and 16000 Nm. All of ABB's actuators have the option of HART and Profibus communication protocols.

ABB's positioner range comprises of its TZIM series electro pneumatic positioners and TZID & TZIDC series smart positioners. Smart positioners include options for HART, Profibus, and Foundation Fieldbus protocols. TEIP series of I/P converters are available with various housings suitable for cabinet, field, rail or slide-in type installation.

AUMA

http://www.auma.com

Ownership	Private
Acquisitions	Siemens' valve actuator business (SIPOS, AKTORIK)
Partnerships	None reported recently
Key Vertical Industries	Water & Waste, Electric Power, Oil & Gas
Key Product Name(s)	SA, SAR, AS, ASR, LE electric actuators AUMA MATIC, VARIOMATIC, AUMATIC & SIMA actuator controls
Strengths	Full range of electric actuators, actuator controls, and valve gearboxes
Challenges	Maintain leadership position and technological edge in the actuator market

AUMA has emerged as one of the leading manufacturers of electric actuators worldwide. Electric actuators and associated equipment, such as gearboxes, is the company's sole business. AUMA manufactures all of its valve actuators in two plants in Germany. AUMA also has subsidiaries located throughout Europe, North America, and Asia. European subsidiaries are located in Austria, England, Finland, France, Italy, and the Netherlands. Additionally, AUMA has a network of representatives throughout the world.

Following its takeover of the valve actuator business of Siemens in 1999, AUMA established a sales office in Russia and entered into a partnership with a representative in Japan to expand AUMA's presence in Russia and Japan.

Europe remains the major market for AUMA geographically, although it has been successful in Asia, as well. Key end user industries for the company are water & waste and power generation. Other markets include the chemical/petrochemical and petroleum industries.

Control Valves, Actuators, and Positioners

AUMA's product range comprises electric actuators, actuator controls and valve gearboxes. Multi-turn, part-turn and linear actuators form Auma's electric actuator range. AUMA's SA and SAR series multi-turn actuators are for on-off and modulating duty applications. AS, ASR and SG series comprises the part-turn actuator range. SA/LE and ALS series linear actuators find use automating globe valves.

AUMA-MATIC, VARIOMATIC, AUMATIC and SIMA series form AUMA's actuator controls range. AUMA-MATIC has built-in actuator controls that integrate to a higher process level or to a standard field bus system such as Profibus or Interbus-S. This model can retrofit into actuators without integral controls. VARIOMATIC actuator controls are for actuators with electronically commutated motors with speed adjustment. They may be either directly mounted or separately mounted from the actuator.

AUMATIC actuator controls are modular systems consisting of function modules, communication interfaces, and equipment elements for valve automation, which can be set up without opening the actuator and control housing. These controls help in diagnostics and fault corrections. SIMA is a master station that integrates electric actuators to control systems. All these actuator controls are equipped with standard fieldbus interfaces, primarily Profibus, Interbus-S, and Modbus.

CCI

http://www.ccivalve.com

Ownership	IMI Group
Acquisitions	Sulzer (Thermtec division); BTG Valves; STI; Fluid Kinetics
Partnerships	Nihon Koso, Japan
Key Vertical Industries	Electric Power, Oil & Gas, and Pulp & Paper
Key Product Name(s)	DRAG
Strengths	Severe service valve solutions in fossil fuel, nuclear, oil and gas industries
Challenges	Primarily a niche market player

CCI is a leading provider of severe-service control valves for high pressure and high temperature applications. Since its inception, CCI has focused on severe service applications involving high pressures and high temperatures. The company designed, built and patented the right angle tortuous flow path of the CCI DRAG valve trim in 1967. Since then, CCI has consistently expanded its market presence for severe service applications by acquiring Thermtec division of the Sulzer Company in 1997, and more recently, Sweden-based BTG Valves in 2001.

CCI's reputation of solving severe service valve problems with special engineering and advanced technology is a good compliment for Sulzer's worldwide reputation for turbine bypass systems and nuclear safety valves. The acquisition of BTG is a continuation of the company's strategy to expand its business, while continuing to focus on severe service valve applications. It not only enhances CCI's severe service valve offerings, but also widens the company's global reach. CCI's severe-service control valves and hydraulic and pneumatic actuators find use in coal, oil, gas, and nuclear power plants, hydrocarbon industries; and pulp and paper plants worldwide.

Control Valves, Actuators, and Positioners

CCI's control valve solutions are industry and application-specific. For fossil fuel based power plants, CCI provides control valves for turbine bypass,

feed water control, attemperator spray-water control, deaerator level control and steam conditioning applications. For nuclear power plants, CCI provides control valves for feed water control, chemical injection and temperature, pressure and level control applications. For Combined Heat and Power (CHP) plants, CCI provides control valves for main and booster feed pump recirculation, feed water control, deaerator level control, soot blower control, turbine bypass and steam conditioning applications. For the oil & gas industry, CCI provides control valves for water and gas injection, wellhead pressure control and methanol injection applications. Additionally, for general applications CCI provides gate, globe, and check valves; single seated, three way and cage guided valves.

CCI's actuator range comprises of pneumatic and hydraulic actuators. The standard CCI actuator is a double acting, piston type actuator. CCI actuators are available with or without manual override and springs. CCI is also capable of providing manual, electro-mechanical, and electro-hydraulic actuators. In addition to valves and actuators, CCI provides its QUICKTRAK smart positioner / electronic valve controller.

Dresser

http://www.flowcontrol.dresser.com

Ownership	First Reserve, Odyssey Investment Partners, and Dresser's management
Acquisitions	Elliott, Entech
Partnerships	Yokogawa
Key Vertical Industries	Electric Power, Petrochemical, Oil & Gas
Key Product Name(s)	Masoneilan and Becker brands
Strengths	Single source supplier of all valve products
Challenges	Internal reorganization to improve customer focus and streamlining manufacturing operations

Dresser is a leading manufacturer of highly engineered equipment in the flow control, measurement, and power systems segments of the energy industry. In early 2003, Dresser consolidated all its flow control businesses by forming a new business unit, Dresser Flow Solutions. Dresser Flow Solutions offers a broad portfolio of flow control solutions in natural gas and power segments of the energy industry. This business unit is also responsible for management of their customers' flow control supply chain. Dresser Flow Solutions has various companies under its fold. Entech manufactures check valves whereas Consolidated manufactures safety & relief valves. Grove, Control Seal, International Valves, Ledeen, LVF Forged Steel Valves, Ring-o Valve, Texsteam, Tom Wheatley and TK Valve all manufacture on/off valves.

Dresser is engaged in a customer-focused alliance with Yokogawa to develop and market Foundation Fieldbus products, integrated systems and management tools to improve process availability. The alliance focuses on providing process industry customers with reduced enterprise-wide costs, compressed project schedules, and minimized technology implementation risks. The core of the alliance between the two companies is the establishment of a Foundation Fieldbus digital valve positioner well integrated with Yokogawa's PAS.

Control Valves, Actuators, and Positioners

With over 100 years of experience in designing flow control devices, Dresser Flow Control offers a broad portfolio of products including ball valves, gate valves, control valves, actuators, pressure relief valves, and field instrumentation. To complement its product lines, Dresser also has established a global network of repair and service centers. It runs several flow control companies including Entech, Consolidated, Grove, Control Seal, International Valves, Ledeen, LVF Forged Steel Valves, Ring-o Valve, Texsteam, Tom Wheatley, TK Valve, and Becker Precision Equipment.

Masoneilan is the leading brand in Dresser's CVAP portfolio. Masoneilan specializes in reciprocating, rotary, and severe service control valves and field instrumentation designed to handle a wide variety of process applications. Major product brands for Masoneilan include Camflex and Varimax eccentric plug rotary valves, and the SVI digital valve positioner.

Masoneilan's actuator products are typically pneumatic models. Masoneilan's pneumatic actuator range includes Type 37/38 and 87/88 spring diaphragm actuators, Type 71 Domotor positioning piston actuators, and the 30A 84/85/86 series piston-cylinder actuators.

Masoneilan's positioner product range comprises of its 4700P/4700E conventional pneumatic positioners, its 8012/8013 electro pneumatic positioners, its SVI II digital valve positioners, and its FVP Fieldbus valve positioner. Models 7000 and 8007/8008 are I/P transducers.

Emerson Process Management

http://www.emersonprocess.com/fisher

Ownership	Public
Acquisitions	Kenonic Controls, PC&E, Orion, CEM, New England Electrical Testing Engineers
Partnerships	MRO software
Key Vertical Industries	Chemicals, Pharmaceuticals, Oil & Gas, Power
Key Product Name(s)	Easy-e, FloVue, e-plug, e-disc, DVC 500f, DVC 6000
Strengths	Diversification, brand recognition, financial position, strong representative network
Challenges	To hold on to its leadership position and maintain its technological edge Expanding presence in China

Emerson is the world leader in control valves, actuators, and positioners to the process industries. The Company has been able to maintain its leading market position, in large part, by successfully keeping abreast of developing trends in the process control market.

Among several leading products aimed at process control applications from Emerson's stable is its PlantWeb process control system. PlantWeb integrates with intelligent field devices and valves and successfully leverages asset management solutions including performance monitoring and optimization. To strengthen its offerings, Emerson acquired MDC Technologies in December 2000 to provide comprehensive solutions that go beyond process control. By integrating them with Emerson's PlantWeb field-based architecture, intelligent field-device diagnostics, asset management tools, and scalable systems technology, customers get a better picture of information about what is actually happening on the plant floor.

Emerson's alliance with MRO Software offers customers new opportunities to lower their operating and maintenance costs, improve process uptime, and increase asset utilization by linking Emerson's PlantWeb field-based architecture with MRO Software's MAXIMO work management software.

Control Valves, Actuators, and Positioners

Fisher Controls division of Emerson manufactures rotary valves & actuators, sliding stem valves & actuators, positioners, accessories, field mounted instruments, severe-service valves, steam conditioning valves, and LPG regulators. Fisher Rosemount's Baumann and CON-TEK subsidiaries, as well as a large range of niche and specialty valves for various industry applications further augment Fisher Controls' products. In addition to Fisher Controls, Emerson has subsidiaries including Bettis, Hytork, and El-O-Matic.

Emerson's rotary valves range comprises segmented ball, eccentric plug, full-bore ball, butterfly and special constructions type. The company's sliding stem valves are of two-way & three-way globe types suited for universal purposes. Specially designed valves are for chemicals and high-pressure applications.

Emerson's positioner range comprises pneumatic, electropneumatic, and digital models. FIELDVUE Digital Valve Controllers support Foundation Fieldbus and HART protocols. Valve accessories include electropneumatic transducers, position transmitters, and volume boosters.

The H.D. Baumann Company in Portsmouth, New Hampshire, specializes in small valves for niche applications. Baumann valves are most suitable for skid mounting and are well suited for HVAC, semiconductor, food, pharmaceutical, and fine chemicals applications.

Fisher's severe service valves find application in oil & gas transmission, hydrocarbon refining and combined cycle, fossil fuel and nuclear power plants. Steam conditioning valves are for turbine bypass applications.

Emerson's "Valve Automation Division" of consists of Bettis actuators and controls, El-O-Matic International, FieldQ, Hytork International, Shafer valve operating systems and Dantorque. This division provides pneumatic, hydraulic, electric and gas-hydraulic valve automation products and services.

Flowserve

http://www.flowserve.com

Ownership	Public
Acquisitions	Invensys Flow Control; Invatech
Partnerships	Honeywell
Key Vertical Industries	Electric Power, Chemicals, Oil & Gas
Key Product Name(s)	Mark One, Trooper, Guardian II globe valves, Valdisk & Valdisk II
Strengths	Worldwide presence, single source valve supplier
Challenges	Dependence on cyclical chemicals market

Flowserve is one of the world's leading providers of industrial flow management equipment and services. The company operates through three divisions: the Pump Division, the Flow Control Division, and the Flow Solutions Divisions. The Pump Division manufactures industrial, engineered and special purpose pumps and systems. The Flow Control Division manufactures control valves, quarter-turn valves, actuators and valve automation systems. The Flow Solutions Division manufactures mechanical seals and engineered fluid sealing systems.

Flowserve's long-term growth strategy is to expand its customer base, broaden its product offerings, and enter new markets or capture operating synergies. Flowserve acquired Innovative Valve Technologies (Invatec) in 2000 and Invensys Flow Control in 2002, which broadened the company's product range. New Flowserve brand names attributable to the acquisition of the former Invensys Flow Control include Gestra, McCanna, NAF/Naval, Schmidt Armaturen, Worcester Controls, Argus/Rotadisk, Edward Vogt, Limitorque, Eckardt, and PMV. Apart from the above brands, Flowserve has various other brands in its valve portfolio including Durco, Atomac for quarter-turn valves and Anchor/Darling, Durabla, Metrex, Contromatics, and Automax for nuclear power applications.

Control Valves, Actuators, and Positioners

Valtek is the leading brand, which, along with Kammer, Sereg, Worcester Controls, Limitorque and PMV, forms Flowserve's CVAP portfolio. Valtek's control valve range comprises Mark-One, Trooper, Guardian II globe valves, Valdisk & Valdisk II rotary valves, Maxflo rotary plug valves, and Shear Stream ball valves. Valtek's Logix series digital valve positioners comprise various models capable of operating with loop-powered power supply, with local PID control, and with HART and Foundation Fieldbus protocols.

Kammer control valves are for niche applications in tough process conditions with low & micro flow trims and metal bellows for zero fugitive emissions. Kammer valves are available in split, globe, cryogenic, angle and plastic body styles.

Sereg control valves include eccentric plug, cryogenic and globe style valves with pneumatic diaphragm and piston actuators. Sereg's rotary eccentric plug valve is available for applications requiring ANSI Class IV shutoff with metal seats and Class VI shutoff with soft seats.

Worcester Controls specializes in industrial ball valves and pneumatic & electric actuators. These valves are well suited for applications in industries such as pharmaceuticals, petrochemicals, and food & beverage with line sizes ranging from one-half to four inches in diameter.

Limitorque is a leading player in the in the electric actuator segment of the valve business. The company's focus is on valve control applications in the power, petrochemical and water & waste industries. Traditional valve actuation and modern field network automation of valve controls comprise the company's technological foundation.

PMV manufactures pneumatic, electropneumatic, and digital positioners for quarter turn as well as linear valves. PMV positioners are compatible with a vast majority of valve/actuator packages. PMV's product line includes single acting, double acting, pneumatic, electropneumatic, fail safe, anti-vibration, explosion proof, intrinsically safe, and digital models. Special housings, such as stainless steel or Tufram coatings, are also available.

Metso Automation

http://www.metsoautomation.com

Ownership	Metso Corporation
Acquisitions	Stonel, Teledyne Brown, MAX Control Systems, Valvcon Corporation, Pulpexpert Oy, CompuSystems
Partnerships	Arca Regler GmbH, Germany
Key Vertical Industries	Pulp & Paper, Chemical, Minerals, Power, Oil & Gas
Key Product Name(s)	Neles, Jamsebury and Valvcon brands
Strengths	Strong presence in global pulp & paper industry
Challenges	Dependence on rotary valves and the cyclical pulp & paper industry

Metso Automation is a leading global supplier of automation and control systems to the pulp & paper industry. Together, with group companies such as Metso Paper and Metso Minerals, Metso offers comprehensive production and service solutions for paper, rock, and mineral processing applications.

Metso Automation specializes in process automation systems and field systems. The Process Automation Systems business unit supplies automation systems, information management networks & systems and lifecycle services. The Field Systems business unit provides flow control solutions, automated and manual control valves, pulp & wet end analyzers and specialty sensors.

Metso Automation has a good mix of control systems and field systems in its portfolio of offerings. In its quest to migrate from a traditional product supplier to a process solution supplier, the company embarked on a number of new company launches, acquisitions, and strategic alliances in recent years to expand its global reach, product areas, and industry expertise. Despite these efforts, the company has struggled in recent years along with its core market, the pulp & paper industry.

Control Valves, Actuators, and Positioners

Metso Automation's valve product range consists mainly of rotary solutions, which are one of the most comprehensive in the industry. Metso' valve products include ball valves, butterfly valves, segment valves, and linear globe valves, as well as actuators and valve-related accessories. The company's rotary valves include eccentric rotary control valves for improved accuracy and controllability, segment ball valves with high rangeability and linear installed characteristics, full ball for maximum capacity, and high performance butterfly valves for large pipelines up to 60 inches.

Neles, Jamsebury and Valvcon are the leading brands in the company's valve offerings. Neles' product range comprises flanged ball valves, rotary plug control valves, butterfly valves, SIS (Safety Instrumented System) solutions, remote monitoring systems, software, positioners and accessories.

Ball, plug and butterfly valves manufactured by Metso Automation are for general, special and high performance applications. The company's actuator range comprises piston operated pneumatic/hydraulic actuators and double diaphragm rotary types.

Metso Automation's positioner range comprises NP 700 pneumatic and NE 700 electro pneumatic types. ND 800 is digital valve positioner available with Foundation Fieldbus and Profibus protocols options. ND 9000 is an intelligent valve controller.

Metso Automation's SIS solutions contain quick opening, quarter-turn ball and butterfly valves for Emergency Shut-Down (ESD) applications. Neles ValvGuard VG 800 testing and monitoring system is a safety management system that helps ensure ESD valves will operate properly despite long periods of idle service. ValveGuard allows operators to test valve performance online without disturbing the process.

FieldSense is an intelligent solution for field system life cycle management. FieldCare is an FDT-based software program for operation and monitoring of intelligent field devices.

Motoyama Engineering

http://www.motoyama-cp.co.jp/e-motoyama_hyousi.htm

Ownership	Public
Acquisitions	
Partnerships	
Key Vertical Industries	Chemical, Petrochemical, Oil & Gas, Pulp & Paper
Key Product Name(s)	3306 L/M, 3802, 3803, 3804, 3805, 3883, 3889 linear control valves 2992 & 3993 rotary control valves
Strengths	Strong presence in the Japanese control valve market, especially the Japanese chemical market
Challenges	Dependency on ailing Japanese market and cyclical chemical industry Need for digital valve positioner range

Motoyama is a leading supplier of globe-type control valves, butterfly valves, eccentric rotating plug valves, ultra clean valves, safety & relief valves, and steam traps in Japan. The company manufactures safety relief valves under a licensing agreement with US-based Crosby Valve.

Motoyama derives most of it revenues from the Japanese chemicals and semiconductors market. The company is also active in Asia-Pacific through a network of overseas representatives in countries such as Korea, Taiwan, Thailand, Malaysia, Singapore, and Indonesia. Direct Sales make up the bulk of control valve sales for the company.

Control Valves, Actuators, and Positioners

Although globe valves represent the majority of control valves sales for Motoyama, the company is also engaged in the manufacture of angle, butterfly, and anti-corrosive valves. Motoyama's globe-type control valves are particularly well suited for high viscosity, high differential pressure slurries and liquids. The Model 3802 series valves serve as general-purpose angle valves for use under various fluid conditions such as high temperature, high pressure, high differential pressure, extremely low temperature, and low noise in various industries such as power, chemical, and water process plants.

Motoyama's range of dust-free control valves find application in gas processing, semiconductor manufacturing and other production lines where cleanliness is essential. UCV (Ultra Clean Valves) series comprises their range of clean control valves.

Nakakita Seisakusho

http://www.nakakita-s.co.jp/

Ownership	Public
Acquisitions	
Partnerships	
Key Vertical Industries	Marine and Electric Power
Key Product Name(s)	Control valves, regulating valves, solenoid valves, safety valves, and butterfly valves
Strengths	Strong presence in Japan and global marine industry
Challenges	Dependency on ailing Japanese market and cyclical chemical industry Lack of digital valve positioner offering

The business focus of Nakakita Seisakusho is on valves and control systems. Designated as one of Japan's Navy authorized companies in 1942 to produce valves for military transport ships, the company has since continued to focus on marine business drawing more than one-half of its control valve revenues. Besides marine market, electric power, petrochemical and metals & mining industries are other areas of key focus for Nakakita Seisakusho. The company has been manufacturing control valves at its factory in Daito-city, Osaka since May 1970.

Though Nakakita's main market continues to be Japan, the company is actively expanding into overseas markets. The majority of sales for Nakakita go through the company's direct sales force but its distributor channel is gaining importance as the company attempts to increase its export sales.

Control Valves, Actuators, and Positioners

Nakakita Seisakusho manufactures control valves, regulating valves, solenoid valves, safety valves, and butterfly valves. The company offers valves for use in a wide range of applications including high pressure, high temperature applications, cryogenic service, nuclear applications, and pressure and temperature control of super-heated steam.

Nakakita's special purpose control valves cater to high pressure, high temperature, cryogenic service, nuclear, and steam conditioning applications. The company's pneumatic actuators comprise diaphragm and piston-cylinder types; however, hydraulic and electric actuators are available.

Nihon Koso

http://www.koso.co.jp/e/index.html

Ownership	Private
Acquisitions	Tokyo Okazaki Industries Co.
Partnerships	Control Components Incorporated (CCI)
Key Vertical Industries	Chemical, Metals & Mining, and Pulp & Paper
Key Product Name(s)	200, 400, 500, 600, 700 series
Strengths	Strong presence in Japan's pulp & paper, and metals & mining industries
Challenges	Growth outside the Japanese market Lack of digital valve positioner offering

Nihon Koso is a leading supplier of control valves, sensors, chemical pumps, and control systems to the Japanese market. The company manufactures both linear and rotary type control valves. Sensors manufactured by Nihon Koso include pressure transmitters, level, pressure, and temperature switches. Pumps manufactured by the company include chemical pumps made out of fluro-plastic components. The company's control system range comprises dispersion control system, switchgear, event recorders, and control consoles.

In its effort to become a global supplier, Nihon Koso has established a number of sales and technology alliances with companies around the world including Ronan Engineering, Cerberus Pyronics, Powell Process Systems, Powell Electrical Manufacturing, Adalet-PLM, SOR, and Drallim Controls. In the control valve sector, the company has adopted severe-service valve designs of Control Components Incorporated (CCI).

Although Japan remains the company's largest market, Nihon Koso is actively investing in overseas markets. Selling through a business network of service centers in North America, Europe, and the Middle East, exports now account for a significant share of the company's sales. Nihon Koso plans to continue establishing more service centers in locations around the world as it continues its push to expand beyond the Japanese market.

Control Valves, Actuators, and Positioners

Nihon Koso manufactures its Series 500 conventional, linear globe control valves in top-guided and cage-guided versions. Severe-service globe control valves offerings for high temperature and high differential pressure have a patented multi-stage trim.

The company's actuator range comprises electric, pneumatic, and hydraulic types for both linear and rotary control valves. Nihon Koso's electric actuators are of motorized, solid state, and intelligent types. Pneumatic actuators are of multi-spring diaphragm and single & double acting piston cylinder types. Hydraulic actuators are of double acting piston cylinder types.

Nihon Koso's positioner range comprises model PP 800 pneumatic type and model EP 800 electro-pneumatic type. Accessories available from the company include air filter regulators, lock-up valves, and handheld calibrators.

Nuovo Pignone

http://www.gepower.com/nuovopignone/

Ownership	Owned by General Electric
Acquisitions	A-C Compressor, Conmec and PII Group Ltd
Partnerships	None reported recently
Key Vertical Industries	Oil & Gas, Chemical, and Electric Power
Key Product Name(s)	Universalvalve UCH, ULN, UCV, and UPC Series
Strengths	Strong presence in the European oil & gas market
Challenges	Expanding beyond the oil & gas and power industries Need for digital positioner range

GE acquired Nuovo Pignone in 1994 to form the GE Oil & Gas Center of Excellence for project engineering, turbo-machinery, compressors, pumps, valves, metering and fuel distribution equipment, and services. GE Nuovo Pignone is now part of the GE Oil & Gas business-unit of GE Energy.

Nuovo Pignone manufactures a wide range of products for the oil, natural gas, chemical, and power generation industries. Nuovo Pignone's valve portfolio comprises control valves, safety valves and hydraulic valves. The company provides complete turnkey systems, service contracts, machinery and equipment, high-technology performance upgrades, and maintenance services. In association with sister companies Thermodyn, Gemini, and Rotoflow, Nuovo Pignone supplies integrated solutions and services to the oil & gas, petrochemical, and power generation industries.

Control Valves, Actuators, and Positioners

Control valve product offerings from Nuovo Pignone include models for standard, low noise, critical service, turbine bypass and anti surge applications. The company's standard control-valve range, the Universalvalve Series, finds use in applications in the oil & gas and power generation services. Low-noise control valves manufactured by Nuovo Pignone are made with co-axial cylinders and assembled with a sliding piston plug, known as the VECO trim.

The company's critical-service control valves find use in thermal power plants, desalination plants, urea plants, combined cycle plants, and liquefied natural gas plants. The major of applications covered are steam turbine bypass, boiler feed water, boiler pressurizing, heater bypass, super heater, pump re-circulation, de-aerator, condenser control valves, compressor anti-surge, gas to flare, and reactor level.

Nuovo Pignone's turbine-bypass control valves have designs to withstand temperature shocks on the valve body by sudden impact of superheated steam. Anti-surge control valves manufactured by Nuovo Pignone for compressor anti-surge and recirculation loops open within a 0.2 to 1 second range to withstand emergency conditions.

Nuovo Pignone also manufactures pneumatic and electric actuators for use with its control valves for both on/off and modulating applications. In addition, Nuovo Pignone manufactures gas/hydraulic actuated ball valves for use in power industry applications.

Rotork

http://www.rotork.com

Ownership	Public
Acquisitions	Jordan Controls, Deanquip
Partnerships	None reported recently
Key Vertical Industries	Oil and Gas Pipelines, Water and Waste Water
Key Product Name(s)	IQ, IQT, A, M, AQ, Q, SKILMATIC, SP, GP, GH, P,H, RP, RH, R, LP, LH, EH
Strengths	More than 40 years of experience in electric, hydraulic, pneumatic, electro hydraulic actuators and gear boxes
Challenges	Maintain leadership position and technological edge in actuators

Rotork is a leading supplier of heavy-duty electric actuators, fluid power actuators, valve gearboxes, mounting kits and accessories. The company's actuators target valve, sluice gate, and damper applications and use a unique double-sealed enclosure designed to improve reliability in harsh environments. Rotork's actuator product line focuses on medium and large size valves with diameters of 4 inches or larger for use in the oil & gas, power, and water & waste industries.

Rotork Controls maintains a presence in the US through a network of offices and agents, headquartered in Rochester, NY. In addition, Rotork has a Fluid Power production center in Rochester, NY. This center deals exclusively with inquiries for fluid power actuators and systems received from Rotork's network of distributors. The Fluid Power production center is fully equipped to design and fabricate appropriate actuation packages, while providing support for service, spare parts, and maintenance.

Control Valves, Actuators, and Positioners

Rotork's electric actuators range comprises IQ series multi-turn actuators, IQT series quarter-turn actuators, and 'M' series multi-turn modulating actuators. The company's SKILMATIC series linear and quarter turn actuators find use in both modulating and on/off control. SKILMATIC ac-

tuators find use in both adjustable slow opening and quick closure ESD applications.

Rotork's fluid power actuator range comprises scotch yoke, rack & pinion, and linear actuators in either pneumatic or hydraulic range. The company provides rotary or quarter turn movement for either on/off or modulating duty.

Scotch yoke actuators manufactured by Rotork include the SP series for low torque applications and the GP, GH, P, and H series for high torque applications. Rotork's rack and pinion actuator range, mainly used for constant torque requirements, is available in three main types - the RP, RH and R series. Linear actuators offered by Rotork include its LP Series (pneumatic) and LH Series (hydraulic) suitable for both globe and wedge gate valves.

Rotork has designed special gas-driven actuators for the gas pipeline industry where the motive force for the actuator is the pipeline gas itself. Actuators for special applications include fast-acting, fire-resistant and custom-built actuators for the nuclear industry.

Samson

http://www.samson.de/enindex.htm

Ownership	Private
Acquisitions	VETEC, Pfeiffer, STARLINE, Air Torque
Partnerships	Endress+Hauser (E+H)
Key Vertical Industries	Chemical, Food & Beverage, Oil & Gas, HVAC and Electric Power
Key Product Name(s)	Series 240, 250, 280, V2001
Strengths	Chemical, Pharmaceutical and Food Industries
Challenges	Growth outside European market

Samson is one of the largest privately held control valve suppliers in the world. As a leading player in instrumentation & controls, heating and air conditioning, Samson focuses on flow control technologies in gases, liquids and chemicals. Samson's product line comprises control valves for process engineering and building automation, auxiliary equipment & systems; self operated regulators and controllers & automation systems.

Although roughly two-thirds of Samson's control valve business still comes from customers in Europe, the company has been successful in expanding its presence in other markets, most notably Asia. Samson's control valve business in Asia has experienced strong growth over the past two years, and now represents more than 15 percent of the company's worldwide control valve revenues. The company does, however, continue to struggle in its efforts to become a top-tier control valve supplier to the North American market.

Control Valves, Actuators, and Positioners

Samson's control valve product offering includes a wide range of globe valves, lined valves, and butterfly valves. Samson's control valves products up to PN 40 (ANSI class 300) comprise of globe, three-way, and angle control valves. Rotary control valves in this range comprise lined butterfly valves, segmented ball valves, VETEC rotary plug valves, Pfeiffer stainless steel, PTFE, and PFA lined ball valves.

Samson control valves up to PN 400 (ANSI class 2500) comprise of series 250 globe, three-way, and angle control valves and series 280 steam-conditioning valves. Samson's angle valves have split body and ceramic valve trim designs.

In addition to its strength in control valves, Samson is a leading supplier of valve positioners. The company's current strength in this segment lies in electropneumatic positioners; however, the company does offer pneumatic and digital valve positioners as well. Digital valve positioners available from Samson have HART, Foundation Fieldbus, and Profibus communication protocols options. Samson's actuator range includes pneumatic, electric, and electro-hydraulic actuators.

Siemens

http://www.siemens.com

Ownership	Public
Acquisitions	Moore Products, Turbowerke, Milltronics, Flow Division of Danfoss
Partnerships	None reported recently
Key Vertical Industries	Chemical, metals & mining, oil & gas, food, pharmaceutical
Key Product Name(s)	SIPART PS2
Strengths	Full range of automation and control solutions
Challenges	Maintain leadership position and technological edge in positioners

Siemens is a major global automation supplier with annual revenues in excess of $87 billion. Major markets for the company include information and communication, automation and control, power, transportation, medical equipment, lighting, financing and real estate.

Siemens has integrated the activities of Applied Automation, Altoptronic, Milltronics, Turbowerk and the recent acquisition of Flow Division of Danfoss into its Process Instrumentation and Analytics Division to create a significantly broad product portfolio. In order to focus on intelligent field devices, Siemens sold off its valve actuator business to AUMA, Germany in 1999. This sell-off included a line of valve actuators including the SIPOS line of electric actuators.

Siemens' strategy is to grow through acquisitions. In 2000, they acquired Moore Process Automation Solutions. Since then, Siemens has focused its attention on intelligent field devices such as their digital valve positioners and Moore's valve controllers. The acquisition of Moore strengthened Siemens' overall process business, particularly in North America. This enabled the company to use Moore's distribution channels for their own field device products, including pressure transmitters and flow meters, to achieve greater market penetration in North America.

Control Valves, Actuators, and Positioners

Siemens SIPART PS2 valve positioners find use on linear and rotary control valves and single & double acting actuators. Built-in LCD and three push buttons enable local operation of this device. SIMATIC PDM software enables remote control and monitoring by a PC or laptop. In addition to its SIPART positioners, Siemens supports Moore Products' 750P, 750E, and 760 positioners.

SPX Valves & Controls

http://www.spxvalves.com

Ownership	Public
Acquisitions	DeZurik, Copes Vulcan, Daniel Valve
Partnerships	None reported recently
Key Vertical Industries	Electric Power, Paper, Chemicals, Oil & Gas, Nuclear, HVAC, and Water & Waste Water
Key Product Name(s)	RCV, VPB, PPE, BHP, BRS, BAW series (DeZurik), SD Series (Copes Vulcan), DanFlo series (Daniel Valve)
Strengths	Strong brands of general-purpose and severe-service valve products
Challenges	More penetration outside North American market

SPX Valves & Controls is a leading manufacturer of control valves and related equipment. The company came about in 2001 when United Dominion Industries merged with the valve business of SPX. Major markets served by SPX Valves & Controls include the electric power, oil & gas, pulp & paper, and water & wastewater management industries.

SPX Valves & Controls manages the CVAP business within the Flow Technology group. The Flow Technology group's control valve offerings consist of the valve businesses of United Dominion Industries and SPX. This consolidated division comprises DeZURIK, Copes-Vulcan, CMB Industries (FEBCO, K-FLO and POLYJET), Mueller Steam Specialty, and Daniel Valve, a former division of Emerson.

Control Valves, Actuators, and Positioners

DeZURIK, Copes Vulcan, and Daniel Valve are the main brands of SPX Valves & Control division. DeZURIK manufactures general-service globe, butterfly, knife-gate, ported-gate, eccentric plug, rotary control valves, instrumentation, and other types of valves for critical applications. DeZURIK's actuator range comprises piston-cylinder, rotary-cylinder and spring-diaphragm types. Intelli-Pulse is DeZURIK's digital positioner. In addition to valve products, DeZurik offers a valve diagnostics system for monitoring control valve performance.

Copes Vulcan offers steam conditioning and globe control valves for severe service applications. The SD series is Copes Vulcan's main control valve range for severe duty and critical-service. The main applications for Copes Vulcan's SC valves include any potentially noisy or vibration prone application. The GS series valves are for use in pressure classes below ANSI 600 and in applications that do not require severe duty and critical service. Their RAVEN (Reducing and Attenuating Velocity, Erosion and Noise) trim for control valves provides velocity control to reduce erosion and noise in critical services such as pump re-circulation, feed-water control, and turbine bypass. Copes-Vulcan's range of pneumatic diaphragm and pneumatic piston actuators are for severe duty, including both nuclear and seismic requirements. The company also manufactures electric and electro-hydraulic actuators

The former Emerson Group's, Daniel Valve Company has been providing valve products to the hydrocarbon pipeline, storage and distribution markets for decades. The company's product offerings include slab and expanding through-conduit gate valves, axial and rotary control valves, piston, swing and wafer check valves. Among its control valves, DanFlo-Axial Surge Relief Control Valves, DanFlo-Axial Pilot Operated Control Valves, and Balltrol- Quarter Turn Control Valves are prominent.

Tyco Flow Control

http://www.tycoflow.com

Ownership	Public
Acquisitions	Flow Control Technologies, Crosby Valve, KTM Valves and SAPAG
Partnerships	None reported recently
Key Vertical Industries	Chemical, Oil & Gas
Key Product Name(s)	Keystone, Biffi, Morin brands
Strengths	Single source flow control solutions from 60 brands
Challenges	Consolidation of CVAP portfolio and establishing synergy between various valve companies

Tyco International is a $35 billion diversified manufacturing & service conglomerate. Tyco has four business units Tyco Flow Control, Tyco Electrical & Metal Products, Tyco Fire & Building Products and Tyco Infrastructure Services. Tyco's key industrial market applications are in the oil & gas, chemical, power generation, petrochemical, waterworks, pulp & paper, pharmaceutical, and food & beverage industries.

Tyco Flow Control supplies industrial valves, actuation and controls, heat tracing products, and thermal control systems. Major brands within Tyco Valves & Controls include Keystone, Hindle, Vanessa, Raimondi, Valvtron, Winn, Fasani, Neotecha, Biffi, and Morin. Tyco's breadth of products and services helps the company solve a majority of flow control needs.

Prior to the Securities and Exchange Commission's (SEC) investigation into possible accounting abuse, Tyco was in acquisition mode. Tyco Flow Control acquired 36 companies in 1999, another 42 companies in 2000 and continued its acquisition spree in 2001. Crosby Valve and SAPAG are some of the most important acquisitions for the Tyco Flow Control division. With the acquisition of KTM Group of Japan, and Flow Control Technologies of France, Tyco expanded its ball valve product line and significantly increased its presence in the Japanese market. Since the SEC investigation, Tyco has reduced its acquisition activities considerably.

Control Valves, Actuators, and Positioners

Tyco Valves and Controls manufactures ball, butterfly, check, gate, globe, hygienic and knife gate valves. Tyco typically provides valves for use in the chemical, mechanical, and marine markets and high performance butterfly valves and lined valves for use in harsh environments.

The company's actuator range comprises pneumatic actuators of rack & pinion, scotch yoke, and single & double acting types. Electric actuators are of heavy duty and quarter/multi turn types. Hydraulic actuators are of double acting types.

Tyco's acquisition of Keystone Valves in 1997 helped the company become a larger worldwide player in the valve market and expand its product line. The Keystone brand focuses on small pneumatic and electric actuators, while the Biffi brand concentrates on the more traditional 3-phase, extended torque, electric actuator. The Morin brand deals in various types of general-purpose actuators.

Yamatake

http://www.yamatake.com/

Ownership	Public
Acquisitions	Cornerstone Division of Hunter Valve Co. Inc.
Partnerships	CEA-Leti
Key Vertical Industries	Chemical & Petrochemical, Oil & Gas, Food & Beverage
Key Product Name(s)	AGVB, AGVM, ADVB, ADVM, HAF, HAH, VFR, VBL,
Strengths	Strong Japanese brand , Product innovation and strong presence in the global oil & gas market
Challenges	Improving its market share in other regions by further penetration of foreign markets outside of Japan

Japan-based Yamatake is involved in providing solutions for process automation, building automation and factory automation. The company is a co-founder of the Fieldbus Foundation and actively contributes to the development of communication protocols. A pioneer in developing new technologies, Yamatake's wide range of industrial products include control systems, control valves and positioners, electromagnetic flow meters, and pressure and temperature transmitters.

In April 2003, Yamatake Corporation merged its subsidiaries Yamatake Building Systems and Yamatake Industrial Systems into two profit centers, one focused on building automation and the other on advanced industrial automation. The newly created profit centers are responsible for all aspects of its designated business, such as, development, manufacture, sales, service, and maintenance.

Yamatake is continuing to expand geographically, despite the challenging global business climate. The company established Yamatake Europe N.V. in Belgium to address the needs of the European natural gas industry. Similarly, the establishment of joint venture companies, SICAL Yamatake Limited, and Yamatake China Limited address the Indian and Chinese markets respectively.

Control Valves, Actuators, and Positioners

Yamatake has more than six decades of experience in valve manufacturing. The company pioneered microprocessor-based valve positioners and later developed one of the market's first field bus valve positioners with diagnostic capabilities.

With one of Asia-Pacific's largest valve manufacturing facilities in Shonan, near Tokyo, Yamatake is in a position to provide a broad range of control valves. The company offers a large number of valve configurations from small to large bore, vacuum to ultrahigh pressure, low to high temperature, ultra clean to rocket-service control valve models.

Yamatake's CVAP product portfolio comprises single seated valves, cage-type and double seated valves, angle type valves, eccentric rotary, butterfly and three-way valves, special purpose valves, motorized valves, pneumatic actuators, positioners and accessories. Yamatake's Smart Valve Positioner AVP 300 series is for valve integral mounting whereas AVP 200 series is for remote mounting. Both versions are available with HART and Foundation Fieldbus protocol options.

Yokogawa

http://www.yokogawa.com/

Ownership	Public
Acquisitions	Ando Electric Co., Ltd.
Partnerships	Dresser, IVT Corporation
Key Vertical Industries	Chemical & Petrochemical, Oil & Gas
Key Product Name(s)	VP200, YVP100
Strengths	Leading player in Japan market
Challenges	Improving market share in other regions

Yokogawa maintains one of the most diversified product portfolios in the process measurement and control business worldwide. The bulk of Yokogawa's automation business consists of process automation systems (PAS) and related services. Yokogawa is also one of the world's leading suppliers of process field instrumentation, such as pressure transmitters, temperature transmitters, and flowmeters. Other major segments of Yokogawa's business include recorders, test and measurement equipment, components, and aviation electronics.

Yokogawa set up four centers in the US, Japan, Europe, and Asia to provide increased support and services. Through these centers, Yokogawa provides system integration, design, implementation, installation, and maintenance services.

To meet the requirements of global customers, Yokogawa has 13 production facilities in nine countries - US, the Netherlands, Germany, Singapore, Indonesia, China, Korea, India, and Brazil. Some of these plants address the global market while others are provide specific products to the local market. Yokogawa is constructing a new production facility at Suzhou in China. As one of the global production centers, it will enhance its global cost competitiveness.

Control Valves, Actuators, and Positioners

Yokogawa manufactures only valve positioners and I/P converters. The company has more than four decades of experience in this product line. Yokogawa's Model VP200 is an electropneumatic positioner for conventional valves. The company's Model YVP 110 is a digital positioner with Foundation Fieldbus protocol. ValveNavi (YVP20S) is a software package for calibrating and tuning the company's YVP 110 digital positioner. The Model PK200 is an I/P converter.

Appendix A: Methodology

Over the past decade, ARC Advisory Group has become the leader in providing in-depth and accurate market intelligence for the industrial automation marketplace. From the beginning, our corporate goal has been total client satisfaction. We have continuously strived to refine and improve our vision of future plant automation systems. To meet the growing need for global market intelligence, we have recently expanded our services to cover the international marketplace.

ARC's research database is based on thousands of user surveys, telephone interviews, plant visits, and in-depth profiles of hundreds of suppliers and users. Our extensive network of industry contacts has been an invaluable asset in filtering out long-term trends from fads. Our consultants are skilled in analyzing and forecasting the impact of new technology and products on plant automation systems. We systematically study each market segment before developing specific recommendations for our clients.

ARC consultants follow technology and industry events on a daily basis, and have a broad range of expertise in all areas of industrial automation including: sensors, control systems, networks, computers, software and services. We are experienced in working with all types of manufacturing processes including continuous, batch, discrete repetitive and job shop.

Each year, ARC consultants visit all major trade shows in the US and in many foreign countries. In addition, ARC consultants attend press conferences held by most major suppliers and review hundreds of news releases each year. ARC consultants then sort out real and long lasting trends in the marketplace.

ARC uses a five step approach to conduct global market research for the industrial automation marketplace. This approach provides our staff with a solid framework to formulate meaningful strategies for our clients. You can be assured that we gave all areas of the study a considerable amount of time and thought before moving on to the next step. The following contains a brief description of how we conduct each of these five steps.

Step 1: Client Inputs and Secondary Search

ARC started this project by inviting inputs from our primary clients and researching all secondary sources of information. Key secondary sources researched are:

ARC Database

ARC maintains a proprietary database on the industrial automation marketplace. This database provides our staff with a solid base to start their research project. The database includes the following information on several thousand companies:

- Annual Reports
- 10K and other Financial Reports
- Client Lists
- Price Lists
- Published Secondary Data on Companies and Products
- Market Size and Forecast Data
- Market and Technology Trend Data

Literature Search and Review

ARC subscribes to over 100 magazines and newspapers covering a wide range of topics relevant to the industrial automation community, as well as an extensive library of directories and books. We are on the news and product release mailing lists of every key user and supplier in the marketplace today. We sort and file important news and articles for future use. We research and analyze our in-house database and the prominent publications relevant to this study to identify:

- Issues of interest pertaining to the study
- Product and technology trends in the industry
- Changing user needs
- Manufacturer's products and key individuals within the study's scope

Sales and Financial Literature Requests

ARC requests capability brochures, catalogs, data sheets, application notes and price lists from all known or potential manufacturers and suppliers of products pertinent to a study. We also request the following financial reports when needed:

- Annual reports
- 10K statements
- Prospectus and investment analyses

Our studies evolve rather than being forced. This assures you that the results are accurate, up-to-date, and meaningful.

Step 2: Identify Key Issues

After discussions with clients and a careful review of all secondary information, ARC developed a list of key issues concerning both users and suppliers. In terms of elapsed time, ARC spent several weeks discussing issues pertinent to this study with the leading suppliers. We also capitalized on information contained in our previous market research reports and seminars on process control.

Step 3: Gather Primary Data

Supplier Survey and Interviews

First, we conducted a top down analysis of the the leading suppliers' products and various businesses in order to get a better understanding of the global business environment. Then we conducted telephone interviews with key individuals at all major suppliers. Where possible or necessary, we interviewed more than one person at each company to verify the accuracy of the information. We interviewed individuals typically engaged in one of the following functions at these companies:

- Product management
- Marketing management
- Product planning
- Sales management

Automation Profiles of the Leading Edge OEMs and Manufacturing Companies

ARC has compiled Automation Profiles of the leading edge OEMs and manufacturing companies. Some highlights of the information that is included in these profiles are:

- Plant automation budget of the company and how it is likely to change over the next five years.
- Open systems implementation plans and preferences of the company.
- What the top automation priorities are for the company and what portion of the budget is likely to be spent on control systems, sensors, computers, software, and systems integration.
- Enterprise-wide integration plans and strategies of the company by geographic region.
- Fieldbus implementation plans and strategies of the company. The company's view of the fieldbus and its impact on plant automation.
- Company preferences for different types of control systems, computers and software.

Step 4: Data Analysis

We organized and entered all gathered data into a computer database. The data was verified, sorted and cross-tabulated in numerous ways to filter out industry trends and answers to the key issues identified earlier.

After analyzing all market data, we prepared preliminary market forecasts. At this time, we considered many alternative scenarios and tested them against some key criteria. Finally, we chose the most accurate scenario.

Step 5: Prepare Final Report

After finalizing market forecasts, we drew charts and graphs to get further insight into user needs and wants. We spent a considerable amount of time and effort to draw conclusions and sort out long-term trends from fads. Finally, after we considered many different strategic alternatives, we developed recommendations for the industry participants.

Benefits Of ARC's Methodology

Key benefits of ARC's methodology in conducting market research are:

- This is a proven approach and is designed specifically to conduct global market research for the industrial automation marketplace.
- Our staff members do all our research work. The ARC staff has first-hand industry knowledge and experience. Our staff's average level of industry experience is over twenty years.

- ARC actively solicits inputs from suppliers and users throughout the duration of a project.
- Our experienced staff conducts all interviews - not someone with absolutely no knowledge of the industry.
- We encourage independent thinking by our staff members.
- We can identify key individuals for interviews quickly and accurately through our extensive network of industry contacts and data base.
- We can complete each task very efficiently through our use of automated resources.

Appendix B: Common Industry Abbreviations

4GL	Fourth Generation Language
µP	Microprocessor
3PL	Third Party Logistics
A/D	Analog-to-Digital
ABC	Activity Based Costing
AC	Alternating Current
ActiveX	Object-Oriented programming language for Internet
Ada	Programming Language (named after Ada Lovelace)
AEC	Architect, Engineer & Constructor Firm
AEGIS	Abnormal Event Guidance Information System
AGC	Automatic Guidance Control
AGV	Automated Guided Vehicle
AI	Artificial Intelligence
ALARP	As Low as Reasonably Practicable
ANSI	American National Standards Institute
APC	Advanced Process Control
API	Application Program Interface
Applet	Small Software Application or Component
APS	Advanced Planning & Scheduling
ARPANET	Predecessor to Internet
AS/RS	Automatic Storage & Retrieval Systems
ASIC	Application Specific Integrated Circuit
ASM	Abnormal Situation Management
ASN	Advanced Shipment Notice
ASP	Application Service Provider
ASP	Average Selling Price
ATM	Asynchronous Transfer Mode
ATP	Available-To-Promise
B2B	Business-to-Business
B2C	Business-to-Consumer
BIOS	Basic Input/Output System
BISYNCH	Binary Synchronous Communication
BOL	Bill of Lading
BOM	Bill of Material
BOOT	Build, Own, Operate, and Transfer
BPA	Business Process Automation

BPE	Business Process Engineering
BPO	Business Process Outsourcing
BPR	Business Process Reengineering
C++	Object Oriented Programming Language
CAD	Computer Aided Design
CAE	Common Application Environment or Computer Aided Engineering
CAGR	Compound Annual Growth Rate
CAM	Computer Aided Manufacturing
CAN	Controller Area Network
CapEx	Capital Expenditure
CASE	Computer Aided Software Engineering
CBT	Computer-based Training
CD	Computer Disc
CDDI	Copper Distributed Data Interchange
CDE	Common Desktop Environment
CD-ROM	Compact Disk, Read Only Memory
CDV	Committee Draft Vote
CEMS	Continuous Emissions Monitoring System
CENELEC	Committée de European de Normalization Electrotechnique
CEO	Chief Executive Officer
CFM	Continuous Flow Manufacturing
CFR	Code of Federal Regulations
CIM	Computer Integrated Manufacturing
CISC	Complex Instruction Set Computing
CLN	Collaborative Logistics Newtork
CM&C	Cell Monitoring & Control
CMMS	Computerized Maintenance Management Systems
CMOS	Complementary Metal Oxide Semiconductor
CNC	Computer Numerical Control
COM	Component Object Model
Component	Software Object containing Data and Method
CORBA	Common Object Request Broker Architecture
COSE	Common Open Software Environment
COTS	Commercial Off-The-Shelf
CPFR	Collaborative Planning, Forecasting, & Replenishment
CPG	Consumer Packaged Goods
CPI	Chemical Process Industry
CPM	Collaborative Production Management
CPN	Collaborative Partner Network
CPU	Central Processing Unit

CRAR	Collaborative Forecasting & Replenishment
CRM	Customer Relationship Management
CRP	Capacity Requirements Planning
CRT	Cathode Ray Tube
CSA	Canadian Standards Association
CSI	Current Source Inverter
CSR	Customer Service Representative
CTP	Capable-to-Promise
D/A	Digital-to-Analog
DAS	Data Acquisition System
DC	Direct Current
DC	Distribution Center
DCE	Distributed Computing Environment
DCOM	Distributed Component Object Model
DCS	Distributed Control System
DD	Device Description
DDE	Dynamic Data Exchange
DDL	Device Description Language
DE	Digitally Enhanced
DIN	Deutsches Institut für Normung
DLL	Dynamic Link Library
DMZ	De-militarized Zone
DNA	Microsoft's Distributed iNternet Architecture
DP	Differential Pressure
DRAM	Dynamic Random Access Memory
DRP	Distribution Resource Planning
DSD	Direct Store Delivery
DSP	Digital Signal Processor or Digital Signal Processing
DTD	Document Type Definition
DVD	Digital Versatile Disc
E-Business	Electronic On-line Business
E-Commerce	Electronic On-line Commerce
EAI	Enterprise Application Integration
EAM	Enterprise Asset Management
EAS	Electronic Article Surveillance
EC	Electronic Commerce
ECR	Efficient Consumer Response
eCRM	Electronic Customer Relationship Management
EDI	Electronic Data Interchange
EDM	Electronic Data Management or Electrical Discharge Machine

eFPM	E-Fulfillment Process Management
eFS	E-Fulfillment Solutions
eIS	E-Integration Solutions
EL	Electroluminescence
EMI	Electro Magnetic Interference
EMS	Energy Management System
EOS	Economy of Scale
EPA	Environmental Protection Agency
EPM	Enterprise Production Management
ePS	E-Procurement Solutions
EPS	Enterprise Production System
ERP	Enterprise Resource Planning
ESD	Emergency Shut Down System
EU	European Union
FA	Factory Automation
FCS	Field Control System
FDA	Food & Drug Administration
FDC	Factory Data Collection
FDDI	Fiber Distributed Data Interchange
FF	Fieldbus Foundation
FIP	Factory Instrumentation Protocol
FMP	Flexible Manufacturing Plant
FMS	Factory Management System or Factory Message Specification
FORTRAN	Programming Language
FT-IR	Fourier Transform Infrared
FTC	Federal Trade Commission
FTP	File Transfer Protocol
GC	Gas Chromatography
GEMS	Global Enterprisewide Management System
GIS	Geographic Information Services
GLS	Global Logistics System
FSK	Frequency Shift Key
GMC	General Motion Control
GMP	Good Manufacturing Practice
GOSIP	Government Systems Interconnect Protocol
GPS	Global Positioning Satellite
GP	Gauge Pressure
GPS	Global Positioning System
GTO	Gate Turn Off Thyristor
GUI	Graphical User Interface

HAL	Hardware Abstraction Layer
HART	Highway Addressable Remote Transducer
HAZOP	Hazard & Operability
HDLC	High Level Data Link Control
HDTV	High Definition Television
HMI	Human Machine Interface
HP	Horsepower
HPI	Hydrocarbon Processing Industry
HTTP	HyperText Transport Protocol (Internet)
HVAC	Heating, Ventilating, Air Conditioning
H/W	Hardware
I/O	Input/Output
IA	Industrial Automation
IC	Integrated Circuit
IEC	International Electrotechnical Commission
IEEE	Institute for Electrical & Electronic Engineers
IFP	Intelligent Front Panel
IGBT	Insulated Gate Bipolar Transistor
Internet	Worldwide network of loosely connected and diverse computers
Intranet	Internet implementation within an enterprise
IP	Internet Protocol
IPO	Initial Public Offer
IR	Infrared
ISA	International Society for Measurement & Control
IR	Independent Representative
ISA	Instrument Society of America
ISFET	Ion Sensitive Field Effect Transistor
ISO	International Standards Organization
ISP	InterOperable Systems Project
ISV	Independent Software Vendor
IT	Information Technology
JAVA	Object-Oriented programming language for Internet
JCAF	Java Control & Automation Framework
JEIDA	Japan Electric Industry Development Association
JEIF	Japan Electrical Industrial Federation
JEMA	Japan Electrical Manufacturers' Association
JEMIMA	Japan Electrical Measuring Instruments Manufacturers' Association
JISC	Japanese Industrial Standards Committee
JIT	Just-In-Time
JVM	Java Virtual Machine

kHz	Kilo Hertz
KVA	Kilo Volt Ampere
KW	Kilowatt
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LES	Logistics Execution System
LCI	Load Commutated Inverter
LIFO	Last In, First Out
LIMS	Laboratory Information Management System
LSI	Large Scale Integration
LTL	Less Than Truckload
mA	Milliamp
MAS	Main Automation Supplier
MES	Manufacturing Execution System
MIS	Management Information System
MIPS	Millions of Instructions Per Second
MLC	Multi-Loop Controller
MMS	Manufacturing Message Specification
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
MOC	Management of Change
MPS	Master Production Schedule
MPU	Microprocessor Unit
MRO	Maintenance, Repair & Operations
MRP	Materials Resource Planning
MRP	Manufacturing Resource Planning
MSDS	Material Safety Data Sheets
MTBF	Mean Time Between Failure
MTO	Make to Order
MVC	Multivariable Predictive Control
MVP	Multivariable Control
MVS	Machine Vision System
NAMUR	Normal Ausschultz Fur Messung Und Regelung
NAFTA	North American Free Trade Association
NAICS	North American Industry Classification System
NC	Network Computer (Internet) or Numerical Control
NEMA	National Electrical Manufacturers' Association
NIST	National Institute of Standards and Technology (USA)
NN	Neural Networks
NTE	Microsoft's Windows NT Embedded Operating System

NTE	National Transportation Exchange
NURBS	Non-Uniform Rational B Splines
OA	Office Automation
OCX	OLE Custom Control
ODBC	Open Database Connectivity
OEM	Original Equipment Manufacturer
OI	Operator Interface
OLE	Object Linking and Embedding
OMAC	Open Modular Architecture Control
OMG	Object Management Group
OMS	On-line Management System
OO	Object-oriented (Analysis, Design or Programming)
OPC	OLE for Process Control
OS	Operating System
OSF	Open Software Foundation
OSHA	Occupational Safety & Health Administration
OCS	Open Control Systems
ORP	Oxygen Reduction Potential
OSF	Open Software Foundation
OSI	Open Systems Interconnect
PAS	Process Automation System
PC	Personal Computer
PCS	Process Control System
PD	Positive Displacement
PDM	Project Data Management
P&ID	Process and Instrumentation Diagram
PES	Process Electrochemical Systems
PID	Proportional Integral Derivative
PIM	Plant Information Management
PIMS	Process Information Management System
PIP	Partner Interface Process
PLC	Programmable Logic Controller
PM&C	Process Monitoring & Control
PMD	Programmable Message Display
POSIX	Portable Operating System Interface
PPP	Point-to-Point Protocol
Profibus	Process Fieldbus
PSI	Pounds per Square Inch
PSM	Process Safety Management
PTP	Profitable-to-Promise

PWM	Pulse Width Modulation
QC	Quality Control
QR	Quick Response
R&D	Research & Development
RDBMS	Relational Database Management System
Rep	Independent Representative
RFDC	Radio Frequency Data Communications/Collection
RF/ID	Radio Frequency Identification
RFI	Radio Frequency Interference
RFP	Request for Proposal
RFQ	Request for Quote
RISC	Reduced Instruction Set Computing
RLL	Relay Ladder Logic
ROA	Return on Assets
ROI	Return On Investment
ROM	Read Only Memory
RPC	Remote Procedure Call
RPM	Revolutions Per Minute
RT	Real-time
RTD	Resistance Temperature Detector
RTOS	Real-time Operating System
RTU	Remote Terminal Unit
RTX	Real-time Extension
SAMA	Scientific Apparatus Makers Association
SCADA	Supervisory Control and Data Acquisition
SCE	Supply Chain Execution
SCM	Supply Chain Management
SCP	Supply Chain Planning
SCPM	Supply Chain Process Management
SCR	Silicon Controlled Rectifier
SDLC	Synchronous Data Link Control
Sercos	Serial Real-time Communication System
SFA	Sales Force Automation
SFC	Shop Floor Control or Sequential Function Chart
SI	Systems Integrator or Systems Integration
SIC	Standard Industrial Classification
SIL	Safety Integrity Level
SIS	Safety Instrumented System
SIS	Short-Interval-Scheduling
SKU	Stock Keeping Units

SLA	Service Level Agreement
SLC	Single Loop Controller
SLDC	Single Loop Digital Control
SLIP	Serial Line IP
SmallTalk	Object Oriented Programming Language
SMP	Symmetrical Multiprocessing
SMT	Surface Mount Technology
SoftLogic	PC-based Logic Control
SOP	Standard Operation Procedure
SP50	Standards & Practice Committee No. 50 (ISA)
SPC	Statistical Process Control
SQC	Statistical Quality Control
SQL	Structured Query Language
SSH	Secure Shell
SSL	Secure Socket Layer
S/W	Software
TBP	Transaction Based Payments
T/C	Thermocouple
TCO	Total Cost of Ownership
TCP/IP	Transmission Control Protocol / Intenet Protocol
TCT	Total Cycle Time
TIE	Technical Information Exchange
TL	Truckload
TM	Transportation Management
TMS	Transportation Management System
TOP	Technical and Office Protocol
TQC	Total Quality Control
TQM	Total Quality Management
TUV	Technischer Uberwackungs Verin (Technical Inspection Association)
TVO	Total Value of Ownership
UEM	Unified Enterprise Management
UL	Underwriters Laboratories
UML	Unified Modeling Language
UPC	Uniform Product Code
URL	Uniform Resource Locator (Internet)
USB	Universal Serial Bus
UV	Ultraviolet
VAN	Value Added Network
USP	United States Pharmacopeia
VAR	Value Added Reseller

VAS	Value Added Services
VBX	Visual Basic custom control
VCI	Value Chain Initiative
VDU	Visual Display Unit
VF	Vacuum Fluorescent
VFD	Variable Frequency Drive
VICS	Voluntary Inter-Industry Commerce Standard Committee
VLSI	Very Large Scale Integration
VMI	Vendor Managed Inventory
VoIP	Voice Over Internet Protocol
VPN	Virtual Private Network
VSD	Variable Speed Drive
VVI	Variable Voltage Inverter
VVVF	Variable Voltage, Variable Frequency
WAH	Web Application Hosting
WABI	Windows Application Binary Interface
WAN	Wide Area Network
WIP	Work In Process
WM	Warehouse Management
WMS	Warehouse Management System
WOSA	Windows Open Systems Architecture
WWW	World Wide Web (Internet)
XML	Extensible Markup Language
Y2K	Year 2000