Siemens Process Industry Strategies

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Process Automation is a Key Component of Totally Integrated Automation

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<td>Analytical Devices</td>
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<td>Turbo-Werk</td>
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<td>Magmeters</td>
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<td>Milltronics</td>
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<td>Ultrasonic Level Transmitters</td>
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<td>Axiva</td>
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<td>ORSI</td>
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Siemens Process Automation Acquisitions (1999-Present)
Executive Summary

Siemens has always been a leading supplier of process automation systems (PAS) and process field instrumentation in Europe, but the company has made significant strides in growing its process business worldwide over the past few years both through acquisitions and organically. Siemens A&D’s goal is to expand both its position as world market leader and its profitable businesses in automation, drives, switchgear, and installation technology.

To achieve this, the group is strengthening its activities in process automation and in software for complex system controls based on the Totally Integrated Automation platform.

Siemens is rapidly emerging as one of the top process automation players in the worldwide market and particularly in the North American market. If previous growth in the business is any indication, the company will continue to grow its business in key areas of process automation at a rate that is well above the market average. The focal point for growth for Siemens’ process business is the SIMATIC PCS 7 system, which has now reached the level of a “bulletproof” and fully scalable system on par with any other system available on the market today. SIMATIC PCS 7 currently has thousands of installations worldwide in Europe, North America, Asia, and Latin America.

Two of Siemens’ key differentiators are its ability to bring together process and discrete automation under a single control environment, as well as its philosophy for ownership of core system technologies. Siemens is not a PLC supplier entering the world of DCSs, nor is it a DCS supplier entering into the world of PLCs. It has years of experience in the arenas of both process and discrete control, and its ability to bring both worlds together in a single environment under the TIA and SIMATIC umbrella is unique. Building upon this are Siemens’ offerings in batch and safety control, as well as its expertise in automation networks. From the perspective of technology direction, SIMATIC PCS 7 conforms closely to ARC’s CPAS model, and has rapidly advanced its technology position in the marketplace.
Siemens Makes Process Industries a Strategic Priority

Siemens has long been a global leader in the world of discrete automation. The company is the largest PLC supplier worldwide and has a strong presence in the drives, CNC, motion control, and material handling markets. Siemens has always been a leading supplier of process automation systems (PAS) and process field instrumentation in Europe, but the company has made significant strides in growing its process business worldwide over the past few years both through acquisitions and organically.

Siemens Adds Selected Pieces of Process Know-How, but Focuses on Organic Growth for the Future

Siemens’ drive to process automation growth began with a series of acquisitions. In 2000, the company purchased Moore Process Automation Solutions, which was one of the last “niche” DCS suppliers. Moore gave Siemens access to a large installed base of PAS users in North America, as well as Moore’s considerably experienced sales channel. Siemens supplemented the Moore acquisition with the purchase of several other companies in the area of process automation, including analytical device manufacturer Applied Automation in 1999, ultrasonic level instrument supplier Milltronics in 2000, as well as MES suppliers ORSI and Compex in 2001 and the process visualization software business of IndX in 2003. In addition to companies with product and solution expertise such as Moore and Milltronics, Siemens has also made several acquisitions that give the company specific industry and engineering expertise. The acquisition of Axiva in 2000, for example, brought engineering expertise in the pharmaceutical business. The acquisition of US Filter in 2004 brought considerable engineering expertise in the area of water treatment.

In ARC’s view, Siemens’ recent acquisition activity is geared toward acquiring specific domain expertise, particularly at the production management and optimization software level, the emphasis has been on small to medium size companies whose software architectures can mesh well with Siemens’ existing TIA infrastructure, such as IndX, Compex, and ORSI. Companies that have solutions capabilities and engineering expertise in
In ARC’s view, the pattern of recent acquisition activity at Siemens is geared toward acquiring specific domain expertise, with smaller to medium size companies whose software architectures can mesh well with Siemens existing TIA infrastructure.

Certain industry segments, such as Axiva and US Filter, are also recent targets. Both kinds of companies are likely candidates for future acquisitions.

For the near future, however, Siemens seems to be focusing on growing its process business organically. By adding selected pieces of process expertise to its portfolio, the company can continue to build on its installed base of the SIMATIC PCS 7 process automation system and the Totally Integrated Automation Architecture. Siemens continues to extend its involvement beyond core control applications through cooperation with engineering tool providers, partnerships with companies such as Tecnomatix, and by developing new products with partners to add value in the engineering process.

**Siemens is an Expert at the Hardware Business**

ARC has reported the declining hardware business trend for automation in both the process and discrete domains for some time. There are few companies left that can view the mass production of control-related hardware as a profitable business, but Siemens’ capability in hardware with its large PLC and I/O business is an exception. Siemens retains the ability to produce a large volume of hardware profitably, thanks to its economies of scale. The company can leverage many of its best manufacturing practices that it has rigorously developed over the past decades to offer its customers a wide range of highly reliable hardware options from I/O to controllers and industrial PCs.

**Siemens Automation Business Organization**

When added together, the automation-related businesses within Siemens account for the majority of revenues for the entire corporation. Siemens’ overall corporate operating groups are organized within eight business segments that report to the board of management. Nine corporate departments provide central services such as Finance and Human Resources and a number of regional organizations cover world geographic regions. The Industry business segment is composed of Automation & Drives (A&D), Industrial Solutions and Services (I&S), Siemens Logistics & Assembly (L&A), and Siemens Building Technologies (SBT). The focus of this report is the Automation and Drives segment of the business, which is where the process automation hardware and software expertise resides. A&D gener-
ates the majority of its process automation revenues from PASs, batch systems, safety systems, field instrumentation, and production management software (CPM). I&S is primarily focused on service offerings, which cover the entire life cycle of industrial and infrastructure facilities, from consulting and planning through installation, operation, integration of IT solutions, maintenance, and modernization.

The industry expertise for the process market is divided between the I&S and A&D organizations. I&S handles responsibility for the oil & gas, metals, pulp & paper, refining, and water & waste industries. A&D is responsible for activities in the chemicals, pharmaceuticals, food & beverage, glass, automotive, and other discrete industries and applications. I&S and A&D work together through a Process Solutions (PS) group to provide total solutions to customers in all industries. All three businesses reach customers through the various regional organizations, such as Siemens Energy and Automation (SE&A) in the US.

The Process Solutions and I&S groups provide considerable pull-through for the product businesses at A&D. Siemens is currently expanding its presence in the process industries further by forming more relationships with third party systems integrators (SI). They believe this offers a key avenue for future growth. Siemens already has a program in place to certify SI partners and ensure they have the proper level of expertise to implement the company’s offerings.

"Totally Integrated Automation” Unifies Manufacturing Enterprises

A&D’s goal is to expand both its position as world market leader and its profitable businesses in automation, drives, switchgear, and installation technology. To achieve this, the group is strengthening its activities in process automation and in software for complex system controls based on
the Totally Integrated Automation platform. TIA is the underlying architecture that allows users to tie together Siemens’ offerings in process and discrete automation with its expertise across the production workflow, including business level integration through its CPM/MES offerings, integration with enterprise systems such as SAP, and inbound and outbound logistics. TIA offers common configuration and programming tools, a common user interface, and common data management across all areas of automation. TIA also offers common communications and network infrastructure based on Ethernet and PROFIBUS networks.

**SIMATIC PCS 7: A Single Process Platform for the Future**

SIMATIC PCS 7 is Siemens’ PAS offering that serves as the fulcrum for all of Siemens’ process industry strategy. SIMATIC PCS 7 currently has thousands of installations worldwide in Europe, North America, Asia, and Latin America. Fulfilling the TIA vision of common hardware infrastructure across application domains, SIMATIC PCS 7 includes hardware based on the common S7 platform, which serves as the control platform for the company’s PLC and safety system offerings. SIMATIC PCS 7 utilizes common ET200 Series I/O, common PROFIBUS and Ethernet communications, common configuration, engineering, operator interface, and a single unified automation database.

**Siemens Process Business is a Growth Leader**

After announcing its intention to pursue growth opportunities in the process industries in the mid-’90s, Siemens has been highly successful in its penetration of the market worldwide. According to Siemens, sales of the SIMATIC PCS 7 platform have consistently exceeded growth targets over the past several years, and the company is currently the number four DCS supplier worldwide. While the company has long been the leader of the
PLC market, Siemens realizes that it has to think like a small company to provide the innovation and value proposition needed to grow its position in the process industries.

While the Moore acquisition gave Siemens its entry into the North American market, Siemens has also gained access to the Japanese market through a recent partnership with Fuji Electric. The two companies announced a formal alliance in November of 2003, under which Fuji will brand label the Siemens SIMATIC PCS 7 as its primary PAS offering. Fuji will also act as a Siemens integrator partner. The Fuji agreement will add to an already rapidly growing process business for Siemens.

**SIMATIC PCS 7 Maps to ARC CPAS Vision**

Like many of the new platforms that suppliers have introduced over the past several years, SIMATIC PCS 7 began as a smaller system that lacked many of the features required in process automation environments. However, today SIMATIC PCS 7 is a full-scale DCS, which possesses the critical requirements needed for process automation applications. In ARC’s view, there are many correlations between SIMATIC PCS 7 and the ARC vision for a Collaborative Process Automation System (CPAS). The CPAS vision calls for PASs to be based on international standards, possess a common
control and configuration environment, and have a common information infrastructure, and SIMATIC PCS 7 maps well to these requirements.

**SIMATIC PCS 7 Based on International Standards**

At the heart of ARC’s CPAS model is the adoption of international standards, which eliminate barriers to functionality. CPAS provides a single automation environment incorporating standards such as ISA-88 and ISA-95. Siemens takes this same approach with SIMATIC PCS 7. The system incorporates ISA-88 and IEC 61131-compatible programming software. SIMATIC PCS 7 is seamlessly integrated with SIMATIC IT (Siemens MES offering), which follows the functional map of the ISA-95 standard. Other standards incorporated into the system include de-facto standards such as OPC, HART and an SQL-based historian. SIMATIC PCS 7 incorporates the IEC fieldbus standards 61158 and 61784 through use of PROFIBUS for communication between control, I/O and smart field devices, and the use of Electronic Device Descriptions (EDD) resident in PROFIBUS and HART devices and hosts.

**Common Engineering, HMI, & Control Environment**

A true CPAS platform requires common tools and a common control environment. SIMATIC PCS 7 provides this with common HMI, engineering,
control hardware, and networking technology.

**ES Provides Common, Standards-Based Engineering**

The SIMATIC PCS 7 Engineering Station (ES) provides tight integration and automated data transition between engineering, configuration, operations, and HMI. The IEC 61131 compliant programming tools offer easy engineering of the configuration logic using a single database, pre-configured library blocks or custom blocks, statement list, ladder diagram and function blocks. The ES features the same configuration capabilities for PLCs and discrete control as Siemens’ Step 7 programming software, with the addition of Structured Control Language (SCL), Process Object view, Continuous Function Chart (CFC), Sequential Function Chart (SFC), Safety Matrix, and ISA-88 compliant plant hierarchy views.

ES provides a common access point for Siemens’ Process Device Manager (PDM) field configuration tool. The configuration views in the ES are contextual in that they allow user-specific views of the control system based on roles and responsibilities. ES allows for pre-engineering of process control libraries, and creation of control “templates” that can be reused, saving both time and cost on Front End Engineering and Design (FEED) and other areas of total cost of ownership.

The Component View in the ES allows for configuration of control hardware and is typically the view for maintenance personnel or technicians. Configuration can be done in standard function blocks or in SFC. Users can also create customized function blocks. The Plant View within ES is the logical view that provides hierarchical structuring of the plant by process area, unit, or component.

The Process Object view in ES is the primary engineering view of ES and offers a single point of entry. It provides a modular and object-based graphical view of the engineering process and provides a device-oriented perspective for configuration. Process Objects represent devices such as

| Based on Standards – ISA-88, ISA-95, IEC 61131, IEC Fieldbus Standard, OPC, XML, Industrial Ethernet |
| Single Control and I/O Platform |
| Single Engineering Environment with ES |
| Single HMI Environment with OS |
| Support of Discrete Control, Batch Control, Safety Control, Plant Asset Management, and Production Management in a Single Environment |
| Full Redundancy, High Availability Control |
| Information is Presented in Context in Both Engineering and HMI Views |
| Single Control Database |
| Supports Online Upgrades |
| Based on International and De Facto Standards – ISA-88, ISA-95, IEC 11312, IEC Fieldbus Standard, HART, OPC, XML, Industrial Ethernet |

**Key Areas Where Simatic PCS 7 Correlates to ARC’s CPAS Vision**
pumps, motors, and field devices by providing access to context-specific information such as I/O assignment, control hardware, HMI representation, archives, function block parameters, alarm priorities and alarm messages.

ES reduces design costs and startup times by automatically reusing data from the control strategy configuration during the creation of the HMI environment. The ability for the operator to view and interact with SFCs is generated automatically for both continuous and batch applications. Graphical representations of faceplates can also be derived automatically from control strategies. Users can automatically generate process graphics from the controller configuration. Displays are populated automatically with symbols, which are pre-linked. Configuration management tools within ES include a central change management tool for SFC modifications and an audit trail for configuration changes. Security in ES can be linked to the Windows security scheme to control logon access.

ES also offers concurrent engineering, enabling a whole team of engineers to work on the same control strategies from multiple, geographically distributed locations simultaneously. This allows for global distribution of engineering tasks and engineering of multiple projects simultaneously. More important, however, is the collaborative sharing of engineering best practices in a dynamic way across multiple plants.

**OS Provides Common HMI**

The common HMI environment for SIMATIC PCS 7 is the Operator Station (OS), which is based on the standard Siemens WinCC HMI but has additional features to make it suitable for process applications and distinguish it from the standalone WinCC HMI offering. OS offers customized, contextual operator views and features a SQL Server-based historian.

The Data Storage compression within OS allows for online modifications and upgrades, which is consistent with ARC’s CPAS vision. OS is also designed to reduce operator response times to abnormal situations. Alarm status is shown at all times, and alarms and messages are automatically segregated by process area. OS also offers alarm filtering and prioritization through alarm classes and priorities. Users can create up to 16 classes of alarms.
Common Hardware and Control Platform

The common control hardware platform for SIMATIC PCS 7 is the 400 Series of controllers, including the 414, 416, and 417 Automation Stations (AS). These Automation Stations feature the same CPUs as the company’s SIMATIC S7 family of PLCs. Used as DCSs, the controllers offer variable scan rates down to 10 milliseconds. Larger controllers can execute over 1,000 PID loops in 0.5 seconds and support online expansion of programming memory. ET200M is the primary I/O offering, and can be placed in hazardous areas, including Class 1 Division 2. Failsafe versions are TÜV approved and can be used for SIL 3 applications with the integrated safety system controllers. The ET 200S Series I/O is designed for motor control, starter control, and pneumatic valve control applications. The I/O is designed to support distributed architectures natively, allowing the user full flexibility in choosing the location for the I/O (Remote I/O).

Common Information Infrastructure

The common information infrastructure provides a single communications framework for the CPAS model. At the field level, the infrastructure hosts sensors, actuators, and logical devices in their primary functions and provides a standards-based distributed computing environment for field devices. At the control level, the common information infrastructure provides a common fault tolerant backbone that synchronizes information in both process control and production management applications. This results in a single, robust, secure, and data rich environment that extends from field devices through the business system interface.

The common communications infrastructure for SIMATIC PCS 7 is based on the standard PROFIBUS protocol and Siemens’ Industrial Ethernet backbone. PROFIBUS DP connects remote I/O, drives, and provides an interface to other device networks such as AS-i. PROFIBUS PA operates at
the process field device level and provides connectivity for fieldbus-compatible process field instrumentation and intelligent control valve positioners. PROFIsafe is also integrated into the system architecture through Siemens’ safety system offering. The Industrial Ethernet control network provides for the specific needs of a real-time controller on a standard Ethernet backbone.

**SIMATIC PCS 7 Offers Scalability & Redundancy**

SIMATIC PCS 7 offers full redundancy and high availability control for critical and larger applications, which can range up to over 100,000 I/O. The system is downwardly scalable to the smallest applications with the new “PCS 7 Box” configuration, which includes a basic workstation for engineering/operation, a hardened controller in a PCI-card form factor, and PROFINET connectivity all packaged in a small industrial PC for under $20,000. PCS 7 Box, which offers the same functionality as a full-blown PCS 7 system can handle up to 800 I/O and can be skid-mounted. SIMATIC PCS 7 supports the use of thin clients for browser-based access through Microsoft Internet Explorer, which can include Siemens’ own MOBIC handheld PC.

There is no single point of failure in the system and the system offers full redundancy at all levels, with redundant I/O, controllers, and historians. In the redundancy scheme, each of the redundant CPUs execute in parallel. Redundant controllers can be physically separated by up to 500 meters. In addition, the SIMATIC BATCH package supports redundancy out of the box, a feature not found in most batch applications.

**SIMATIC PCS 7 Supports Multiple Application Domains**

A typical process plant requires up to three different types of control applications, from regulatory control to sequential control, discrete control and safety applications. CPAS incorporates these functions as well as asset management, advanced control, and production management.
SIMATIC PCS 7 addresses the needs of process, hybrid, and discrete applications within the context of a single framework. The common hardware platform and common network infrastructure, as well as the unified 61131 and SFC-based configuration environment, allow for seamless incorporation of discrete control capabilities, batch, and safety system applications along with process. Batch applications are supported with Siemens’ SIMATIC BATCH application, which serves the purpose of a high performance basic batch engine. Safety applications are addressed by the 400 FH safety system.

Advanced control options in SIMATIC PCS 7 include PID controller tuning and analysis. Siemens offers its own PCS 7 PID Tuner and supports tuning tools from Expertune and RaPID. SIMATIC PCS 7 offers fuzzy logic control in the form of S7 Fuzzy and supports third party applications such as Inca, ADCO, and Brainwave. PCS 7 simulation and operator training are accomplished through the SIMIT process training simulation package. The system’s configuration tool automatically creates the simulation environment directly from the control strategy. For production management applications, SIMATIC PCS 7 interfaces directly to the SIMATIC IT Production Suite.

For plant asset management applications, Siemens offers PDM (Process Device Manager). Using PDM from a central engineering station, users can parameterize and troubleshoot intelligent field devices remotely. PDM serves as the communications basis for the asset management system and is available integrated with SIMATIC PCS 7 or in standalone configurations. PDM reduces Factory Acceptance Testing (FAT), commissioning, and startup times.

**SIMATIC PCS 7 Version 6.0 & Future Roadmap**

Siemens’ policy is to introduce a major new release of SIMATIC PCS 7 approximately every 18 months. The next major version release will be version 6.1, which is due in 1Q of 2005. Version 6.1 features a new generation of controllers with increased performance and increased capacity, as well as extended support for remote I/O. The new controllers are three times faster with five times more memory at the same price. Additionally PCS 7 Box, the integrated AS/OS/ES will now support small batch applications.
While SIMATIC PCS 7 is Siemens’ unified control system architecture for the future, the company has made a commitment to support its legacy platforms for the future, such as APACS, Teleperm, PCS OSx, and the Braumat brewing system and Cemat cement plant control system. Siemens, however, must provide a migration path forward to its central PAS platform for the future – SIMATIC PCS 7. The company has created what ARC believes is a comprehensive, stepwise approach to migration that effectively addresses the needs of its installed base. In addition, Siemens is developing a solid strategy for migration from many competitor systems to SIMATIC PCS 7.

Siemens’ Spring House, Pennsylvania location is the center of excellence for control system migration. Although Siemens first started on its migration path from Teleperm to SIMATIC PCS 7 after the system’s introduction in 1996, it was not until after the Moore acquisition that the company really began to develop a cogent and solid migration strategy.

Siemens migration path addresses the varying lifecycles of different components of the system. ARC believes there are over $65 billion of installed legacy systems worldwide that are approaching the end of their useful lifecycle and will need to be replaced. This replacement, however, depends on
the viability of the components of the system. I/O, for example, can last over 20 years, while lifecycles for HMI workstations are typically five years or less.

Siemens has considered this and has adopted a stepwise and flexible approach to migration for both its legacy systems and competitor systems. Siemens’ migration strategy applies to all of its legacy systems, including APACS and Teleperm. In addition to their comprehensive suite of migration products, Siemens offers a full set of services for migration. Phase one of the migration strategy is typically an HMI replacement, where SIMATIC PCS 7 OS HMI are placed directly on top of the existing legacy system, with an OS Server connecting to the legacy control network. Siemens offers a runtime migration plug-in that provides an interface for communication with the legacy system’s communication channel or OPC through a network interface card.

Siemens also offers the Data Base Automation (DBA) conversion tool for legacy systems, which provides automatic generation of HMI elements (symbols, navigation, and links to faceplates, trends, and alarms). Gateways can also provide a direct connection to the Industrial Ethernet network and SIMATIC PCS 7. Several additional tools and services are available to minimize migration cost from APACS to PCS 7, such as APACS faceplates and APACS application libraries. An automated graphics conversion tool is also provided for APACS systems to redraw existing HMI graphics.

For Siemens, competitor system migration is a strategic imperative. By combining the development platform and infrastructure that it uses for its own legacy systems, Siemens is also able to create standard migration products for competitor platforms.
**Migration Timeline**

Most components of SIMATIC PCS 7 are now fully compatible with the existing installed base of legacy systems from Siemens. For APACS, Siemens offers PCS 7 OS and SIMATIC BATCH applications; engineering libraries for both PCS 7 OS and controllers, network gateways, and a full suite of services. The same suite of products and services are available for Teleperm M and SIMATIC 505 systems, and Siemens is well on the way to providing the same features for the Braumat and Cemat systems.

For competitor systems, Siemens already offers PCS 7 OS for Bailey INFI-90 systems and replacement FTAs for Honeywell TDC 3000, with additional interfaces to Freelance, PROVOX, TDC 3000, and I/A Series systems planned. With its new Fuji alliance in Japan, Siemens must also provide a full-scale migration path for Fuji’s Micrex system. The first wave of migration solutions for Micrex will be introduced around the middle of 2005.

**SIMATIC BATCH – Next Generation**

**Batch for SIMATIC PCS 7**

Siemens has always been a strong player in batch processing, and recently released its next generation batch package called SIMATIC BATCH. The successor to the previous Batch Flexible application, SIMATIC BATCH is a modular and scalable batch platform that is tightly integrated with the SIMATIC PCS 7 DCS.

**High Scalability & Redundancy**

SIMATIC BATCH possesses the same scalability options as SIMATIC PCS 7 in that scalability is essentially unlimited. Recipe creation, execution, and control are all included in the single Batch Operator Station. At the low end, users can purchase a single operator station and controller at an entry-level price for small out-of-the-box applications. For larger applications, the system supports up to 12 redundant server pairs with up to 32 clients per server. SIMATIC BATCH also features complete redundancy with hot standby and database replication.
Full Integration with SIMATIC PCS 7

One of the biggest advantages of SIMATIC BATCH is its tight integration with the SIMATIC PCS 7 control system. Information from the system can be easily shared with the Batch system to achieve reduced engineering costs and startup times. The SIMATIC BATCH Recipe Editor, for example, extracts relevant information out of the SIMATIC Manager in the PCS 7 Engineering Station and creates the master recipe, avoiding manual population of recipes. SIMATIC BATCH also supports the security and logon conventions that are inherent in SIMATIC PCS 7.

Already one of the most highly regulated industries in the world, US FDA ruling 21 CFR Part 11 has placed additional burden on the pharmaceutical industry in terms of electronic records requirements for currently installed systems and all future systems. Through its close integration with the PCS 7 Operator Station, SIMATIC BATCH provides enhanced traceability by recording all operator actions in the single SIMATIC PCS 7 database.

SIMATIC BATCH Meets ISA88 Standard

The ANSI/ISA-88 (IEC 61512) batch control standard contains three sections. Part 1 defines standard terminology and a number of models for batch control. Siemens has adopted standard terminology and SIMATIC BATCH has been designed with a modular set of functions and hierarchy based on the Control Activity Model. Part 2 of ISA-88 is in three parts: data models, information exchange tables, and procedure function charts. Procedure Function Chart (PFC) notation addresses procedural control and execution, and is featured in SIMATIC BATCH. Part 3, which defines General and Site Recipes, is also supported by SIMATIC BATCH.

SIMATIC BATCH recipes can be “flat” according to the S88.01 collapsibility requirements. Batch related trends can be recorded at the recipe level, unit
recipe level, or operation level, and the operator can make changes to the recipe while the operation is taking place. Dynamic unit allocation is supported, allowing the operator to choose units based on criteria such as process parameters or longest out of use.

Siemens offers a simple XML-based batch report generator, but the customer can use any other report generator on top of SIMATIC BATCH.

The system also features a library for recipe operations. By picking predefined operations, the user can build an object library. Any change to an object in the library is instantiated throughout the entire system. Separation of formula and procedure is also incorporated. Formulas can be created for basic recipes and modified for different grades.

**Integration with SIMATIC IT**

SIMATIC BATCH offers integration not only with SIMATIC PCS 7, but also with the SIMATIC IT suite of production management applications offered by Siemens. Integration is accomplished through the SIMATIC Control Interface (SCI), a COM-based interface that allows for the exchange of master recipes, formulas, material data, tag references, Process Cells, and so on.

**SIMATIC BATCH Strengths & Challenges**

SIMATIC BATCH is Siemens’ first true foray into the world of a full-blown batch offering across all of its batch business under the unified SIMATIC PCS 7 architecture. In the past, Siemens excelled at providing customized batch solutions with a large engineering content. While Siemens still possesses this strength, it must also apply itself to providing a standard batch product that cuts horizontally across multiple industries, each with their own specific requirements.

While SIMATIC BATCH is a fully functional standalone batch package, it provides a superior value proposition to customers when it is integrated with the SIMATIC IT MES production management offering. Siemens must continue to articulate a compelling business value proposition for the combination of SIMATIC BATCH and SIMATIC IT under the PCS 7 architecture.
SIMATIC IT Fits ISA-95 Roadmap

Siemens’ SIMATIC IT MES group was formed out of two acquisitions and one internal group at Siemens. In January 2001, Siemens acquired ORSI, which provided the main architectural pieces of SIMATIC IT, including the Production Modeler, Historian, and many of the ISA-95 components including Material Manager and Order Manager. The acquisition of Compex later that year brought the expertise of the Unilab LIMS system to the group. Finally, all three businesses were brought under one MES product division in early 2003. The SIMATIC IT MES group is a part of Siemens Automation Systems group, sharing sales, marketing, and development resources.

SIMATIC IT offers industry-specific, configurable applications. In addition, SIMATIC IT offers a flexible toolkit that allows users to develop new applications quickly to fit their specific needs and work processes. In Siemens’ view, each manufacturer has unique processes, and thus unique needs. As part of the TIA architecture, SIMATIC IT offers seamless integration with both the SIMATIC BATCH platform and SIMATIC PCS 7. SIMATIC BATCH communicates all of its functions and events to the SIMATIC IT framework. SIMATIC IT can share a common historian with SIMATIC PCS 7 thus allowing it to access PCS 7 data directly.

SIMATIC IT: A Component-Based ISA-95 Solution

SIMATIC IT is a componentized production management/MES approach that provides advanced batch functionality and conforms to ISA-95 roadmap. Each ISA-95 functional domain matches to a component in the SIMATIC IT architecture. Cross-functional interactions (production operations) are defined and executed by workflows in the framework. SIMATIC IT links and integrates the plant floor with business systems, providing
communication, process synchronization, and coordination throughout a plant or a series of plants. SIMATIC IT provides collaboration tools for improving production and coordinating the whole supply chain.

**SIMATIC IT Framework**

The SIMATIC IT Framework coordinates and synchronizes activities through data management techniques and application integration. SIMATIC IT Framework is a graphical modeling environment, responsible for the overall management of the plant. The graphical environment is used to create a physical model and graphical workflows (Production Operations) that actively coordinate machines, people, and applications in the plant. Each step of a Production Operation corresponds to the function of a component.

Used for project modeling, engineering, and operations, the SIMATIC IT Framework executes production operations against an ISA-95-compliant plant model. Encapsulated components and integration scenarios are stored in reusable libraries for rapid prototyping and the establishment of corporate manufacturing standards.

SIMATIC IT Components provide basic and guaranteed functionality. Each component addresses specific manufacturing issues, such as Order Management, Material Management, KPI calculation, Lab Management, Personnel Management, Report Management, and so on. SIMATIC IT Components can include standard Siemens components or third party components and legacy systems adapted for use inside the Framework.

SIMATIC IT Production Modeler handles overall management of the plant. It controls and improves plant activities by coordinating and synchronizing the machines, people, and applications connected to SIMATIC IT Framework. Used for project modeling, engineering, and operations, SIMATIC IT Production Modeler executes production operations against an ISA-95-compliant plant model.

SIMATIC IT Components are standard products providing a set of functions for a particular horizontal domain. Components include, orders management, SAP interface, material tracking and genealogy, batch management, data validation, and downtime reporting.
The SIMATIC IT Production Suite comprises the integration and coordination platform SIMATIC IT Framework, SIMATIC IT Components, and libraries of pre-configured components and solutions. Tailored to meet the needs of a particular sector, it provides a complete collaborative manufacturing solution. Production Suite Components include SIMATIC IT Production Order Manager, SIMATIC IT Material Manager, SIMATIC IT Messenger Manager, SIMATIC IT Historian, SIMATIC IT Unilab, and SIMATIC IT Interspec.

**SIMATIC IT Strengths & Challenges**

SIMATIC IT possesses many unique strengths. Its adherence to the ISA-95 standard makes it one of the most advanced offerings in this regard. Its integration with SIMATIC BATCH and the SIMATIC PCS 7 system is also unique among process industry suppliers. SIMATIC IT’s modularity and flexibility are also a strength. For hybrid industries, Siemens expertise in discrete automation combined with its process and batch systems expertise and SIMATIC IT make Siemens the only supplier to provide an integrated offering in all areas of batch process automation.

If Siemens is to continue to build its presence in production management, however, it must look not only to its place as part of an integrated TIA and SIMATIC solution, but also to its relationships with third party solutions.
providers and suppliers to adopt SIMATIC IT as a preferred production management platform.

**SIMATIC PCS 7 Provides Integrated Safety Solution**

Siemens is in a unique position in the market for safety and Critical Condition Management (CCM) because it is one of the few companies that has expertise in both machine safety applications and process safety. Through its close involvement with PROFIBUS, Siemens is also one of the few companies that can offer standard networking solutions for both process and discrete safety applications.

Siemens’ approach to safety is high availability yet integrated. The company approaches its philosophy on safety systems in much the same way it has with process automation systems. The approach is based on international standards, specifically the IEC 61508 and IEC 61511 standards.

In addition to providing the system, Siemens provides a full scope of services, from assistance with the overall planning and execution of the safety system from an operations, maintenance, validation, installation, and commissioning standpoint. Siemens consultants provide safety analysis according to IEC standards.

Siemens has a long history in the safety systems marketplace, starting with the SIMATIC S5-110F platform in 1980 through the QUADLOG platform acquired along with Moore. Today, Siemens’ flagship safety system platforms include the S7 400FH and S7 300F, along with the Safety Matrix cause & effects analysis software package, as well as a series of I/O, actuators, and sensors that are PROFIBUS-compatible and PROFIsafe compliant. Siemens also continues to supply and support the QUADLOG system.

**Separate Yet Integrated Safety and Process Control**

Siemens process safety system platform for the future is the SIMATIC S7 400F platform. The 400F Series controllers are TUV-certified, handle applications up to SIL 3 in a simplex or completely redundant configuration, and are compliant with the IEC 61131 standard. Failsafe communications are
provided over the PROFIBUS network via PROFlsafe, PROFIBUS DP and PROFIBUS PA.

Similar to Siemens’ Batch and CPM platforms, S7 400F is also tightly integrated with the SIMATIC PCS 7 platform, which includes automatic data transfer from the SIMATIC PCS 7 Engineering Station. Both standard and failsafe programming can exist concurrently in the system. The system fulfills ARC’s CCM vision of “separate yet integrated”, where the safety system is logically separated from the process automation system, but both are integrated into one system. Standard and fail safe programs can be run in a single control system environment, and communication with failsafe I/O modules is accomplished through PROFlsafe.

The system is flexible in terms of configuration and scalability. Simplex I/O configurations all the way up to redundant switched I/O are available. As is the case with SIMATIC PCS 7, scalability is essentially unlimited. The CPU itself features embedded safety mechanisms such as redundancy, local program execution, and two independent hardware timers. The ET 200M failsafe I/O incorporates redundant circuits and a redundant disconnection facility. Configurations with redundant CPUs are also available. Safety and standard I/Os can be mixed in the system. All of the CPU and I/O modules are able to achieve a SIL 3 rating non-redundantly, removing the typical degraded mode of operation that is seen in many safety systems today.
Safety Matrix Provides Advanced Failure Analysis

Developed by engineers from the Moore Products side of the business, Safety Matrix reduces human error and cuts costs by automating cause and effect analyses. The simple cause and effect analysis provided by Safety Matrix can automatically generate CFC code for the safety controller. Safety Matrix software components include Safety Matrix Engineering Tool, Safety Matrix Viewer, and Safety Matrix Editor.

Safety Matrix provides automatic integration of cause and effect logic into any SIMATIC project. The online control function is based on a dynamic and graphic representation of cause, effect, and intersections. The system also features an automatic report function for reviews, maintenance operations, and system modifications. Safety matrix features parameterization, engineering visualization, code generation, documentation, report generation, and automatic change management. Some of the benefits of the system include reduced development effort and translation errors, management and verification of configuration, and simplified documentation. The safety matrix adds many of the measures needed by users to comply with the IEC 61511 safety standard.

Safety System Strengths & Challenges

Siemens’ ability to provide safety solutions for both the process and discrete industries is unique, as is the integrated architecture of the S7 400 F platform with SIMATIC PCS 7. Similar to its DCS business, however, Siemens must think like a small company and aggressively build its installed base of safety systems to take a position as one of the dominant suppliers worldwide. This depends on successfully leveraging its installed base of QUADLOG customers around the world, particularly in North America. Siemens must also strive to offer a compelling value proposition for its integrated architecture under TIA and SIMATIC PCS 7.

Siemens Process Business Strengths & Challenges

Siemens is rapidly emerging as one of the top process automation players in the worldwide market and particularly in the North American market. If previous growth in the business is any indication, the company will con-
continue to grow its business in key areas of process automation at a rate that is well above the market average. The focal point for growth for Siemens’ process business is the SIMATIC PCS 7 system, which has now reached the level of a “bulletproof” and fully scalable system on par with any other system available on the market today.

This is evident in many of the new contracts the company has won, including being once again placed on the preferred vendor list of major end users, such as BASF, and being selected by Air Products for a five-year global alliance for all components of Siemens process automation and safety (DCS, PLC, HMI and PROFIBUS-based fieldbus). As long as Siemens keeps up with its promised release schedule and continues to develop the system, SIMATIC PCS 7 will continue to perform well in the marketplace and capture market share.

Siemens must continue to build on market awareness and communicate its message to existing and potential clients. Siemens still suffers from an image portrayed in the marketplace as a primarily discrete supplier. In ARC’s view, this is primarily due to its regional strengths in process automation being confined to the European market.

Siemens has made great strides in building a presence in key markets such as North America through the Moore acquisition and Japan through the Fuji alliance. Siemens is gradually building key clients in regions outside of Europe, but simply having distribution channels is not enough. The company must particularly build up its solutions expertise in its emerging regional markets and convince users that they provide not only products, but also value-added engineering services and support.

Providing solutions is done through cooperation between the A&D and I&S business units within Siemens. The formation of the Process Solutions business was a crucial step toward combining the capabilities of the two businesses, and Siemens must continue to build on its solutions business and expand its regional capabilities. Where appropriate, Siemens must also be agile enough to bring in expertise from its other business units to pro-
vide solutions that span across the supply chain, which is the primary goal of the TIA architecture.

Building a market presence, however, is not solely a matter of Siemens leveraging its internal resources. Siemens is making strides in the process side of the business to break out of its traditional role as a monolithic solutions provider. Its efforts to build relationships with third party solution providers, software developers, and other automation suppliers have increased considerably in the past year, and will continue to be a key strategic focus for the company in the coming years.

Two of Siemens’ key differentiators are its ability to bring together process and discrete automation under a single control environment, as well as its philosophy for ownership of core system technologies. Siemens is not a PLC supplier entering the world of DCSs, nor is it a DCS supplier entering into the world of PLCs. It has years of experience in the arenas of both process and discrete control, and its ability to bring both worlds together in a single environment under the TIA and SIMATIC umbrella is unique. Building upon this are Siemens’ offerings in batch and safety control, as well as its expertise in automation networks. From the perspective of technology direction, SIMATIC PCS 7 conforms closely to ARC’s CPAS model, and has rapidly advanced its technology position in the marketplace.

A particular area where Siemens is advancing is in the realm of production management through the SIMATIC IT MES- business and its corresponding framework. Standards are embraced here as well, and SIMATIC IT demonstrates a deep understanding and corresponding offering for meeting the ISA-95 standard.

PROFIBUS is the key to Siemens common communication infrastructure, and its expertise in both device networks for discrete applications and process fieldbus, gives it an edge. Critical to Siemens’ success in this regard, however, is the successful adoption of PROFIBUS as a standard network architecture outside of its core installed base in Europe. Siemens is doing this, and has developed several large PROFIBUS installations in North America in the past few years.
ARC’s position on process fieldbus has always been to support international standards. PROFIBUS meets the requirements of the IEC fieldbus standard and incorporates standard underlying technologies such as Electronic Device Descriptions (EDD). Users must evaluate process fieldbus not only for the soundness of the underlying technology, but also for the business value proposition it presents and the return on investments and assets it provides.

Ethernet is rapidly becoming the networking technology of choice for automation systems at the control level, and its penetration to the device level is on the horizon. Siemens was one of the first suppliers to adopt an Ethernet-based solution through its Industrial Ethernet, and the company has a strong base of networking expertise to draw on not only from A&D and I&S, but also from its Communications Networks business.

As one of the few suppliers that can successfully compete in the control hardware business, Siemens must be vigilant and continue to ensure that this business remains profitable for them in the future. Siemens must also continue to look to its legacy system business, which goes beyond the issue of hardware support to providing software and service support and a stepwise migration path. Siemens already has the resources to support the legacy hardware side of the business, since they have been doing it for years with its own legacy Teleperm business. It must continue to do the same with its APACS and QUADLOG systems.
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Acronym Reference: For a complete list of industry acronyms, refer to our web page at www.arcweb.com/Community/terms/terms.htm

AI  Artificial Intelligence  ERP  Enterprise Resource Planning
API  Application Program Interface  HMI  Human Machine Interface
APS  Advanced Planning & Scheduling  IT  Information Technology
B2B  Business-to-Business  LAN  Local Area Network
BPM  Business Process Management  MIS  Management Information System
CAGR  Compound Annual Growth Rate  MRP  Materials Resource Planning
CAS  Collaborative Automation System  OLE  Object Linking & Embedding
CMM  Collaborative Manufacturing Management  OPC  OLE for Process Control
CNC  Computer Numeric Control  PAS  Process Automation System
CPG  Consumer Packaged Goods  PLC  Programmable Logic Controller
CPAS  Collaborative Process Automation System  PLM  Product Lifecycle Management
CPM  Collaborative Production Management  ROA  Return on Assets
CRM  Customer Relationship Management  ROI  Return on Investment
EAI  Enterprise Application Integration  RPM  Real-time Performance Management
EAM  Enterprise Asset Management  SCE  Supply Chain Execution

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