

ARC WHITE PAPER

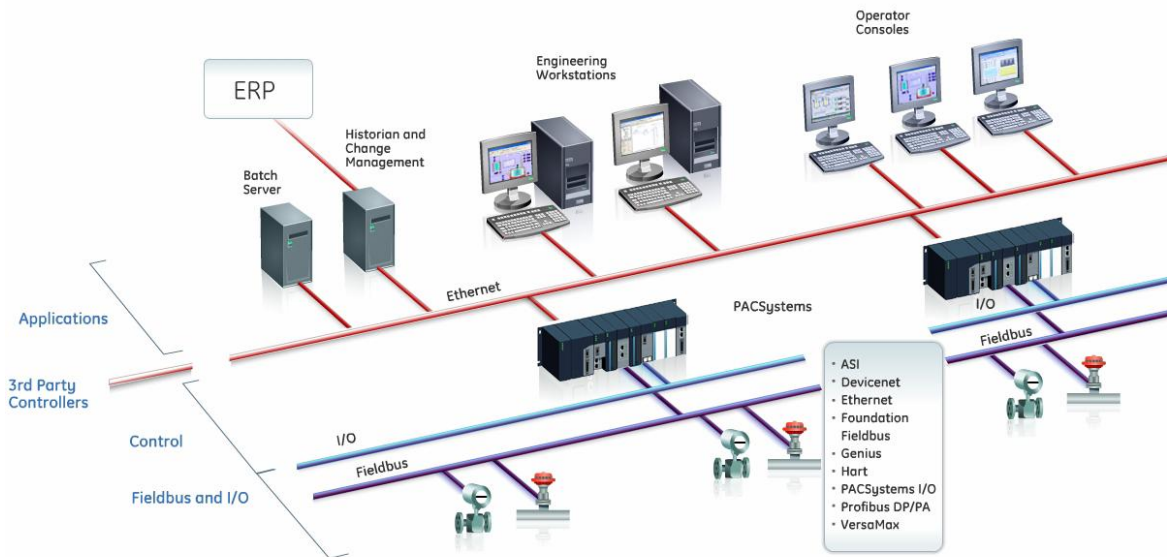
By ARC Advisory Group

FEBRUARY 2008

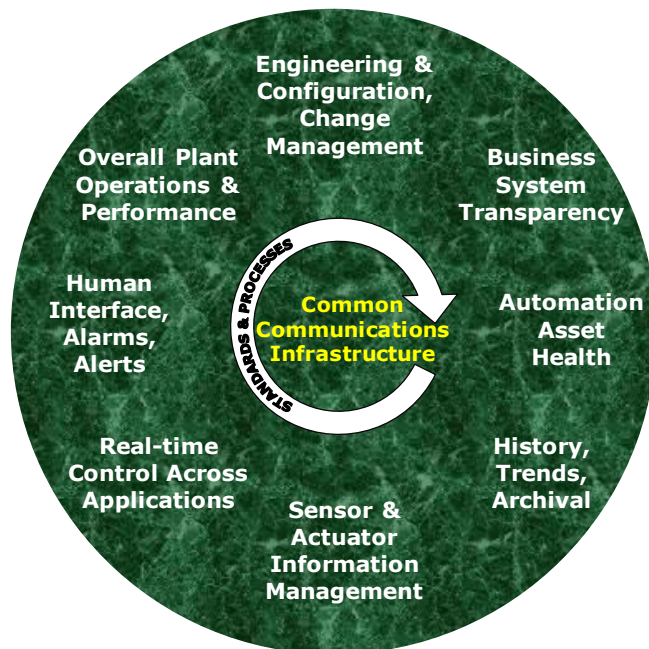
GE Fanuc's Proficy Becomes Reality for Collaborative Process Automation

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GE Fanuc Combines their Expertise in Control, Visualization, Production Management, & Batch to Create a Collaborative Production System



Functional Requirements of Today's Collaborative Production Systems

Executive Overview

There have been many forks in the road toward a truly open and collaborative framework for automation. This is primarily because automation and production management systems have sprung out of different islands of

It is a significant competitive advantage for an automation supplier to offer an open and collaborative production environment that embraces standards and can address the full scope of automation and control applications from process to discrete and motion applications.

functionality in the manufacturing enterprise. The need for the open and secure access to data across the manufacturing enterprise has driven the creation of a single environment where these applications can coexist and share information with each other, but there is little agreement as to how this common environment should function or the technology it should be based on. In ARC's view, the environment must embrace standard technolo-

gies, work processes, and best practices wherever possible to ensure the widest range of choice for the end user and to ensure a path toward open development, away from the proprietary standards and technologies that are the legacy of yesterday's automation systems, and a primary source of additional lifecycle cost.

End users are under increasing pressure to respond to competition, meet regulatory requirements, and drive innovation. For any automation supplier, the need for an open environment must be supplemented by a fit for functionality approach that addresses specific vertical industry expertise. This is particularly true for manufacturers in the hybrid space of process automation, where continuous and batch processes intersect significantly with high speed discrete processes such as motion and packaging.

It is a significant competitive advantage for an automation supplier to offer an open and collaborative production environment that embraces standards and can address the full scope of automation and control applications from process to discrete and motion applications. Just as important, however, is the ability to provide an open framework for production management or MES applications that allow truly transparent access to data from multiple applications in a contextual manner that provides the right information to the right people whenever it is needed, regardless of where it resides in the system. GE Fanuc has combined its long time expertise in real time control applications with its production management and HMI capabilities to produce such as system. Proficy Process Systems plays well against many of GE Fanuc's strengths to produce a collaborative produc-

tion environment that is cost effective, standards-based, and addresses the requirements of hybrid manufacturers.

Proficy Process Systems is more than just GE Fanuc's answer to a collaborative production system. It is the foundation of an approach to process automation that can provide much more. GE Fanuc's capabilities in areas such as condition monitoring, advanced process control, environmental monitoring, and even wireless technology all provide promising synergies that the company is developing to become a true global player in process automation.

Collaborative Production Systems are a Foundation of Operational Excellence

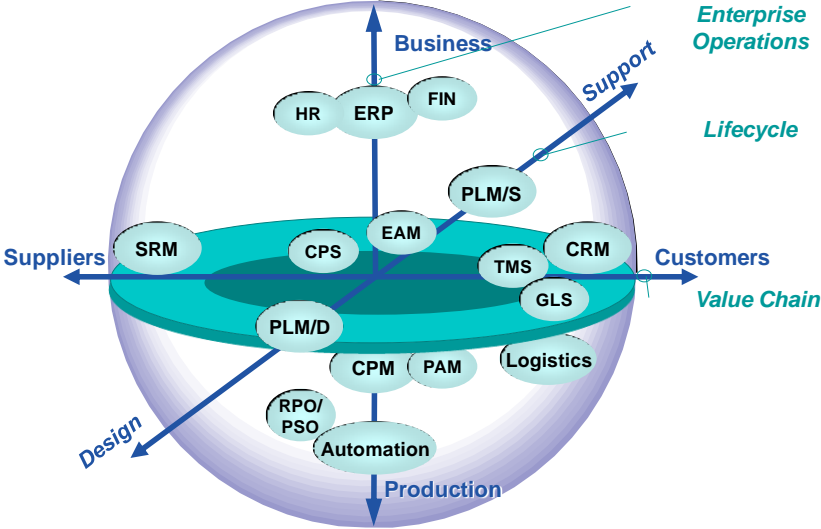
Barriers to information still exist between automation systems and operations management and enterprise systems. End users should consider the impact that these barriers to information have on productivity, business opportunities, lifecycle costs, and the realization of a strategy for operational excellence

ARC's CPS model highlights the need for collaboration and integration among the domains of automation and operations management. Working together, these domains form a framework for operational excellence in the manufacturing industries.

in today's plants and factories. Automation suppliers need to move to a single environment where the automation system, spanning all realms of control disciplines from process to discrete automation and motion control, interacts with operations management applications.

Whether one wants to characterize it as driven by the "Flat World", globalization, or increased connectivity through the Internet and related technologies, the increased speed and agility of today's global manufacturers have created the most competitive environment in history. Information, ideas, and currency are being exchanged at the speed of light. The networks that facilitate these exchanges are evolving to become more and more complex and difficult to manage. Amid all of this, manufacturers need to enhance their speed and agility to respond to customer demands, regulatory pressures, competitors, and shareholders. At the same time, product variety has increased dramatically, placing greater demands on manufacturing and automation. Take the simple example of milk products, where there were roughly 20 different varieties of milk drinks available in 1970 compared to almost 250 today.

It would be a rash overstatement to say that the old, traditional world of automation and operations management has been an enabling force for driving agility and speed among manufacturers. For example, in the process and hybrid industries, material flows through pipes, vessels, and tanks. Products are created and managed at the molecular level. Systems, software, and devices that control these real time processes have long been regarded as separate, sacrosanct domains from the non-real-time world of



ARC's CMM Model Illustrates Relationships Between Primary Domains of Functionality in the Entire Manufacturing Enterprise

operations management functions that dictate planning activities, production schedules, and other realms of operations management (also known by the inaccurate designation of "MES"). Even the realm of plant design and engineering, which can provide valuable data to production systems, was regarded as a separate domain.

If one counted the number of hours spent, the amount

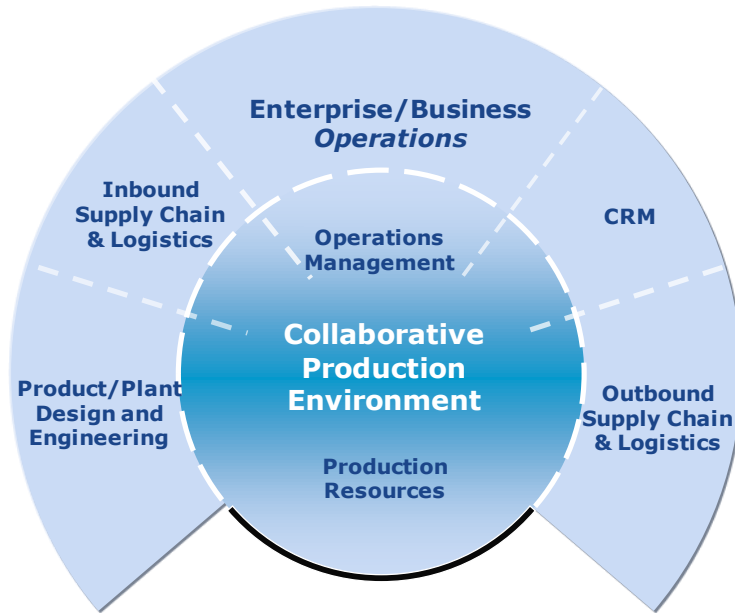
of custom code generated, and last but not least, the amount of money spent by manufacturers trying to tie these worlds together, the figure would be staggering, well into billions of dollars. Manufacturers can no longer afford to deal with this, as the economic concerns of the enterprise have foreshadowed the concerns of technology. End users are faced with issues such as preserving capital assets and extending their life, increasing asset utilization, maximizing operational effectiveness, reducing fixed costs, minimizing variable costs, and empowering their workers to make it all happen.

In the past decade, however, we have witnessed a wholesale collapse to these barriers to information. The first major step toward this in the world of automation systems was probably the adoption of Ethernet-based control networks and commercial off the shelf hardware, components, and operating systems. The adoption of standards also played a role in the openness of systems, from OPC UA, ISA95, ISA88, to IEC 61131-3 and others, standards have greatly improved the way systems communicate and provide users with flexibility, choice, and predictability.

ARC has developed many models to illustrate the collapse of barriers to information and the openness of systems and applications. ARC's Collaborative Manufacturing Management (CMM) model provides a roadmap to operational excellence on a high level throughout the manufacturing enterprise, but its focus is not specifically on automation or operations management. Other ARC models, such as the Collaborative Process Automation Systems (CPAS), Programmable Automation Controllers (PAC), and others focus on some specific aspects of these requirements, but do not articulate the collapse that we have witnessed between operations management and automation along with the broadening scope of plant-wide automation and how this has affected the traditional, hierarchical model of automation that many of us are familiar with.

CPS Brings Context and Provides a Starting Point for Discussion

While CMM is a good way to articulate the various relationships between primary domains of functionality in the manufacturing enterprise, it does



ARC CMM Model Showing Collapsing of Boundaries between Production and Enterprise Systems

not delve deeply enough into the relationships between automation, operations management, and engineering and design in the process, hybrid, and discrete industries. A different kind of view and a more explicit model was required to show the growing integration of the real time world of control applications with the transactional world of operations management, engineering, and design. For this purpose, ARC has developed a model for Collaborative Production Systems (CPS), which clearly illustrates the increasingly collaborative relationships between these domains and how they interact with the rest of the manufacturing enterprise in a non-hierarchical manner. It is not intended to suggest that manufacturers need a single monolithic system for their production ecosystem. More importantly, CPS starts as a high-level

systems (CPS), which clearly illustrates the increasingly collaborative relationships between these domains and how they interact with the rest of the manufacturing enterprise in a non-hierarchical manner. It is not intended to suggest that manufacturers need a single monolithic system for their production ecosystem. More importantly, CPS starts as a high-level

abstraction to illustrate common concepts among different industries, and then becomes more granular and refined to suit the needs of specific industries, from process and hybrid industries to discrete manufacturing. In the process and hybrid industries, the relationship between operations management and automation is at the forefront, while issues such as Product Lifecycle Management (PLM) and Digital Manufacturing are going to take center stage for discrete industries such as automotive.

The breakdown of barriers between automation and operations management has been evolving for some time. Automation suppliers must move

For the process, hybrid, and discrete industries, full realization of the CPS model would include a single system infrastructure that encompasses all types of control, from continuous process, batch, logic, and motion control. This full spectrum of control functionality would exist in the same common infrastructure alongside the operations management applications, all sharing a common adoption of standards and work processes.

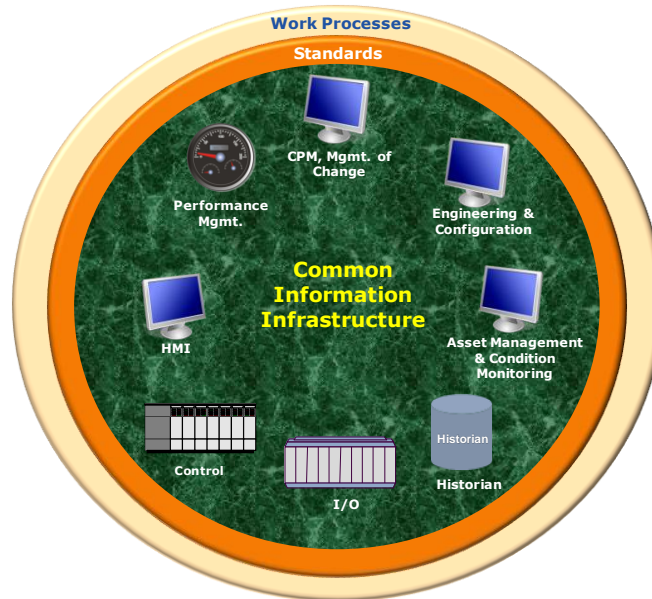
to a single environment where production management applications such as plant asset management, performance management, and scheduling can plug seamlessly into the same communications infrastructure and environment as the basic control system functions, including HMI, system engineering and configuration, and control. For the process, hybrid, and discrete industries, full realization of the CPS model would include a single system infrastructure that encompasses all types of control, from continuous process, batch, logic, and motion control. This full spectrum of control functionality would exist in the same common infrastructure alongside the operations management applications, all sharing a common adoption of standards and work processes.

Decomposition of CPS Model and Linking to CPAS Principles

The CPS model also makes a good starting point for decomposition into the specific requirements for the process, hybrid, and discrete industries. One can easily overlay the principles embodied in the ARC Collaborative Process Automation System (CPAS) model into the CPS space, where principles such as a single control hardware infrastructure, single HMI, single historian platform, and open environment for production management applications all coexist and access to data is facilitated by a common information infrastructure.

The CPS model emphasizes the elimination of barriers to contextualized, role-based information. The value of information in a real-time enterprise is directly proportional to the number of people using it to collaborate and the period in which the information is made available. The CPS model also

highlights the need for enhanced collaboration, whether the collaboration is between Corporate IT and automation groups or other disciplines such as engineering and operations.



CPS for Process Provides a Common Information Infrastructure and Open Access to Data across Applications

There are aging systems out there that are nearing their end of life. The people who knew how to run and operate those systems are retiring. There is a need to update systems that can be managed and maintained by the new workforce and to take businesses successfully forward for the next 10 to 15 years. It is no longer very effective to update or maintain a single controller at a time. Businesses are looking to tie their control systems into their business information systems, but to do so intelligently. The CPS model can help them define their path to success.

Proficy Process Systems: A Path to CPS

It was GE Fanuc’s expanding reach into the process and hybrid automation space that made Proficy Process Systems possible. The company has expanded significantly from its roots as a PLC supplier. During those two decades, GE Fanuc grew and evolved, both organically and through its acquisitions such as Total Control Products, CimWorks, DataViews Corporation, AFE Technologies, Computer Dynamics, VMIC, Intellution,

SBS, Condor, and Radstone. These acquisitions extended GE Fanuc's reach significantly, requiring a new name to reflect the company's full portfolio products and solutions accurately.

End users have recognized the impact that eliminating these barriers to information can have on their productivity, business opportunities, lifecycle costs, and the realization of their strategy for operational excellence.

GE Fanuc is no stranger to the process and batch automation markets either. The majority of the company's sales are to the process industries such as food and beverage, pharmaceuticals, consumer products, oil and gas, and power and energy.

Evidence of GE Fanuc's expanding reach into process and hybrid automation is reflected in the company's name change to GE Fanuc Intelligent Platforms, which occurred in late 2007. Tying together the company's business of GE Fanuc Automation, CNC and Embedded Systems, the name change was driven to accurately represent to their customers and the marketplace who they are and what they do.

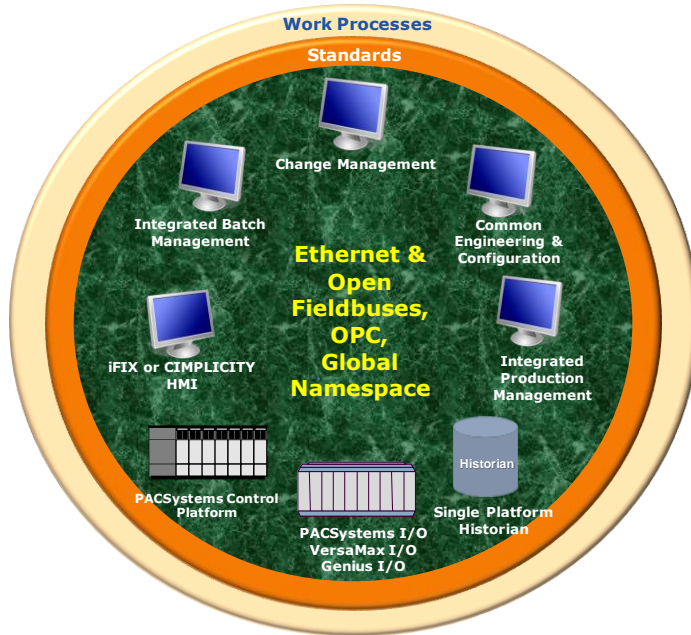
Proficiency Process Systems: GE Fanuc's Vision for a CPS

The name change to GE Fanuc Intelligent Platforms certainly coincides with the collapsing of the barriers to information between automation systems, operations management and enterprise systems outlined in ARC's CPS concept. End users have recognized the impact that eliminating these barriers to information can have on their productivity, business opportunities, lifecycle costs, and the realization of their strategy for operational excellence. This trend will drive end users to seek relationships with suppliers who share a true vision for a collaborative production system (CPS), and have structured their companies to deliver solutions that support the breakdown of barriers between automation, operations management, and the enterprise.

Many have speculated on when GE Fanuc would make a serious play for the process automation marketplace after the company and its parent GE embarked on a series of automation related acquisitions over the past several years, such as the acquisition of Intellution in October 2002. Prior to its acquisition by GE Fanuc, Intellution generated the majority of its revenues from process industries such as food & beverage, life sciences, consumer products, and water and wastewater.

GE Fanuc now had essentially all the building blocks necessary to make a serious play for the process automation system marketplace, including a solid offering for production management and batch applications, operator interface capabilities, historian, a full suite of Ethernet-based open networking technologies, and of course a control and I/O platform. GE Fanuc is now approaching the process automation market with a full-scale offering that provides a vision for a collaborative production system.

GE Fanuc Intelligent Platforms launched Proficy Process Systems, in June of 2007. The Proficy Process System provides a fully integrated system with



Proficy Process Systems is GE's Answer to a Collaborative Production System

the goal of providing customers with improved quality and reliability, increased throughput, performance and efficiency, and reduced total cost of ownership. GE Fanuc's vision with Proficy Process Systems is provide a hardware and software infrastructure that offers the benefits of both traditional DCS and PLC/HMI systems, without many of the historic limitations of those approaches. GE Fanuc's multi-disciplined PACSystems controllers can handle process, discrete, and motion control, applications giving users flexibility in their control system.

GE Fanuc's Proficy software technologies empower users with visibility, analytics, and connectivity throughout their enterprise. The HMI/SCADA and Historian technologies, coupled with Batch and a complete Production Management suite, allows customers to finally close the gap between automation and information. All of this exists within an open communications framework that is based on industry standards and facilitates the sharing of data throughout the manufacturing organization.

PACSystems Provide a Single Platform for Process, Discrete, & Motion Applications

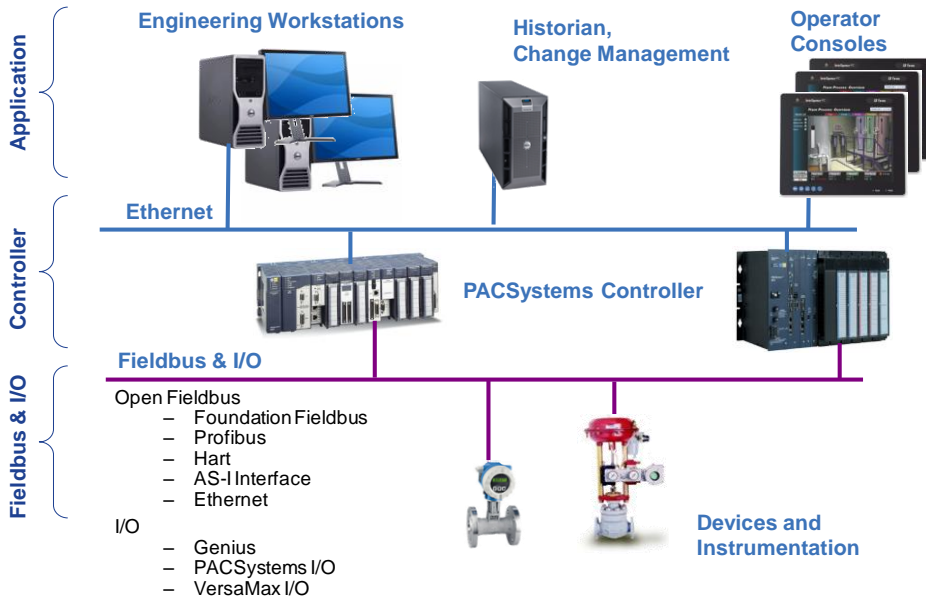
The foundation for Proficy Process Systems is the single, open control platform in the form of PACSystems controllers -- multi-disciplined controllers that allow end user can run process, discrete, and motion applications in the same controller simultaneously. Whether the end user has a process control application that requires function block programming or high speed packaging application that requires ladder logic, both applications can be run in the controller at the same time.

Being able to use the same controller across an entire plant or facility can lower the end user's total cost of ownership by reducing training time, maintenance, spare parts, and increasing uptime and availability. PACSystems controllers are VME64 based, and support all standard VME based modules, yet operates at 4 times the bandwidth of standard VME.

PACSystems controllers are available in two configurations - the RX7i and RX3i. The PACSystems RX3i is an integrated Programmable Automation Controller (PAC) solution that can address applications in the discrete and

hybrid domains. The PACSystems RX7 offers more power, memory and bandwidth to handle mid to high-end applications. Another key feature that makes PACSystems different is a common engine that is used in both the RX7i and RX3i that provides for consistent deterministic control. Both controllers are capable of running process, discrete, and motion applications. Programs that are created in one

can easily be moved to another. The end user can start with an RX3i, and as the system grows and expands, switch to an RX7i without having to reprogram the system.



Proficy Process Systems Architectural View

Highly Scalable Architecture

The architecture of Proficy Process Systems is highly scalable in both system size and functionality, allowing users to implement applications of any scope cost-effectively. It is easy to grow and expand the system by simply adding the operator consoles as needed. Because the data from the controllers is broadcasted via the global namespace, there is no additional network load for adding operator consoles. This means less network traffic compared to other systems. Proficy Process Systems also supports thin clients to further reduce total cost of ownership.

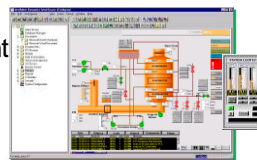
Support of Third Party I/O and Controllers

Proficy Process Systems supports a range of I/O offered by GE Fanuc, including PACSystems I/O, VersaMax I/O, and Genius I/O. Because of the system's strong roots in the HMI marketplace, Proficy Process Systems can easily interface to most suppliers' I/O and controllers. GE Fanuc has also been a strong advocate of OPC and has one of the strongest OPC offerings in the process automation market today.

Flexible HMI Environment

The Proficy Process Systems' Operator Console provides a user-friendly environment for process operations and information access. In addition to state-of-the-art graphical components for process monitoring and control, the Operator Console also includes alarm monitoring and management tools for process and system diagnostics and troubleshooting.

- Process Visualization
 - Graphics for process status
 - Faceplates
 - Real Time and Historical Trending
- Process Supervisory Control
 - Set points
 - Recipe Downloads
- Alarm Viewing and Acknowledgment
- Change Management
 - Project Deployment



Proficy Process Systems offers a choice of visualization technology for hosting the Operator Console technology in the form of iFIX or CIMPLICITY. In 2007, GE Fanuc announced the availability of Proficy HMI iFIX 4.5, providing monitoring, control and data management for companies worldwide. This new version of the visualization

Proficy Process Systems Offers a full Suite of HMI Functionality

product addresses a wide range of customer-identified needs, including advanced reliability to improved ease of use, while adding more power and flexibility.

iFIX 4.5 supports operation on the Microsoft Windows Vista operating system. The software automatically adopts the latest operating system look and feel throughout all of its applications and dialogs. In addition to integration with its award-winning Proficy Change Management and Microsoft Windows Vista support, other major enhancements in iFIX 4.5 include dynamo versioning, multiple display instances, support for up to 200 clients connected to one HMI node, and improved OPC functionality and certification.

CIMPLICITY is based on open, distributed client/server architecture and provides plant wide data collection, distribution, and visualization to users across extended enterprises. The product is scalable and supports both symmetric multiprocessing architectures and multi-user systems. CIMPLICITY clients are Internet-enabled and provide platform independent visualization to wireless Windows CE-based operator interface devices. CIMPLICITY connects to enterprise-level systems to distribute production requirements to the shop floor and feedback production results.

Proficy Process Systems Supports Change Management

Automation solution suppliers that offer change management as part of their HMI software suite are providing manufacturers with a tool to enable seamless management and tracking of HMI software changes at the component and application levels, as well as specific change histories within the development environment. Change management software is a key component

The Proficy Process Systems Engineering Workstation contains a Change Management client, which is responsible for providing version control and an audit trail of configuration changes.

in enabling synchronization between all levels of the plant, and plays a key role in standardization and collaborative operations management, which aids in transparency across business levels. Interoperability also puts change management software in a critical role, managing a multitude of software in need of upgrade due to security, monitoring, and optimization.

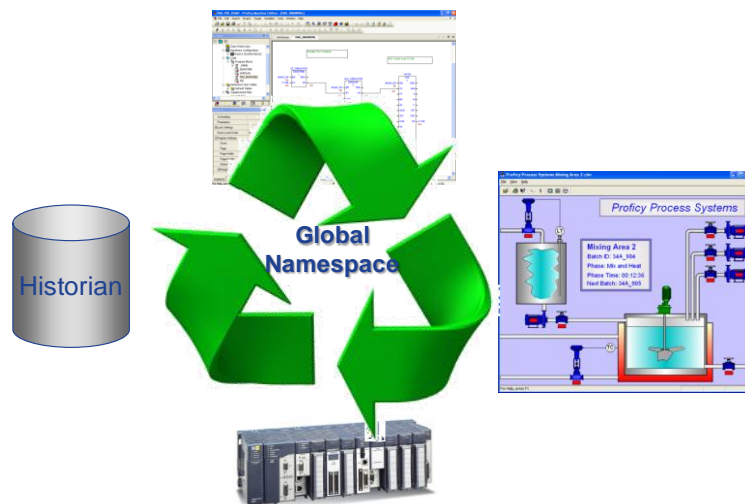
The Proficy Process Systems Engineering Workstation contains a Change Management client, which is responsible for providing version control and an audit trail of configuration changes. The Change Management Server provides security control for configuration and is responsible for tracking the configuration changes received from the engineering workstations. As engineers' checkout their control drawings or operator screens, Change Management keeps track of the previous versions of the configurations as

well as the new changes. If you ever need to restore or revert back to a previous configuration, change management enables the end user to easily do so.

Global Namespace Allows Points to be Referenced throughout System

One intriguing thing about Proficy Process Systems is the ability to do plant wide control in a single namespace environment. Process control and PID functionality is available in the same programming and configuration environment as discrete and motion control functionality. GE Fanuc's approach of a global namespace, combined with a system that is designed to provide scalability from very small systems to larger systems in an environment

that is totally network-neutral and offered at a value price point, is a competitive advantage for the company.



Global Namespace Provides Real-Time Data Broadcasted from the Controllers & Received by Each Console, Including Process Data & Process Alarms

Global Namespace provides real-time data broadcasted from the controllers and received by each console, including process data and process alarms. Proficy Process Systems alarms, for example, are generated directly in the controller and sent to the consoles through the Global Namespace. Because each console receives the data and alarm information independently,

there is inherent redundancy in the architecture. When the Logic Developer is used to create control logic, it also generates a global namespace. When the point is created in the logic, it then becomes part of the Global Namespace and available to be referenced throughout the system, including in graphics or by the Historian.

Ethernet Global Data Provides Standard Control Network

The Global Namespace along with Ethernet Global Data (EGD) and Ethernet provides for common data communications for the system. Ethernet Global Data is a technology that was developed by GE Energy and GE Fanuc to enable high speed, reliable communications between computer

systems and controllers. Information is broadcasted on the Ethernet and received by all interested recipients. EGD server can be local to the Engineering Workstation, or it can be in a remote machine. This “configure once” aspect of the Proficy Process System greatly simplifies the creation, maintenance, and operation of the system and GE Fanuc claims it can cut development times by as much as 40 percent over traditional systems.

Continuous Control Programming via Function Block Diagramming

Within the Engineering Workstation, the Process System Logic Developer is used to control strategies. It provides a flexible choice of languages for programming the controllers. In addition to Function Block Diagrams, the Logic Developer also supports IEC languages such as structured text (ST) and standard ladder logic for high-speed discrete applications like packaging. End users can create and define their own function blocks using Structured Text, Ladder Logic, or Function Blocks. This allows users to take specific knowledge and embed it as a reusable component in the system. This feature is particularly valuable to integrators and OEMs because it allows them to lock their intellectual property in function blocks that their customers can easily use. Proficy Process Systems also provides an Advanced PID block, which consists of both of Feedback Control and Feed Forward Control. It supports adaptive tuning where you can change the setpoint into the PID.

Scalable Historian

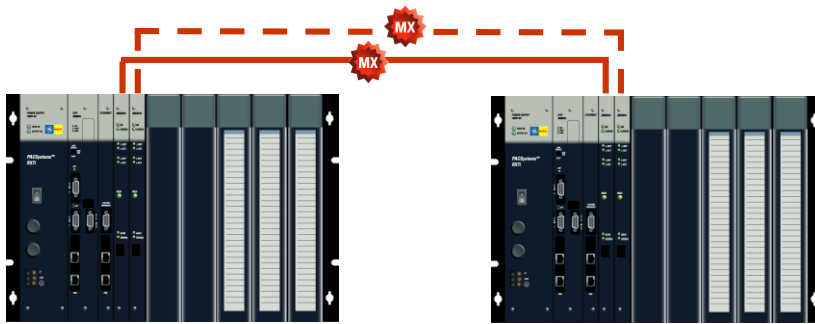
Proficy Process Systems offers a scalable historian that grows as the system grows. The historian is designed specifically for handling process data and provides high performance storage & retrieval with sub-second collection and millisecond time stamping through the Global Namespace. The historian has the ability to handle 20,000 events per second for both read and write. Data is fed into the historian by an EGD OPC Server through the Historian OPC Collector. The historian offers functions such as trending and a Microsoft Excel add-in that allows users to extract the historical data easily into a spreadsheet for detailed analysis.

Control Memory Exchange is Facilitated by GE Fanuc Embedded Solutions

Proficy Process Systems features Control Memory Exchange, a technology that GE Fanuc incorporated from its Embedded Systems business. Through high-speed fiber optics, Control Memory Exchange allows data in one con-

troller to be exchanged and shared with another controller at a rate of over 2 gigabaud. Essentially, it provides “Shared Memory on a Wire” for truly distributed control. This allows end users to synchronize controllers for distributed control, or reflect the memory state of one controller to another for redundant operations.

This provides the end user with several key benefits. It allows the end user to move large amounts of data in one command, in real-time, and to coordinate control between processors. It also provides users with the freedom



Control Memory Exchange Allows Data in One Controller to be Exchanged & Shared with Another Controller at High Speeds

to design distributed control systems that are easier to build and maintain. No message protocol is required, allowing the user to simply write or read data between controllers. Control Memory Exchange is also a good solution

for applications that require redundant controllers. Users can reflect the entire data state from one

controller to another, also known as Reflective Memory Exchange. Should a problem arise in the primary controller, the secondary controller can instantly take over with the full and current state of the process.

Target Industries

GE Fanuc Intelligent Platforms is specifically targeting a range of industries

GE Fanuc Intelligent Platforms is specifically targeting a range of industries for Proficy Process Systems. Aside from the Pharmaceutical, Food & Beverage, and Consumer Products industries, GE Fanuc is also targeting sectors such as Ethanol, Power, Water & Wastewater, and Oil &

for Proficy Process Systems. Aside from the Pharmaceutical, Food & Beverage, and Consumer Products industries, GE Fanuc is also targeting sectors such as Ethanol, Power, Water & Wastewater, and Oil & Gas. In ARC’s view, these sectors play best against GE Fanuc’s strengths in batch and hybrid control. GE Fanuc also has considerable expertise in specific

applications, including blending, fermentation, and LNG regasification.

Developing Synergies in GE Fanuc

GE Fanuc Intelligent Platforms took advantage of many of GE’s recent acquisitions in the development of Proficy Process Systems. As an option to

the system, the advanced multivariable control system from GE Energy via the Continental Controls advanced process control software acquisition can be added. The global namespace, which is inherent to the system, is jointly developed with the Turbine Control group. Some of the key visualization (iFIX) and batch (iBatch) technology derives from the Intellution acquisition, while elements of the Production Management/MES (historian, plant applications) technology come from the Mountain Systems acquisition.

Availability & Future Releases

Proficy Process Systems is available now, and GE Fanuc is going to continue to drive functionality into regular new releases of the platform. GE Fanuc is currently working on the 1.5 version release of the Proficy Process Systems product, which is due in April. This will add the capabilities for dynamic modifications to the EGD global namespace, update the system for iFIX 4.5 and provide Batch 5.1 on the installation DVD. GE Fanuc is planning for the next major release, version 2.0, which is targeted for fourth quarter of 2008.

Integrated Batch Capabilities Provide Flexibility

One of the key advantages of the Proficy for Process offering is the integrated batch management and execution capabilities. GE Fanuc's goal with its evolving batch strategy is to develop batch experts and consultants to provide customers with full support capabilities through partnerships with

Proficy Batch Execution Features

- ISA-S88 Equipment and Procedure Model
- Highly Modular and Flexible
- Scalable – Unit, Cell, Area
- Phase Logic Interface Function Block
- Sequence Function Blocks

process integrators. As part of its acquisition of Intellution, GE Fanuc obtained the Proficy Batch Execution batch control software, which began shipping in early 1997. Formerly called iBatch, the product features full integration with the Proficy for Process system, OPC support, full ODBC support, and Batch Integration Services (BIS), a Microsoft DNA model that enables integration with business level ERP systems.

Proficy Batch Execution follows ISA-88.01/IEC 61512-01 batch control models and terminology, and the IEC 61131-3 standard. The Proficy Batch Execution application seamlessly integrates with any OPC compliant SCA-

DA, PLC or DCS system, allowing OPC browsing to establish connection and automatic creation of tags.

Proficy Batch Execution delivers a graphical batch control environment that enables users to model plants, manage recipes, execute batches, create electronic batch records, and generate reports on any batch process. The product is targeted toward applications in the pharmaceutical, specialty chemical, food and beverage, and consumer packaged goods industries. An operator workflow component in Proficy Batch Execution enhances the cGMP capabilities, as well as adding critical functionality for meeting the requirements of 21 CFR Part 11.

The software addresses manual and semi automatic batch processes and is the company's solution for operator workflow control. The solution fully integrates operator workflow into a Proficy Batch Execution ISA-88 recipe. That allows generation of a single batch report that captures both the automatic execution of the batch, as well as the manual actions and data entries. The operator workflow control solution consists of three applications, the authoring tool for writing class-based work instructions, the work instruction server for managing and executing active work instructions, and the Client ActiveX control, which displays work instructions and allows the operator to interact with them.

Proficy Batch Execution delivers security, reporting, and recording capabilities, making the application suited for meeting the demands of the FDA and other regulatory bodies. GE Fanuc collaborates with independent consulting firms that provide solutions to FDA-regulated and mission critical pharmaceutical and biotech industries to provide support to its clients in meeting the FDA regulations. These independent review firms provide corporations with system development, validation services, enterprise solutions, quality auditing, and training. Major customers of Proficy Batch Execution are pharmaceutical, food, beverage, and chemical industries, followed by consumer goods.

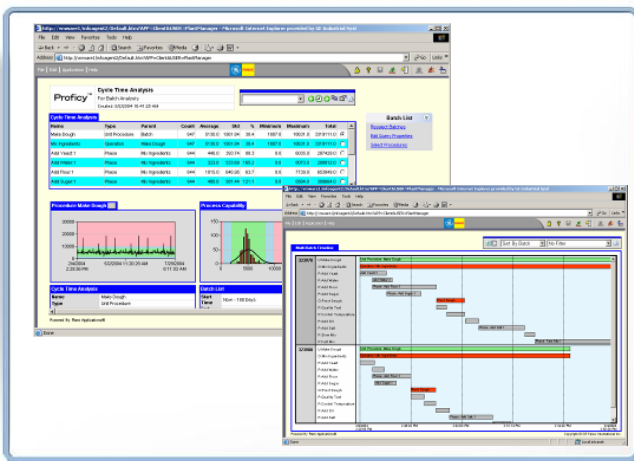
Proficy Batch Execution Version 5.1

GE Fanuc announced the release of the latest version of Proficy Batch Execution - Version 5.1 - in 2007. This release is highlighted by new features that focus on ease of use, performance, and system integration designed to improve customer productivity and reduce system operational costs. This version introduces a variety of features to simplify and improve the design,

maintenance, and operation of batch processes. Included in the release are a Tabular Recipe Editor, new ActiveX Controls, integration with the groundbreaking Proficy Process Systems, performance enhancements, and ease of use features.

Batch Execution 5.1 software also introduces a new ActiveX Control that simplifies the operation of the batch system. The control allows users to view the active phases of the recipes being executed, along with the key parameters that are being collected for each phase. The ActiveX control is designed to work in both GE Fanuc Intelligent Platforms Proficy HMI/SCADA - iFIX and Proficy HMI/SCADA - CIMPLICITY products, as well as other ActiveX containers. Other significant features include new driver support, enhanced tag templates, key quality parameters, recipe export to XML, and performance enhancements.

GE Fanuc also offers Proficy HMI/SCADA - CIMPLICITY and Proficy HMI/SCADA - iFIX, which provide solutions from simple unit-level operations to highly complex, multi-structured tasks in a network environment.



Batch Analysis Capabilities Allow Users to Find their “Golden Batch”

These solutions help companies define the procedures, process stages, operations, and actions to create a given set of materials in any of the process industries such as pharmaceuticals, specialty chemicals, biotechnology, food and beverage, consumer goods, petrochemicals, pulp and paper, and metals and mining.

Additionally, GE Fanuc offers Proficy Plant Applications (formerly Mountain Systems’ Proficy for Manufacturing), which enables production managers to gain clear insight into how products are actually produced so they can more efficiently manage their operations to

achieve peak performance. Increasing consistency and quality of batch related processes through a comprehensive set of analysis and reporting capabilities, the Batch Analysis module provides the necessary tools to drive production improvements. Using these solutions, end users can determine what their “golden batch” is and how to reproduce it.

Proficy for Process Systems’ tight integration of batch operations with the control systems provides greater consistency, adherence to ISA 88 standards, and greater repeatability. GE Fanuc’s strategy is to make ISA 88

simple to use and implement. There are many highly customized batch installations in the market that GE Fanuc can target with Proficy, and its scalability and ease of use make it particularly suited for many of the smaller batch applications on the market today. OEMs are another target market that can derive value from Proficy Batch solutions.

Collaborative Production Management Capabilities

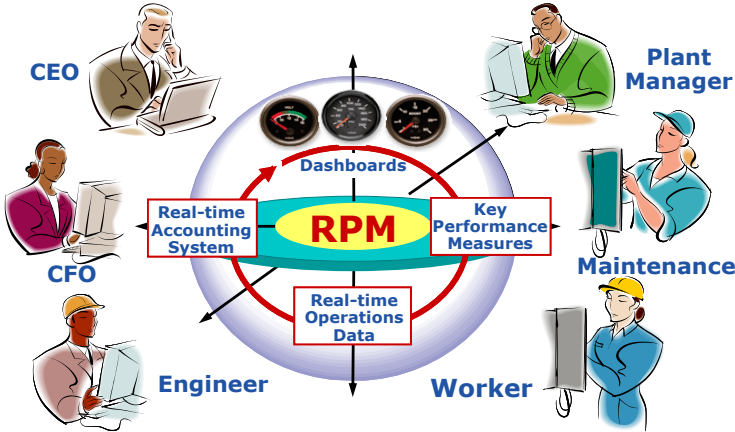
ARC defines Production Management as a broad class of applications that embody the tenets of CPS to enable collaborative manufacturing. Collaborative production management solutions are integrated software applications that support and manage production activities by coordinating all manufacturing data and information related to operations. Production management solutions provide manufacturers with the means to plan, schedule, track, analyze, and execute their operations on a continual basis through functionality such as workflow planning and management, plant and process modeling, recipe management, resource management, production optimization, and seamless integration with other applications. These applications are production-centric in the fullest sense, meaning that they encompass all of the functionality needed to operate and coordinate manufacturing operations.

Collaborative production management solutions represent a suite of applications that combine visibility into real-time production status with traceability and genealogy of manufactured products, performance analysis of production operations to identify trends and weaknesses, paperless management of production processes to reduce overhead, and operator instructions in the form of schedules, recipes, operating instructions, and batch records. The functions performed by production applications include: scheduling, resource management, dispatching, production execution, data collection, tracking, performance analysis, quality assurance, inventory management, management of change, security, compliance, plant data model, order management, etc.

Collaboration Thrives on Real-time Performance Functionality

Most organizations have implemented continuous improvement and operational excellence programs. These programs apply to all facets of manufacturing. Effectiveness, agility, and performance visualization are keys to operational excellence. Effectiveness is the result of combining the right decisions with the ability to perform the revenue producing activity profitably, and relates to highly efficient execution. Agility relates to periods where the plant or process needs to transition between states or make adjustments as opportunities present themselves.

Real time Performance Management is a concept and strategy that works hand-in-hand with operational excellence programs. Real-time performance management improves operational performance by collecting,



Real-time Performance Management Concept

analyzing, and visualizing financial, historical and real-time data to better monitor, control and change operations as needed to take advantage of opportunities, improve quality or reduce costs. The use of performance targets with operationally relevant cost allocation, event monitoring, and predictive capabilities empowers individual to make faster, more knowledgeable decisions. Ideally, real-time

performance management should support the natural workflow of people, plants, and business systems and incorporate a consistent set of data for long-term strategic planning, short-term tactical planning, and operational analysis.

Plant Floor and Enterprise Integration Vital

Companies, faced with the challenge of responding to rapidly changing markets and business opportunities need real-time information exchange between business and plant floor systems. A ubiquitous problem to the timely flow of information within an enterprise is the costly and difficult effort required to integrate disparate systems. There are still many facilities

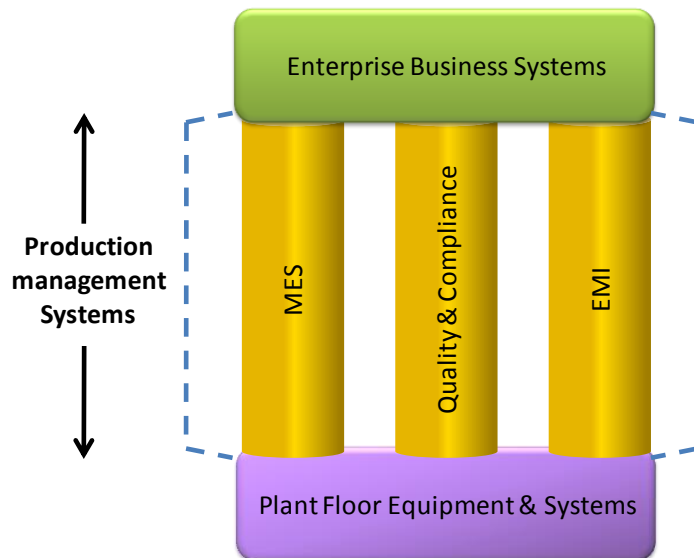
with plant floor systems that do not communicate directly with business systems dedicated to accounting, forecasting, and other resource planning activities. As a result, business systems are unaware of important manufacturing details such as the availability of equipment, materials, maintenance schedules, records of past process performance, product quality, or the status of work in progress. The lack of flow of information presents a barrier to performance improvement.

Quality and Compliance

In today’s competitive landscape of increasing competition and regulatory compliance, cost, product quality, and production efficiency can mean the difference between success and failure. Quality systems must be capable of detecting and identifying process variations that adversely affect quality and cost, improve asset utilization and reduce scrap, and trend and analyze quality data from shift-to-shift or line-to-line.

In regulated industry, collaborative production management solutions must address compliance issues such as the US FDA 21 CFR Part 11. The US FDA 21 CFR Part 11 is becoming the criteria upon which product quality or genealogy records functional requirements are being defined. It stipulates requirements for creating, maintaining, archiving, retrieving, and transmitting electronic documents and includes criteria for consideration of

electronic signatures to be the equivalent of full hand-written signatures. These genealogy or traceability records also include requirements for determining and documenting any corrective and preventative actions (CAPA).



GE Fanuc offer Rich CPM Functionality

GE Fanuc offers a variety of production management applications that adhere to the philosophy of ARC’s CPS model. The company’s production management applications facilitate collaboration through

tight integration of plant systems along with tight integration of plant and business systems. This permits improved information flow and visibility, enables real-time performance management, enhances continuous im-

provement and quality programs, and allows companies to better manage and execute their operations.

GE Fanuc's production management capabilities bridge the gap between business and plant floor systems. The company's Proficy Production Management System is a real-time enterprise solution that provides manufacturers with a wide range of applications and services based upon an open, scalable, and standards-based architecture. Proficy's focus is on continuous performance and agility improvement, visualization and control of production equipment and operations, and unified and standardized plant IT infrastructure.

GE Fanuc has designed its Proficy Production Management suite to integrate with manufacturers' existing systems. Built upon three functional architecture pillars of MES, EMI, and Quality & Compliance, Proficy enables closed loop information exchange with ERP systems. It also aligns with Lean and Six Sigma initiatives to facilitate gathering, analyzing, storing, and transforming data into real-time information. Proficy's performance management capabilities help companies to model production operations based on ISA 95 standards, track and execute production operations, and continuously monitor production productivity and performance by providing real-time visibility and intelligence.

Proficy Historian Provides Data Management Foundation

Proficy Historian is the foundation for intelligent production management. It provides a robust and effective plant data repository to collect, archive, and distribute large volumes of real-time, plant floor information quickly and easily. With its ability to read all types of process data, Proficy Historian provides a window into manufacturing operations across all key performance metrics.

The Proficy Historian is scalable and incorporates additional functionality in the enterprise edition including alarm and event management, advanced calculations, distributed data management, and enhanced high availability. Proficy Historian offers a wide range of client applications that help make business sense out of plant data – in real-time. These Production Management clients include Proficy Plant Applications (Efficiency, Quality, Production, and Batch Analysis), and Proficy Real-time Information Portal.

Proficiency Plant Applications

Proficiency Plant Applications are scalable modules that create a digitized virtual plant for monitoring and executing production objectives. Components of Proficiency Plant Applications enable workflow management, asset management, performance management, production execution, batch management and execution, quality management, tracking and tracing, efficiency improvements, collaborative manufacturing, analytical analysis, and change and equipment management.

Released in 2008, GE Fanuc's Proficiency Workflow is a system for designing, capturing, automating and improving industrial and manufacturing practices. Proficiency Workflow is a user-configurable module that automates a series of steps or procedures based upon a predefined set of rules. As information and tasks are passed along, each participant – whether it is a person or machine – performs the necessary action to complete their portion of the workflow. Each step can involve manual interactions with a user or automated steps with a piece of equipment. Proficiency Workflow ensures strict adherence to procedures and stores the outcomes.

Proficiency Workflow is designed to allow companies to rapidly develop and deploy procedures and also to monitor and manage them more effectively. The tool uses a graphical user interface and requires no programming. Workflow allows companies to capture both manual and automated processes with one tool, solve production problems immediately based on real-time events, and replicate processes across the enterprise by using libraries and templates.

The workflow engine is applicable for many applications including:

- Orchestrating high-level processes and manage the data between systems
- Digitizing GMP tasks
- Digitizing SOPs and work instructions – ensuring production complies with defined procedures
- HACCP monitoring procedures and corrective action
- Alarm and event response, corrective action – automatically send tasks to people or other systems to correct for alarms
- Manual assembly error-proofing
- Setting up lines, work cells and machines
- Automate the process of change management

The Efficiency module allows companies to better utilize plant assets by providing a comprehensive view of overall equipment effectiveness (OEE). Proficy Efficiency helps identify areas that are causing operational inefficiencies by monitoring all areas of manufacturing. It has the capability to perform root cause analysis, historical data summaries, schedule reports and control OEE.

Consistent product quality improves all aspects of production operations and customer satisfaction. The quality module improves product quality by lowering waste, scrap and product recall costs. Proficy Quality is intended to assist companies in their Six Sigma and other continuous improvement programs. The module permits users to capture and summarize manufacturing and quality data in the context of production events such as batches, lots, and time period. After data capture, Quality enables users to apply product specifications and recipes to the data and alarm against any out-of-spec conditions as they occur.



Proficy Integrates a Full Range of Plant and Business Systems

The Production module provides insight into how products actually flow through a plant. Product genealogy is a key component of the Production module. It tracks product and material flow through their entire production lifecycle to help manage, control, and report on in-process inventories and to reduce inventory costs.

Proficy Production ties together plant operations by exchanging key production and status information with customers and internal business systems as well as plant processes using the latest XML technology. Proficy Production provides a scorecard for operators, which identifies the components of the product being produced and indicates when a particular order is scheduled for completion.

The Proficy Plant Applications also includes the Batch Analysis module, which was discussed separately in this paper.

Advanced Process Control

GE Fanuc's model predictive control technology is embodied in its MVC product, which it uses to develop purpose-built solutions for several vertical industries and is an integral component of other products as well. MVC is an online, real-time, nonlinear adaptive predictive, multivariable control and optimization technology for continuous processing operations. It is a combination of fundamental thermodynamics and physical-chemical models from first principles, and actual plant process dynamics and operating economics. MVC has proven successful in handling complex processes exhibiting wide variations in conditions, and in particular, performing economic optimization of processes with frequent price changes of feedstock and products.

The MVC products encompass a wide range of process modules and unit operations found in ammonia, gas processing and treatment plants, chemical plants, refining, distillation, and pipeline applications. GE Fanuc continues to aggressively expand and broaden the scope of MVC into other application areas.

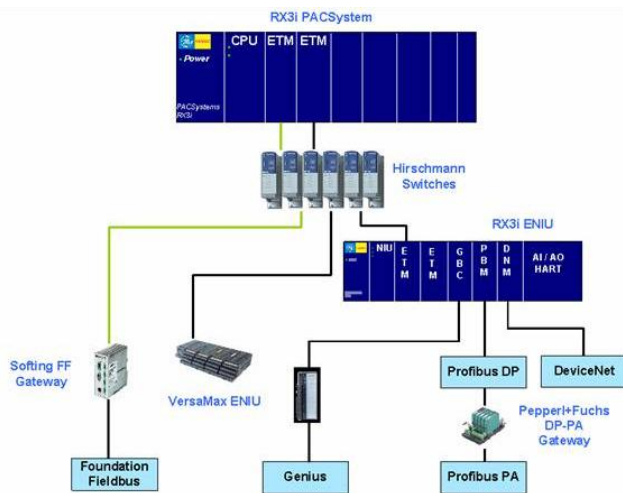
For thermal power plants, GE Fanuc has developed its Closed Loop Optimal Control (CLOC) system. CLOC is a supervisory controller that automatically determines optimal setpoints and passes these on to the plant's underlying control system. At the heart of the CLOC system are GE Fanuc's EfficiencyMap and MVC software modules. They work in tandem to move the plant closer to optimal operating limits while ensuring that operational demands and regulatory constraints are dynamically met.

GE Fanuc's Knowledge³ (Kn³) platform blends process modeling, optimization, and advanced process control. The Kn³ platform is a powerful, yet generically applicable tool that embeds a rules based engine, neural nets, genetic algorithms, MVC, and data management components. The Kn³ platform has been applied to a variety of energy-related processes such as power and steam production, pipeline optimization, and grid management. It can be applied to processes as diverse as steel and pharmaceuticals. Kn³ is particularly useful for diagnosing problems and identifying anomalies in highly complex data that does not lend itself to rules based analysis.

Declaration of Network Independence

Most automation suppliers have adopted one of the fieldbus technology and device networks of choice that are felt in particular to offer a unique value proposition to various process industries. GE Fanuc has taken a different stance, allowing the manufacturer to select the fieldbus technology and device networks that best suit their own needs, rather than those of the automation supplier. This is the primary reason that GE Fanuc has taken the position in the marketplace of a “Declaration of Network Independence”. In the realm of networking and device connectivity, GE Fanuc supports Foundation Fieldbus, HART, and Profibus, as well as in the Field Device Tool FDT/DTM Group and EDDL. GE Fanuc is a long-time supporter of the OPC Foundation and embraces OPC UA (Unified Architecture) for open interoperability between the plant floor and the enterprise.

Virtues of Common Fieldbus Technology & Device Networks



**Many Types of Fieldbuses and Device Networks
Need to be Supported in Today's Plants**

The common fieldbus technology and device networks that manufacturers have deployed or are planning to deploy each have their own unique value propositions. The HART protocol has become a de facto standard in the process industries, and ARC estimates that the majority of intelligent, microprocessor based field instruments installed today are HART-compatible. HART continues to serve the majority of the installed base of intelligent field devices worldwide, using its Integrated Development Environment (IDE) and Smart Device Configurator (SDC) technology.

Fieldbus Foundation (FF) has the support of many process industry end users. The most recent developments for FF include increased acceptance and continued advancement of High Speed Ethernet (HSE), EDDL enhancements, impending TÜV certification for safety systems, and development of a wireless specification. Demand for devices compatible with HSE continues to escalate. Fieldbus Foundation is also extending its functionality into the world of safety systems and critical control through TÜV certification.

Profibus' value proposition lies in its ability to address multiple manufacturing domains, from bus power for field instruments to high-speed deterministic control, all running on a common communication layer. Profibus, which conforms to IEC 61158 standard for fieldbus, is an industrial network to connect control systems with field devices. To meet the process industries needs for intrinsic safety and bus power with two-wire technology, Profibus also offers MBP-IS (Manchester Coded, Bus Powered, Intrinsic Safety) technology.

All variants of Profibus share a common communications layer; the differences are a function of the required network media and application profile. This single communication layer simplifies network configuration and diagnostics by providing a seamless link between all manufacturing domains. With data rates up to 12 Mbps, Profibus DP is used to network I/O and intelligent devices due to its response time and may serve as the fieldbus "trunkline". For hazardous areas, Profibus PA employs an intrinsically safe physical layer that provides bus power to devices on two-wire technology. Field instruments such as pressure or temperature transmitters, flowmeters or control valves are networked using Profibus PA. Because DP and PA share a common communication layer, PA segments can be coupled as extensions to a Profibus DP backbone network via segment couplers that are transparent to the bus protocol.

GE Fanuc Forms Fieldbus Alliances

As part of its Proficy Process Systems strategy, GE Fanuc has relationships with what it calls its Technology Partners. One of their Technology Partners is Pepperl + Fuchs North America, of Twinsburg, Ohio, who provides

interface components that create connections in industrial automation systems, including Profibus-based analog signal transfer and digital fieldbus communication. Proficy Process Systems will use Pepperl + Fuchs for Profibus connectivity. The company has also entered into a similar Technology Partnership agreement with Softing to provide solutions for Foundation Fieldbus. The company has also formed an

alliance with Allied Telesis for Ethernet switching technology.



GE Fanuc Has Taken a Network Neutral Approach to Proficy Process Systems

In ARC's view, maintaining a neutral stance and accepting a wide variety of networks is a good idea, since we will continue to live in a multi-network protocol world. GE Fanuc also must consider its own field device and related businesses under the GE umbrella with which they could develop, such as Bently Nevada, which could further expand their capabilities. Bently Nevada recently released a wireless condition monitoring solution that would fit nicely within Proficy Process Systems.

GE Fanuc Addresses Industry Specific Requirements through PAT Capabilities

Process automation suppliers are finding it increasingly necessary to add deep vertical industry expertise to their clients. GE Fanuc has developed these capabilities in various industry and application segments. A good example is their offering for compliance to the FDA's Process Analytical Technology (PAT) initiative, called Proficy RX.

PAT is defined by the FDA as a system for designing, analyzing, and controlling manufacturing through timely measurements, such as during processing, of critical quality and performance attributes of raw and in-

process materials and processes with the goal of ensuring final product quality.

GE Fanuc feels that the challenges faced by the Pharmaceutical industry in deploying the concepts of the PAT initiative include quality by design, as the PAT design process really begins far upstream. This means that PAT is not just a manufacturing deployment, as process variation needs to be identified during product design.

The manufacturing process should be designed to manage this variation, with appropriate solutions deployed that are capable of measuring and controlling the variability. GE Fanuc also feels that there are architectural challenges to the deployment of PAT including support of multiple software development environments, diverse data formats and protocols, and disparate software, as well as the challenge of validating and supporting so many procedures. Manufacturers will not have sufficient financial and human resources to adopt PAT unless they can deploy an in-

Benefits of PAT

- Helps understand what happens during the process
- Real-time information
- Continuous monitoring
- Tailor measurement based on need
- Identify and monitor Critical Quality Factors

tegrated implementation scheme in multiple unit operations coupling different instrumentation made by a variety of manufacturers together.

GE Fanuc's Proficy RX is a software tool to help manufacturers overcome these barriers. GE Fanuc defines Proficy RX as process analytical software focused on universal application development, networking, and on-line monitoring environments for PAT applications. Capabilities cited by GE Fanuc for manufacturers who use Proficy RX include the ability to standardize control and networking of multiple instruments as well as to pre-process captured analytical data and accelerate application development. Features of Proficy RX include a plant data archiving and repository (Proficy Historian), historical playback mode capability, an interface to commercially available MVA software, and adherence to 21 CFR Part 11.

Elements of the Proficy RX approach include a PAT specific user interface containing four standard user windows, a modular PAT specific command structure, standardized Interfacing for all Instruments and I/O Devices, and a menu driven development method. An example of a core Proficy RX solution may include using the Proficy RX runtime engine for universal instrument setup and configuration, capturing spectral data from instrumentation, and sending that data to the Proficy Historian while Proficy Portal is retrieving process data for reporting and analysis. An example of a complete Proficy RX solution may also include online MVA software retrieving spectral and process data for online analysis; integration with chemometrics software to run prediction models and close the loop with the controller; and updating the Proficy HMI/SCADA iFix software for operator process information.

ARC feels that GE Fanuc is certainly going in the right direction with Proficy RX, which is a logical extension for the Proficy family as well as a key vertical focus area for GE Fanuc.

GE Fanuc's long-term vision for Proficy RX is reflected in their plan to release a generation two and three version of Proficy RX over the next two years, as well as adding some features to the present generation

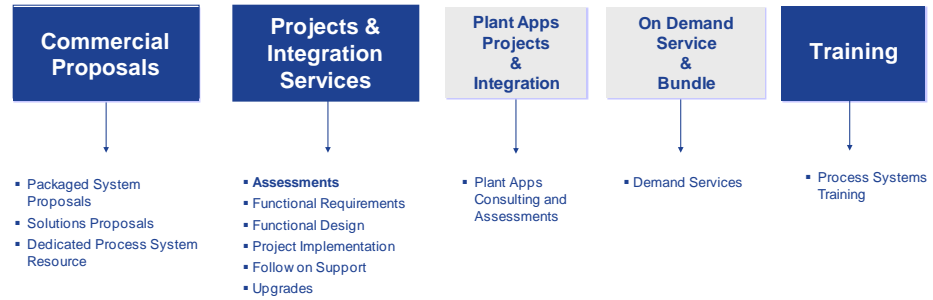
one version in October 2006. The additional features of generation one Proficy RX will include OPC client, a historian collector, and SIMCA/historian integration. In 2007, generation two will add workflow integration, OPC server support, electronic signatures, advanced math capabilities, additional alarming features, and equipment model integration. In 2008, generation three will add Proficy client integration, automated spectrometer qualification, the ability to nest process diagrams, and batch integration.

ARC feels that GE Fanuc is certainly going in the right direction with Proficy RX, which is a logical extension for the Proficy family as well as a key vertical focus area for GE Fanuc. Proficy RX can differentiate GE Fanuc from other automation and production software and solutions providers in the pharmaceutical marketplace. The challenge is to meet the new generation and feature milestones that will fully match Proficy RX with GE Fanuc's long-term vision for their solution. How successfully this differentiation is communicated, as well as adherence to the milestone schedule, will be directly proportional to the overall success of their Proficy RX solution.

Service Capabilities Become a Top Priority

Automation suppliers are offering an ever-increasing scope and breadth of services designed to improve the bottom line for manufacturers, spanning from the front-end engineering and design process through operations, outsourced maintenance, and performance improvement. This leaves end users with a wide range of service choices from automation suppliers, many of which can provide real cost benefits and fill an increasing skills gap.

GE Fanuc has an expanding portfolio of services capabilities and can execute the majority of the project management and technical expertise if the customer desires it. The company, however, must preserve its relationships with its partners and will not compete with their solution provider partners. To maximize collaboration, GE Fanuc manages both its own Services team and Solution Provider Program under the same leadership. The company has experienced growth both in its larger plant-wide projects as well as in its smaller retrofits.



GE Fanuc’s Scope of Service Capabilities

GE Fanuc’s scope of control system services includes support for its substantial base of installed controllers and automation software. The company sells service contracts on all of its automation hardware and software products. GE Fanuc also has a professional services consulting team. They do provide consulting around efficiency and quality in production management applications attached to Proficy Intelligent Production Solutions.

GE Fanuc’s Commercial Proposal Team provides Focused support for Proficy Process Systems works closely with Project & Integration Services team, provides broad product knowledge, proposal solutions for customers, and provides seamless handoff to execution team. The Projects and Integration Team provides process-oriented project managers & engineers with close ties with software development team and incorporates a six-

sigma methodology for project implementation. Project and Integration Services already has experience on a number of projects with customers in the pharmaceuticals, food & beverage, plastics, paper, and oil and gas industry for a wide range of applications from batch and production management to boilers and balance of plant.

Any serious process automation solutions provider should also have a mechanism for training its customers. The influx of less experienced workers into the world of automation and manufacturing is spurring extremely high growth in the training segments, with both suppliers and end users stepping in to fill the need. It is clear that employee and skills retention will become more important than they have been for many years.

Replacing a lost employee is already a costly exercise, especially for specialists such as process control engineers and process op-

End Users Increasingly Look to Automation Suppliers for Wider Scope of Services

- Decreased in-house expertise/resources among manufacturers.
- Engineering firms view automation as less of a core competency.
- Suppliers are filling the void as MAC.
- Suppliers offering more value-add services designed to increase ROA, reduce TCO, etc.
- Users now view services with an eye toward business value proposition.

erators. However, that pre-supposes that the replacements are available. Statistics show that they will be less available as time goes on. GE Fanuc has developed a training team for process systems that will work with partners, integrators, and customers to provide training around the architecture, configuration, I/O drivers, data acquisition, and visualization.

OEMs and Systems Integrators are a Key Part of the Solution

GE Fanuc already has a strong relationship with a series of preferred systems integrators, reps, and distributors that it will use as part of its sales channel network. Systems integrators can provide the services necessary for system installation and commissioning, or end users can look to GE Fanuc to provide them with project implementation services. GE Fanuc's goal is to give end users flexibility in what they wish to provide their system related services.

While GE Fanuc does have a full-fledged software and services organization, GE Fanuc's strategy is to leverage OEM, and systems integrators to use Proficy Process Systems as a base platform upon which they can add their own knowledge, expertise, applications, and services to create a complete process automation solution. GE Fanuc's strategy is to form partnerships with OEMs and systems integrators with a lot of domain expertise in key process industry segments. Instead of going to manufacturers alone in a direct fashion, GE Fanuc will incorporate OEMs

The common fieldbus technology and device networks that manufacturers have deployed or are planning to deploy each have their own unique value propositions.

and systems integrators into the process. These organizations are entities that GE Fanuc considers an integral part of the Proficy Process Systems team and are incorporated in an inclusive approach. GE Fanuc will create a pull with process manufacturers and communicate the value proposition of Proficy

Process Systems, so they in turn will demand their inclusion into the offerings of their OEMs and systems integrators.

Process Manufacturers Increasingly Looking To OEMs and Systems Integrators for Solutions

GE Fanuc's strategy of leveraging OEMs and systems integrators as part of the Proficy Process Systems team is based upon market trends regarding the role that OEMs and systems integrators are playing with process manufacturers today and in the future. Market drivers for these trends continue to be the lean technical staffing levels of most process manufacturers as well as the rapid advances in software development. OEMs and systems integrators are being used for tasks such as commissioning, controls engineering, front-end process design, and process and instrumentation design. Most process manufacturers no longer have the adequate number of staff or trained staff employees to perform these functions adequately. Some process manufacturers have either eliminated such groups to focus on their core manufacturing activities, or have reduced the size of internal technical groups such that any new technology initiative requires the usage of systems integrators.

Even in mature process manufacturing environments, the need to achieve interoperability of business and operating systems presents challenges to internal staffs. It is difficult for process manufacturers to maintain their staff's skill sets at the level required as integration needs evolve in complexity. Process manufacturer's integration needs vary over time, and the strategic objective is to be able to use systems integrators as a flexible extension to the internal staff. Process manufacturers may choose to strengthen certain internal capabilities and leverage this enhanced resource across multiple-sites or engagements. This helps process manufacturers to developing a flexible, agile partnering approach with GE Fanuc, along with key OEMs and systems integrators.

Each vertical process industry has unique business processes. Manufacturing and processing standards and certifications vary greatly between verticals. Vertical industry packaged solutions developed by OEMs and systems integrators save process manufacturers significant development and configuration costs. In addition, product familiarity of the systems integrator allows them to leverage their past experiences to the Proficy Process Systems project. The farther the systems integrator is along on the learning curve, the higher the implementation efficiency. Past experiences can often expose infrequent but serious flaws in the application of products. The bottom line is there is no substitute for hands-on knowledge, and the

combination of GE Fanuc, along with key OEMs and systems integrators, ensures that this hands-on knowledge

The integration services market is dynamic with new competitive offerings emerging from multiple sources including systems integrators and traditional automation suppliers. Migration planning programs should incorporate an ongoing effort for efficient scheduling of integration projects. Cost of integration projects can be controlled if the correct project plan is in place and managed properly. The time related issue of late project completions or deferred milestone dates will result in the deferment of improved asset utilization. Integration projects are usually initiated to improve business or manufacturing efficiencies, and a late project can have a significant negative effect on a process manufacturer's operations. Strong project management practices, practiced by systems integrators working closely with GE Fanuc, focus on delivering projects on time and, of course, on or below budget.

OEM Specific Features Driven into iFIX

GE Fanuc has included a wide range of unique features specifically designed for OEMs and their specialized needs in the recently announced Proficy HMI/SCADA - iFIX 4.5. These enhancements provide comprehensive monitoring, control and data management for companies worldwide. This new version of the visualization product provides a variety of OEM-specific features including the ability to build OEM brand awareness with their customers. By building their own brand, OEMs are also building customer loyalty and product recognition in their specific marketplace.

Vertical industry packaged solutions developed by OEMs and systems integrators save process manufacturers significant development and configuration costs.

Specific customizable features for OEMs include a custom splash screen that loads upon iFIX installation. The installation menu can also be customized to user requirements, adding or removing choices and launching additional CD content. OEMs will also have the ability to create a CD with custom Install Options and a custom bitmap graphic. A script answers all installation questions and the setup.exe includes new command-line options. The iFIX CD has been organized to accept additional content, typically application files, or user utilities, enabling simultaneous installation with the program. iFIX 4.5 also supports the remote management capabilities of Microsoft SMS (Systems Management Server). OEMs can

now stop iFIX, install SIMs, restart iFIX remotely and automatically using Microsoft SMS.

GE Fanuc Strengths & Challenges

In ARC's view, GE Fanuc is in a good position to take advantage of the many opportunities that the process automation marketplace now offers. Of course, the company has a long road ahead in a market that is already saturated with players both big and small, but GE Fanuc's capability for plant wide control, combined with a value price point and network neutral stance, should appeal to many process manufacturers.

GE Fanuc may be a new entrant into the marketplace for process automation systems, but it already has a strong presence in several markets that serve the process industries that will give it an advantage when it comes to getting new business and expanding its footprint at existing customer installations. Intellution has a huge installed base among the process and hybrid industries, as do the company's batch solutions and PLCs. GE Fanuc also has the advantage of being free to pursue these opportunities without having to migrate an existing base of process automation system customers

ARC has said for some time that the hybrid industries in particular are ripe for innovation and change. A key enabler for this is the adoption of a Collaborative Production System framework where all types of control from continuous process to batch, discrete, and motion control can exist in and be configured through a single, open environment. More importantly,

GE Fanuc may be a new entrant into the marketplace for process automation systems, but it already has a strong presence in several markets that serve the process industries that will give it an advantage when it comes to getting new business and expanding its footprint at existing customer installations.

these domains of control must also exist in an environment that has standards-based and transparent access to data from the operations management domain. Building an open control platform is one thing, but placing it in context with an open and collaborative environment for operations management is where the real power is. It provides a totally open window into the entire manufacturing enterprise that lays the groundwork for real optimization of manufacturing processes.

What's interesting about GE Fanuc's approach, however, is their acceptance of the fact that we live in an open world. Through their

background in providing solutions that often coexist with other suppliers' hardware and applications, GE Fanuc has a lot of expertise that it can leverage to provide an open and neutral environment.

GE Fanuc's level of openness also plays well with its OEM and system integrator partners. Most automation suppliers today are focused on building their own service capabilities, but GE Fanuc has a lot of strength it can draw from through its existing network of partners. The company will have to be careful to take the right approach developing its own internal service capabilities while cultivating relationships with partners.

Despite these advantages, the company realizes that it has a long road ahead and its work is just beginning. There is already a lot of competition in the process automation marketplace today and GE Fanuc is not the only new entrant into this market. The company will really have to play to its strengths and not try to cast itself in the mold of the traditional large DCS suppliers. The key industries that GE Fanuc is targeting are those that are typically underserved by adopting a combination of PLC and HMI technologies, but for whom the full scale functionality of a full-scale DCS that would normally be used in the refining or petrochemical industries. Offering these industries the specific functionality they require along with a CPS-based approach to batch and operations management should serve the company very well.

GE Fanuc must also continue to drive synergies with the other businesses in GE Infrastructure and Industrial to expand functionality of Proficy Process Systems. Many possibilities exist with the Bentley Nevada, Continental Controls, and other GE businesses that have a hand in automation and production management

Analyst: Larry O'Brien, Craig Resnick, Tom Fiske

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Acronym Reference: For a complete list of industry acronyms, refer to our web page at www.arcweb.com/C13/IndustryTerms/

API	Application Program Interface	IOP	Interoperability
B2B	Business-to-Business	IT	Information Technology
BPM	Business Process Management	MAC	Main Automation Contractor
CAGR	Compound Annual Growth Rate	MES	Management Execution Systems
CAS	Collaborative Automation System	OpX	Operational Excellence
CPAS	Collaborative Process Automation System	OEE	Overall Equipment Effectiveness
CPG	Consumer Packaged Goods	OEM	Original Equipment Manufacturer
CPM	Collaborative Production Management	OLE	Object Link Embedding
CPS	Collaborative Production Systems	OPC	OLE for Process Control
CRM	Customer Relationship Management	PAC	Programmable Automation Controller
DCS	Distributed Control System	PAT	Process Analytical Technology
DOM	Design, Operate, Maintain	PLC	Programmable Logic Controller
EAM	Enterprise Asset Management	PLM	Product Lifecycle Management
EDDL	Electronic Device Description Language	RFID	Radio Frequency Identification
ERP	Enterprise Resource Planning	ROI	Return on Investment
HMI	Human Machine Interface	RPM	Real-time Performance Management
		SCM	Supply Chain Management
		WMS	Warehouse Management System

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