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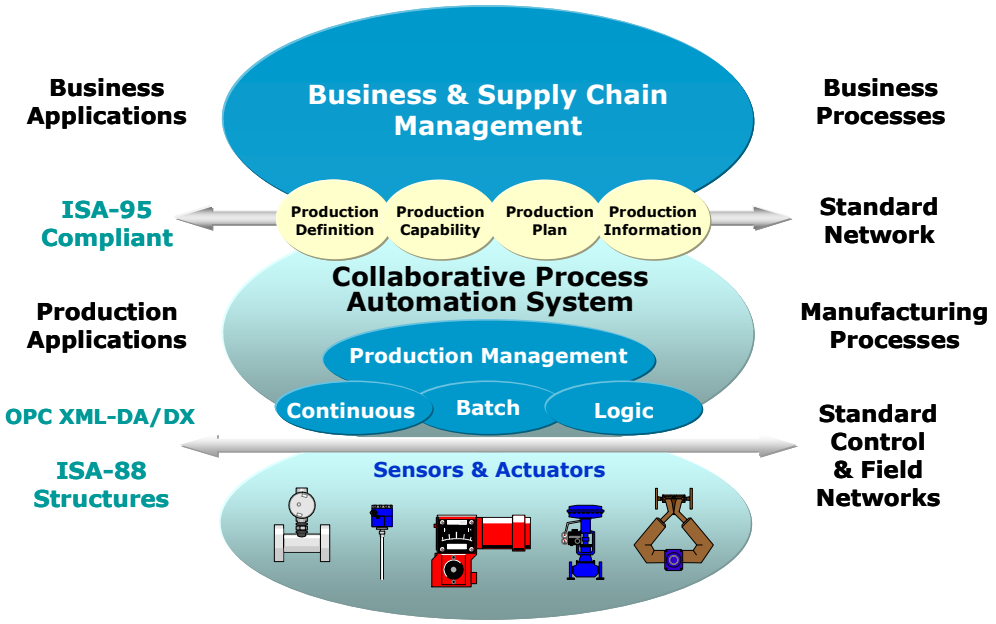
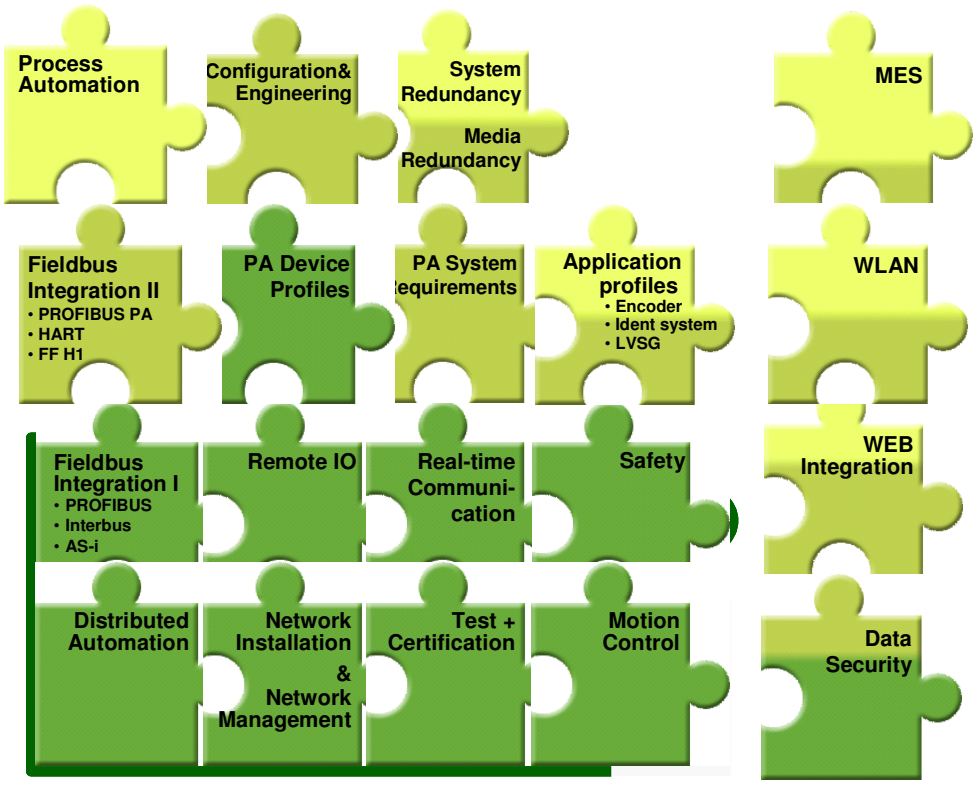
PROFINET in the Process Industries



Industrial Ethernet Provides The Data Transparency That Is A Key Element Of A Collaborative Process Automation System



With Each Completed Block, Profibus International Moves Closer To Its Goal Of Providing Complete Networking Solutions For All Industries

Executive Overview

Having proven its value in factory automation, industrial Ethernet is now emerging as a viable infrastructure solution in the process industries as well. While standard Ethernet is often used at the peer-to-peer level in process plants, industrial Ethernet will soon play an increasingly important role as industrial consortia adapt their solutions to the needs of process users.

Profinet's value proposition lies in its ability to address the needs of multiple manufacturing domains, from bus power for field instruments to high-speed deterministic control, all running on a common communication layer.

As a backbone network, Ethernet is ideally suited to the task of surfacing process data stored in control systems and field devices. Media gaps that hinder the flow of critical data between process equipment and enterprise systems can be bridged with industrial Ethernet gateways, creating an all-encompassing network architecture that brings the now ubiquitous industrial Ethernet into the process plant. This allows users to preserve their investments in legacy networks while extending the reach of modern IT down the "last mile" of process networks. Profibus International is pioneering this effort by leveraging its existing portfolio of discrete, process and industrial Ethernet-based networks to create a seamless, end-to-end solution for the process industries.

Process instrumentation customers have made substantial investments in existing Profibus PA, HART or FF H1 compatible process field devices, so the adoption of any new technology will be more evolutionary than revolutionary. In addition, many process plants have installed bases of intelligent devices - from simple remote I/O to motor control centers - that are networked with legacy device networks such as Profibus DP or DeviceNet. Therefore, the key success factor of industrial Ethernet's introduction into process plants will be the availability of a migration path that lets users preserve their investments in legacy networks and devices by integrating existing networks into an Ethernet backbone.

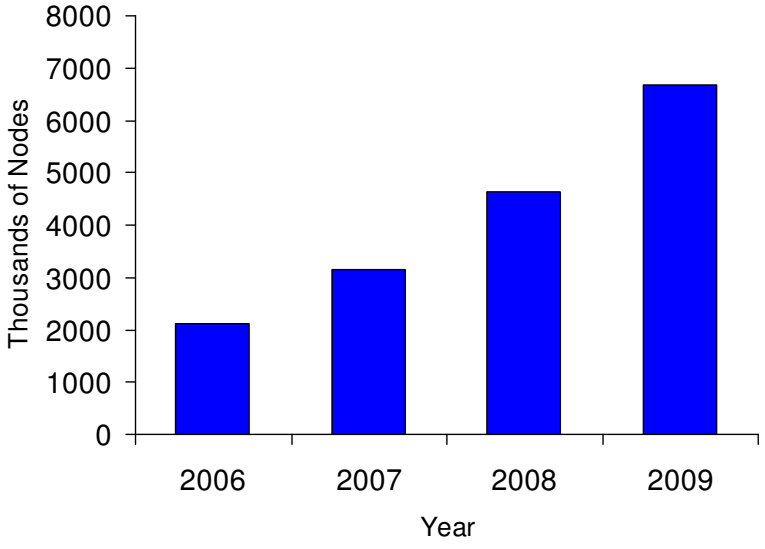
Bringing industrial Ethernet into the process plant presents process users with a variety of cost-saving opportunities. From an operational point of view, industrial Ethernet allows valuable field data to flow directly into a real-time, high bandwidth network, making these data available with no additional programming to a variety of information-consuming applications ranging from MES to Plant Asset Management (PAM). In addition,

using standard IT tools and hardware can help reduce costs in areas such as project engineering, commissioning and maintenance.

Business Perspectives Drive Acceptance of Industrial Ethernet

Global manufacturers today demand simpler and more modular automation solutions that use open networks and interfaces. New business drivers require the seamless integration of production data with business systems to make better use of information originating from the factory floor. Using Ethernet, key production data can be more easily and more cost effectively gathered on the plant floor than with conventional industrial networks.

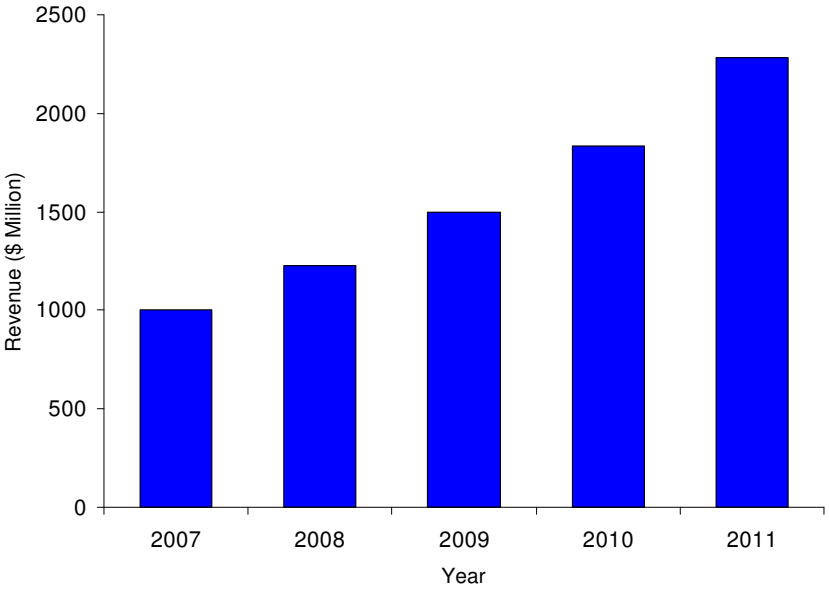
Ethernet allows process engineers to apply standard IT components and tools such as SNMP and DHCP in the production environment, resulting in reduced engineering and maintenance costs. Standardized network services such as remote access and advanced network diagnostics can help increase productivity and plant availability by simplifying troubleshooting and shortening downtime. Ethernet provides these enhancements without sacrificing any of the capabilities found in existing automation architectures.



Total Shipments of Ethernet Devices
Source: ARC Advisory Group

ARC believes that industrial Ethernet is the logical choice for meeting the challenges of the next generation of plant communications. Ethernet accomplishes this by providing users with familiar IT tools while enabling seamless connectivity to enterprise-level applications. Most importantly, Ethernet is sufficiently "tweakable" for industrial organizations like Profibus International to adapt and enhance its performance while supporting all the functionality of standard Ethernet, resulting in single, open industrial networking solution for the whole enterprise. The net effect is a lower Total Cost of Ownership (TCO) for plant assets thanks to an all-encompassing approach to industrial networking.

The volume of electronic information that manufacturers generate, evaluate and store has increased dramatically in the past decade, due to increased intelligence built into field devices and more stringent laws requiring the tracking and tracing of both raw materials and finished products. This trend will likely continue indefinitely as a natural consequence of the Information Age. To handle ever-increasing volumes of information, manufacturers are turning to standards-based network strategies designed around Ethernet.



Shipments of Process Fieldbus Products and Services
Source: ARC Advisory Group

Thanks to its *de facto* status in the enterprise world, Ethernet is highly suitable as a plant backbone network in any industry. In fact, establishing Ethernet as the standard for both the enterprise and the plant is the first step towards achieving plant-wide connectivity and bridging the traditional gap between these two domains. Once achieved, plant-wide connectivity unleashes the true potential of information-intensives applications, ranging from asset management to MES, by making information available anywhere at any time without the need for costly integration.

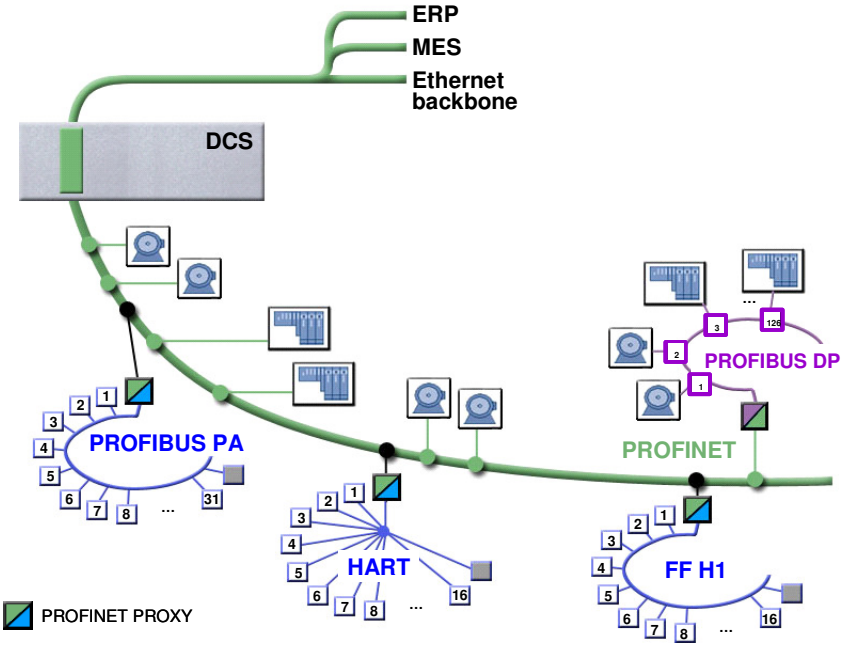
Ethernet in Process Plants?

At first glance, Ethernet may seem out of place in the process industries. With its high data rate and large bandwidth, Ethernet is a stark contrast to established process fieldbuses such as Profibus PA, HART and Foundation Fieldbus H1. Moreover, industrial Ethernet solutions such as Profinet have been adapted to high performance demands that are characteristic of the discrete industries, but not necessarily needed in process applications.

In reality, industrial Ethernet will not likely replace process fieldbuses directly. Rather, it will augment their functionality by providing seamless integration into a high-capacity backbone network based on the same standard Ethernet as used in the rest of a company's network infrastructure. This integration will allow enterprise-wide access to process control sys-

tems and field devices that were previously isolated by the integration problems of dissimilar networks. Profibus International (PI) has recognized the need to bridge this gap with Profinet by launching a multi-pronged initiative to first identify the specific needs of process users and then adapting Profinet to address these needs.

Existing industrial networks are typically special purpose networks designed to address specific requirements. Controls suppliers support open remote I/O networks such as Profibus and DeviceNet, while field instruments are typically networked using Profibus PA, HART or Foundation Fieldbus. The bottom line is that the typical plant is saddled with many disparate communications solutions that give the user integration headaches. Industrial Ethernet, with its large bandwidth, high throughput and support of multiple protocols, addresses users' requirements with just one "cable". However, for Ethernet to establish itself as the basis for plant-wide communication, it has to satisfy specific automation requirements. In a process environment, these aspects include peer-to-peer DCS communication, connection of field devices, support for critical control systems (including safety and redundancy), engineering, maintenance and asset management tools, as well as connectivity to plant historians, MES systems and high-level enterprise systems.



PROFINET Allows Company-Wide Data Exchange Between The Field Level and The IT Level

Profinet as Plant Network Backbone

Profibus PA is PI's preferred solution for networking process field devices. Compatible with the international fieldbus standard IEC 61158, Profibus PA meets requirements for intrinsic safety in explosive environments and provides power over the bus to devices. PA-devices normally connect to host such as a DCS via Profibus DP, but thanks to the development of gateways, PA segments can be connected directly to Profinet, meaning that Profinet can serve as a plant-wide backbone network. This brings indus-

trial Ethernet one step closer to the level of the instrumentation network by allowing a single Profinet segment to connect multiple PA "clusters".

The significance of Profinet's connectivity to legacy networks is that it will open up a new era of data transparency and data availability in process plants. This connectivity will allow existing DeviceNet, Profibus DP and Profibus PA, HART and Foundation Fieldbus networks to connect seamlessly to a Profinet backbone network, essentially bringing an Ethernet data pipeline right down to the field device level.

Bridging the Gap between Process and Discrete

Many of the classic process industries also contain applications typically associated with discrete or factory automation. For example, pharmaceutical and food & beverage plants as well as wastewater treatment plants often employ motor control centers or discrete I/O modules together with process instrumentation. The higher the discrete application content, the more the industry is classified as "hybrid" rather than pure process or discrete.

A Profinet-based architecture allows all communication to take place seamlessly via a single communications protocol, leaving the choice of physical layer to the end-user.

Profibus PA offers communication to process field instruments in applications that require a different network medium, for example, for networking intrinsically safe devices in explosive environments. Via a network coupler, PA devices can communicate seamlessly with other devices on both Profibus DP and Profinet. This is significant because it allows all communication to take place seamlessly through a single network architecture, leaving the choice of the physical layer to the end-user.

Extending Networked Safety to the Process Industries

Thanks to developments in safety technology, running two separate busses for safety and non-safety data is simply no longer commensurate with modern automation philosophy. A two-bus architecture requires double the amount of training, twice the network access hardware and makes start-up and troubling shooting tasks unnecessarily complex.

With the introduction of Profisafe, the safety protocol for both Profibus and Profinet, end users can eliminate the need for a separate safety network and reduce their industrial network architectures to a single bus. Profisafe ex-

tends the standard Profibus communications protocol to address special requirements for safety-related information necessary to conform to strict safety standards. For example, Profisafe adds elements such as message numbering and data consistency checks to rule out typical network messaging faults, enabling networked safety devices to meet the reliability requirements of Safety Integrity Levels (to SIL3) prescribed by international safety standards. Since Profisafe is a communications-independent application profile, it can be used by devices connected to Profibus DP, PA and Profinet.

Plant Asset Management as Profinet's "Killer App"

When end users adapt Profinet as their backbone network, all applications will stand to benefit from increased data transparency and availability. However, the most long-term value will be derived by Plant Asset Management (PAM) applications. Especially in the process industries where assets are costly and are often deployed for long lifecycles, PAM can greatly enhance the service life of a field instrument through real-time monitoring of an asset's status and health. Add in intelligence evaluation of the data allows users to more easily predict impending equipment failure well enough in advance to substantially reduce or avoid system downtown.

To achieve this, PAM applications need unhindered access to devices at the lowest levels of plant architectures. For most networked devices today, this stream of information ends at a network master - typically a DCS. By connecting these clusters of networked devices to an Ethernet trunkline, data can be made available instantly to any other device, controller or software application anywhere in the plant. This has the effect of enabling data intensive applications such as asset management for which this level of connectivity previously was technically unfeasible or too costly.

PROFINET Adapts to Process User Needs

The needs of process users are as diverse as the various process industries themselves. To complete its offering to process users, PI has embarked on a series of initiatives to identify specific user requirements and to develop solutions to meet them.

PI's first initiative established a multi-supplier working group to identify DCS requirements for industrial Ethernet. Jointly led by ABB and Siemens, this working group also includes input from other leading DCS suppliers such as Emerson Process Management. Current topics include system redundancy, time stamping and time synchronization. In addition, PI's vision is to grow its process Ethernet solution beyond its own Profibus PA by turning Profinet into a universal backbone network for all process applications. To accomplish this, the group evaluated the requirements for adding Profinet proxies for HART and Foundation Fieldbus devices.

Fieldbus Integration Preserves Investments in Installed Devices

Few greenfield plants are being built today, so preserving existing investments in field devices is a top priority for plant engineers during the planning phase of plant expansions. Many existing plants already use process networks such as Profibus PA or Foundation Fieldbus. For retrofit or migration projects in existing plants, significant value can be achieved by modernizing the industrial network infrastructure with a solution that adds functionality while preserving investments in legacy systems. This is the main driver behind PI's initiative to adapt Profinet to the needs of process users.

Profinet's connectivity to legacy process networks will open up a new level of data transparency and data availability in process plants.

To meet process industry requirements, PI is developing Profinet interfaces not just for Profibus PA, but also for all other leading technologies, including HART communications protocol and Fieldbus Foundation. This is the key element in a grand scheme to make Profinet technology attractive to end users in all industries, from discrete to process, by unifying existing technologies under the "umbrella" of Profinet.

With the integration of Profibus PA complete, PI's internal initiative "Fieldbus Integration II" aims to also complete the integration of third party technologies HART and FF H1 by the end of 2007, while draft versions should be available in April. Support for this initiative comes from a series of significant industry players, including ABB, Biehl +Wiedemann, Emerson Process Management, Endress+Hauser, HART Communication Foundation, HMS, Hilscher, ifak, Pepperl & Fuchs, Phoenix Contact and Siemens.

The advantages of this integration for end-users are clear. For plants with an existing installed base of process field devices, users can preserve exist-

ing investments while adding the sophistication of an industrial Ethernet backbone to their network architecture with Profinet, providing a level of end-to-end connectivity that was impossible until now. In plants with multiple industrial networks, Profinet can also integrate most legacy networks via proxies. Besides Profibus DP, DeviceNet, AS-i and Interbus can be integrated into Profinet.

Profinet Adds Process-Specific Application Profiles

To support specific application requirements, Profibus supports a series of device and application profiles. These profiles define simple sets of standardized rules designed to meet specific requirements of applications such as drives, safety, or input/output devices, allowing applications and devices to communicate more easily. PI is extending support for process users by adding Profinet support for the profiles *Weighing and Dosage Devices*, *Intelligent Pumps*, *Remote IO for Process Control* and *Lab Devices*, in addition to existing support for *PROFIsafe*, *PROFIdrive* and *PA Devices*. Other profiles may be added in the future based on input from end-users and member suppliers.

Profile	Planned Release
PA devices	2006
Water/ Wastewater	2006
Weighing and Dosage Devices	2007
Intelligent Pumps	2007
RIO for Process Control	2007
Lab Devices	2008
DCS Requirements	2008
PROFIsafe	2006
PROFIdrive	2006
Fluid Power /Hydraulics	2007
Identification Systems	2007
Low Voltage Switch Gear	2006
Controller Profile for PROFINET IO	2007
Encoder	2007
IO-Link	2007

PI is Adding Industry-Specific Application and Device Profiles to Meet the Needs of Process Users

Siemens and Emerson Announce Fieldbus Cooperation

Industrial communication in the process industries has been long dominated by Profibus PA and Foundation Fieldbus for fieldbus solutions, as well as HART-enabled devices that still make up the majority of the installed base. Siemens and Emerson Process Management, the two major backers of Profibus PA and Foundation Fieldbus, announced a significant cooperation agreement in 2006 by which the two companies will share and cross-implement their respective technologies.

Driving this cooperation is the desire of both suppliers to increase the value propositions of the network offerings by expanding end users' choices of technology. Customers want more choice today, and it is the responsibility of suppliers to make these choices available. At the same time, the suppliers stand to gain access to currently underserved markets. By adding Foundation Fieldbus connectivity to its process field devices, Siemens will increase its attractiveness to oil & gas users, a domain in which FF traditionally has had a large installed base. At the same time, support for Profibus will help Emerson reach more customers in the hybrid industries such and food & beverage or pharmaceutical, industries that have profited from Profibus' ability to blend discrete and process applications seamlessly with a single bus architecture.

Four Case Studies

According to Profibus International (PI), Profibus has nearly 19 million installed nodes worldwide in all application areas, making it one of the most successful fieldbus and control network solutions available. Profibus has a huge installed base in discrete manufacturing and at the high-speed control network layer and its installed base of Profibus PA is growing steadily.

PI claims that 3.3 million nodes are deployed in the process industries and 630,000 of these are for Profibus PA devices. Additionally, more than 230,000 Profisafe nodes are installed worldwide in 26,000 applications, with close to 10 percent of them deployed in process industries. This remarkable track record is due in part to PI's broad technical resources, the marketing strength of its 1400+ members, and the wide range of available application

profiles that address specific manufacturing needs. The following section takes a look at fieldbus applications of four end-users who have realized benefits from using Profinet in typical process industry applications, ranging from pulp & paper and metals & mining to food & beverage and cement.

Paper Recycler Optimizes Power Loading with Profinet

When oil prices are stabile, energy is often viewed as a fixed cost – a more or less constant value that can be treated like other overhead costs. However, steep increases in energy costs in recent years have taught manufacturers to take a closer look at the cost of energy. Many now take a more dynamic approach by treating energy more like a variable cost subject to the same price fluctuations as any other raw material. Some even integrate energy management directly into their automation systems.

A German Paper Recycling Plant Optimizes Its Energy Usage With A Profinet-based Architecture By Shutting Down Unnecessary Systems During Peak Times

Located deep in Germany's Black Forest, the Albert Köhler paper recycling plant recently added energy management functionality to its automation architecture to address a unique challenge. While the plant generates about two-thirds of its own energy, it is dependent on its local electric company for the rest. However, industrial users like Köhler can place a high burden on the power grid, forcing the energy provider to tap into additional resources to cover spikes during peak usage periods. To deter this, Köhler's provider sets a consumption limit of 820 kW per hour. If this limit is exceeded, the electric company charges a substantially higher rate – a situation that had occurred more and more frequently and forced Köhler look for ways to better management its power consumption.

To find a solution, plant engineers contracted local systems integrator Kriko Engineering to add an energy load optimization system to its existing Siemens Simatic PCS 7 distributed control system. The solution consists of an additional Simatic S7 CPU 315-2 PN/DP controller with onboard ports for both Profibus and Profinet, allowing the new system to communicate with the existing PCS7 control system via Profibus. The company's fiber optic-

based Ethernet infrastructure is used to connect the central control system via Profinet to other systems.

The goal of the load optimization system is to automatically shut down non-critical plant systems whenever energy use threatens to exceed the specified limit within a 15 minute period. One particularly energy-intensive system is the stock preparation, which processes 30,000 tons of waste paper annually by breaking it up into small pieces, which are then dissolved in water and cleaned in several stages before being fed into cardboard production machines. Just the various pumps alone account for nearly a third of the demand for externally supplied energy. Shutting these down temporarily has the greatest savings effect without comprising the performance of the continuous paper production processes. Mill board production, a less energy-intensive system, is not automatically shut down, but handled case by case by operations personnel based on warnings from the load management system.

According to Köhler, the system has already paid for itself thanks to the costs avoided by optimizing the load during peak use times. The company is satisfied with the solution and is considering plans to expand the monitoring to other systems. Technically, this should not be difficult as the Profinet interface built into the S7 controller has capacity for up to 128 nodes.

Arcelor Mittal Chooses Profinet for Stockyard Automation

Industrial Ethernet is especially well suited to supporting large infrastructures in any industrial environment, due in part to the wide variety of topologies inherited from the office world. Networks can span far greater distances than conventional industrial networks via copper cable, fiber optic or even wireless technology. And thanks to its large bandwidth, industrial Ethernet is becoming the unifying network in many plants since legacy networks can be easily connected to industrial Ethernet via gateways. These features and others convinced engineers at Arcelor Mittal Ghent in Belgium to base its new stockyard automation concept around Profinet.

With an annual production exceeding 120 million tons and €56 billion in sales, Arcelor Mittal is the world's largest producer of industrial steel. At one of its Belgian plants near Ghent, the company ships nearly 5 million

tons of steel to customers worldwide in coils that weigh up to 30 tons each. Prior to shipping, the coils pass through a stockyard that employs overhead gantries to load and unload them onto railcars. To modernize the stockyard operation, Arcelor Mittal implemented a project recently to upgrade an existing crane to fully autonomous operation. Also, the company optimized tracking and production planning functionality for a Manufacturing Execution System (MES) to track as many as 1500 coils per stockyard.

Objectives of the project were to increase the efficiency of the supply chain and lower overall operational costs. This was achieved through the implementation of a new stockyard automation system with higher system availability, which helped reduce work stress work for crane operators. Another top objective was to achieve best-in-class safety conditions for stockyard workers and reduce coil damage. Moreover, the company expected a payback period of less than 2 years. Finally, since stockyard shutdowns are expensive, cranes were expected to be retrofitted within 5 days.

Arcelor Mittal Uses PROFINET Over Both Wired and Wireless Media

The project contains several interesting innovations. Before picking up a coil, the crane first gathers information using a 2-dimensional laser scanner integrated into an industrial robot that is mounted on the crane. The scanner determines the position of the coil, target cradle or railcar and helps prevent collisions with other objects. To achieve SIL 3 safety, failsafe PLCs on the crane and on the ground communicate via a wireless Profinet link with Profisafe protocol. A second industrial wireless communication handles the connection between the crane and the MES-system.

Arcelor Mittal Ghent chose to base its new automation architecture around Profinet due to the network's use of standard Ethernet, support of the Profisafe safety protocol, product support from multiple suppliers, and the ease of integrating wireless communication. The use of wireless communication alone saves about $45,000 in cable costs per crane. Finally, using Profinet allowed the straight-forward integration of existing networks into a versatile, future-proof industrial Ethernet architecture.

Based on the success of initial projects, Arcelor Mittal Ghent intends to upgrade several of its remaining stockyard cranes using the same standard. In addition to the short payback, the company was able to improve customer satisfaction by tightening control of its supply while bringing worker safety up to a best-in-class level.

Xuzhou Tobacco Builds in Flexibility with Profinet CBA

With assets in excess of $125 million and an annual production of half a million cartons of cigarettes, the Xuzhou Tobacco Factory is one of the largest of its kind in China. For a new cigarette production system, the company set out to find the right automation solution to help it achieve its business objectives. These objectives include built-in flexibility to allow more product variants to be produced on the system with a minimum of effort for future expansions. In addition, Xuzhou Tobacco wanted to add tracking and tracing functionality to its production processes while reducing overall production costs.

Rather Than Hard-Coded Communication, Xuzhou Tobacco Factory in China Configures Flexible Data Exchanges Between Controllers With Profinet CBA

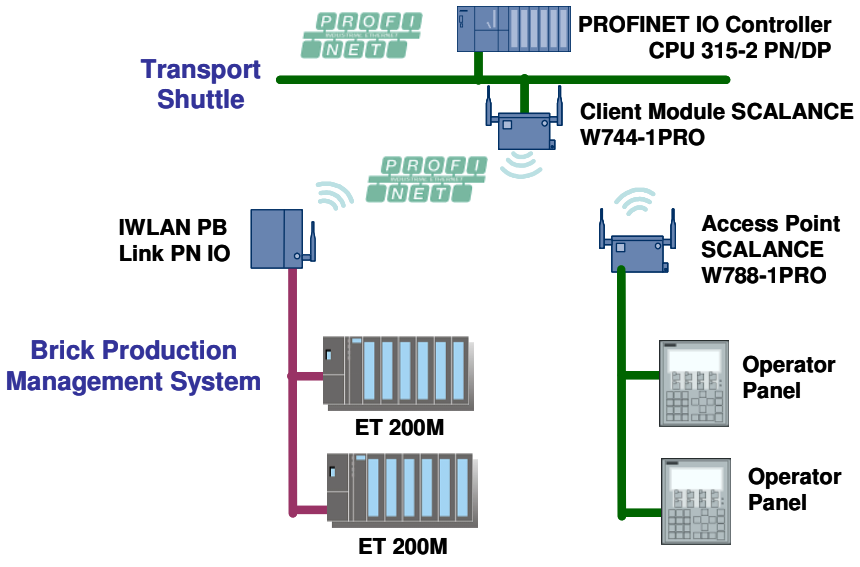
Xuzhou Tobacco decided on a Profinet-based architecture that uses Profinet Component-Based Automation (CBA) to tackle the issue of flexibility. The solution entails 10 large PLCs of the type Simatic S7-400, communications processors for Profinet, and more than 60 Profinet-capable Simatic ET200S I/O blocks. In addition, the architecture includes multiple HMI stations and panel PCs running WinCC visualization software. The industrial Ethernet infrastructure is managed with Scalance X-400 switches.

Profinet CBA is a software tool that allows engineers to graphically configure data transfers between controllers on Profinet as an alternative to "hard coding" communication. The advantage of configured communication is that logical data paths can be easily reconfigured in the future any time the physical architecture is changed – for example, if the production line is expanded to raise its capacity. With this object-oriented approach, the transfer of PLC data can be quickly and easily configured – either during the engineering phase, or later during start-up at the customer site.

While the company had previously used Siemens products with Profibus, this was its first Profinet installation and the first use of Profinet and CBA. So many "firsts" could lead to project delays, but Xuzhou Tobacco reports that network installation and wiring was actually faster and less troublesome with Profinet. Easy configuration and a high degree of data transparency kept project costs down by making system debugging and diagnostics faster. In addition, the use of Profinet CBA saved engineering time by allowing engineers to develop flexible communications schemes faster and with greater transparency. Most importantly, Xuzhou Tobacco expects the CBA configurations to greatly shorten the engineering effort in future expansions of the production line.

Wienerberger Equips Shuttle with Wireless PROFINET

As the world's largest brick manufacturer and Europe's number two supplier of clay roof tiles, Wienerberger AG operates 260 plants in 25 countries. To maintain its leading positions in its various markets, the company continually invests in new technology to optimize its manufacturing and logistics processes. This means relying more and more on a network infrastructure based on open standards, industrial Ethernet and wireless communication.



Wienerberger AG Improved The Performance And Reliability Of An Automated Transport Shuttle By Upgrading To Profinet Wireless Communication

In a brick making plant in Belgium, Wienerberger employs automated shuttles to transport up to 12 tons of bricks over about 100 meters to automatic

drying and baking ovens. These shuttles, in operation for many years, are equipped with a PLC and remote I/O blocks connected via Profibus. Previous solutions first used slips rings and later radio modems to bridge Profibus to the moving shuttle. While this solution worked more or less adequately, communication faults often brought the system to a standstill, halting production and requiring operator intervention. In addition, limited network throughput put a strain on the system's potential performance.

To bring both performance and reliability up to benchmark standards, Wienerberger decided to upgrade the system based on a solution using Profinet and a Wireless Local Area Network (WLAN). The solution includes Siemens Scalance WLAN access points that transmit Profinet wirelessly at t data rate of 54 Mbit/s between a Simatic S7 CPU 315-2 PN/DP controller and an IWLAN/PB PN IO gateway mounted on the shuttles. This transceiver connects to the existing Profibus network and I/O modules, eliminating the need to replace these components.

According to Wienerberger, engineers were able to upgrade to the wireless Profinet solution with little interruption to production. The resulting solution has proved to be much more reliable than its predecessor, resulting is higher productivity, better overall performance, and zero downtime since the installation nearly two years ago. Based on the success of this pilot project, Wienerberger completed a second installation in 2006 and plans additional, similar retrofits on other brick-making lines.

Conclusion & Recommendations

Industrial Ethernet's broad acceptance in factory automation has amounted to no less than a minor revolution. Using standard Ethernet with industry-specific enhancements has helped countless manufacturers increase data transparency, shortened start-up time, lower downtime and maintenance costs, and increase productivity. The process industries now stand to benefit from Ethernet's advantages as industrial consortia and automation suppliers begin to address specific process requirements.

Using industrial Ethernet, process users can gain access to previously hidden data by technical barriers. These data can be used effectively by both production and enterprise applications to measure and better understand what is happening in manufacturing processes, helping to cut costs and increase productivity. While Ethernet can greatly enhance data gathering from the plant floor, this becomes especially useful if the data are effectively evaluated using applications such as Plant Asset Management (PAM).

Profibus International's (PI) initiative to adapt Profinet to the needs of process users is bringing a lot of value to the process industries. As a backbone network, Profinet will help to unify existing installations of Profibus PA, Foundation Fieldbus and HART devices by adding universal connectivity without sacrificing the integrity of legacy architectures. Building on its foundation of industry experience, this initiative is helping PI to put in place the final pieces of its all-encompassing automation solution.

Process users should monitor developments in this initiative to understand how open standards-based industrial Ethernet can add value to their process automation architectures.

Analyst: David W. Humphrey
Editor: Larry O'Brien

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

API	Application Program Interface
APS	Advanced Planning & Scheduling
B2B	Business-to-Business
BPM	Business Process Management
CAGR	Compound Annual Growth Rate
CAS	Collaborative Automation System
CMM	Collaborative Manufacturing Management
CNC	Computer Numeric Control
CPG	Consumer Packaged Goods
CPAS	Collaborative Process Automation System
CPM	Collaborative Production Management
CRM	Customer Relationship Management
DCS	Distributed Control System
EAI	Enterprise Application Integration
EAM	Enterprise Asset Management
ERP	Enterprise Resource Planning
HMI	Human Machine Interface
IT	Information Technology
MIS	Management Information System
MRP	Materials Resource Planning
OpX	Operational Excellence
OEE	Operational Equipment Effectiveness
OLE	Object Linking & Embedding
OPC	OLE for Process Control
PAS	Process Automation System
PLC	Programmable Logic Controller
PLM	Product Lifecycle Management
RFID	Radio Frequency Identification
ROA	Return on Assets
RPM	Real-time Performance Management
SCM	Supply Chain Management
WMS	Warehouse Management System

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