

## ARC WHITE PAPER

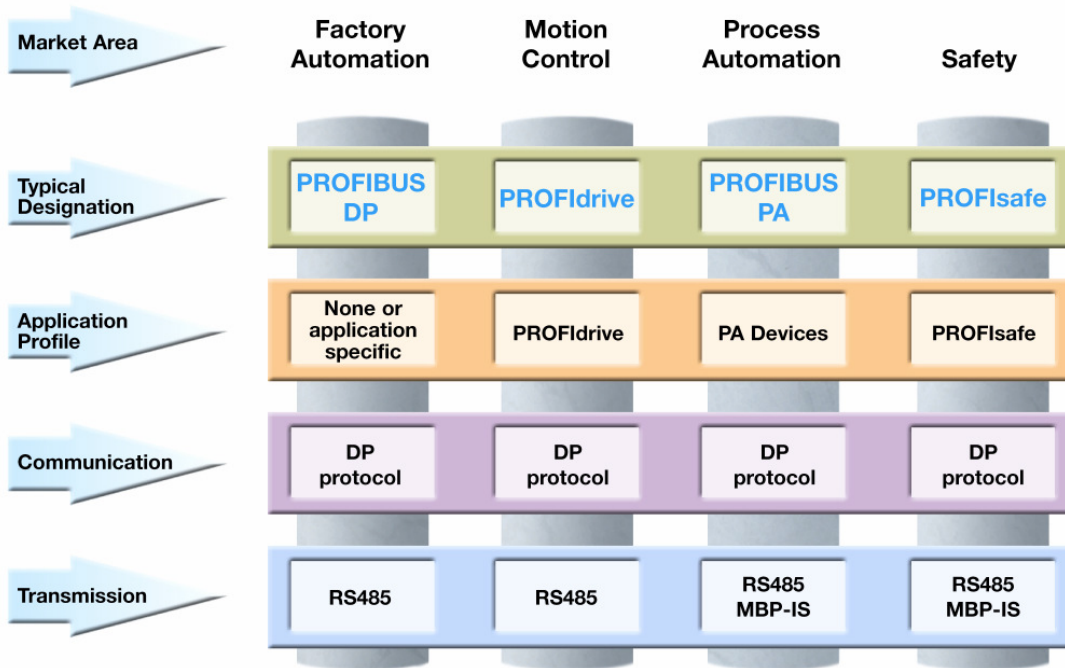
By ARC Advisory Group

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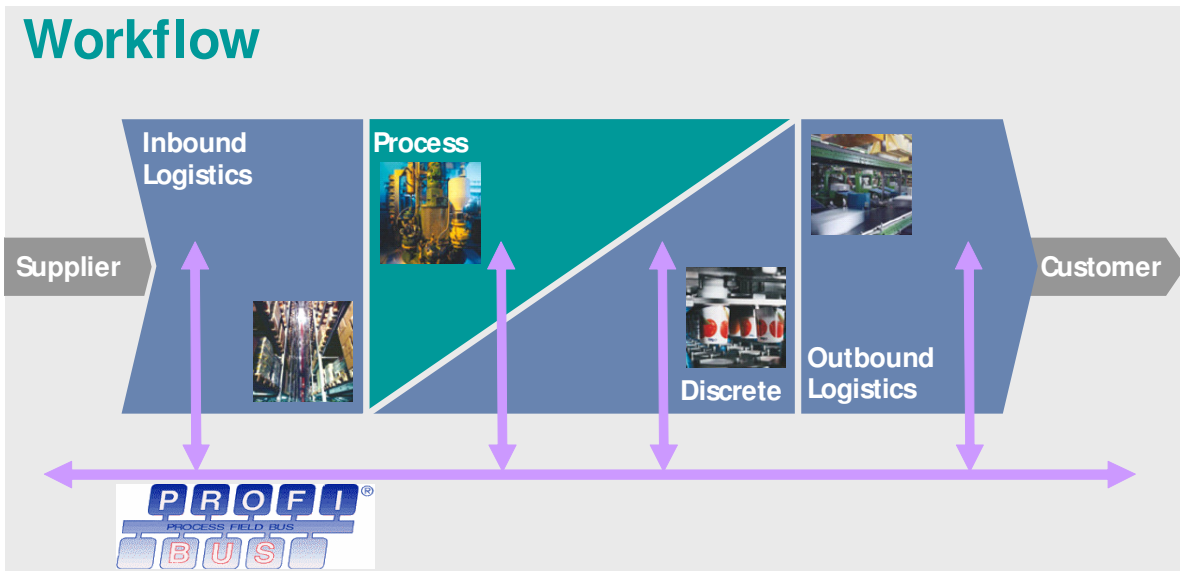
# The Value Proposition of PROFIBUS in the Process Industries

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**PROFIBUS' Application Profiles Address Specific User Needs While Sharing a Common Communication Layer**



Source: Siemens AG

**PROFIBUS Provides a Seamless Networking Infrastructure**

## Executive Overview

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The adoption of fieldbuses in manufacturing continues to grow rapidly, especially in the heavy process industries such as oil & gas and chemical where the penetration of fieldbuses is still small. Manufacturers are realizing the benefits of homogeneous fieldbus architectures that enable industrial networking across domain boundaries from simple sensors to complex field instrumentation. PROFIBUS, with its common communications layer, many application profiles, and breadth of media alternatives, offers manufacturers a solid long-term value proposition to help protect their automation investments.

PROFIBUS' 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.

The value proposition of fieldbus has changed from the initial perceptions of the marketplace. Benefits such as reduced wiring and installation costs are apparent, but often mask the long-term benefits of fieldbus and device networks. According to ARC's research, the greatest benefits of fieldbus and device networks are realized in the areas of maintenance and operations, long after a

plant has been commissioned. In other words, fieldbus itself is often not the cost-saver, but merely an enabler to a new level of asset management effectiveness that can significantly reduce operating costs and help manufacturers achieve operational excellence. Many of the benefits of fieldbus are still being discovered as users gain more experience with these technologies in real world plant settings.

In typical process industries such as oil & gas or bulk chemicals, fieldbuses can contribute significantly to the achievement of operational excellence by enabling the sharing of critical information about the condition of devices. A fieldbus simplifies the gathering of data for Plant Asset Management (PAM) systems that watch over devices, tracking their "health", and even detecting problems before they occur – a process known as predictive or proactive maintenance.

PROFIBUS, which conforms to the international IEC 61158 standard for fieldbus, is the most widely used industrial network to connect control systems with field devices. To meet the special needs of the process industries for intrinsic safety and bus power with two-wire technology, PROFIBUS offers MBP-IS (Manchester Coded, Bus Powered, Intrinsic Safety) transmission technology as well. 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 in all areas of the plant by providing a seamless link between all manufacturing domains.

PROFIBUS DP is used to network I/O and intelligent devices due to its fast response time and may also serve as the fieldbus “trunkline”. With data rates up to 12 Mbps, more devices can be connected to the network than with other fieldbus solutions. 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, flow meters 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.

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. Unlike other fieldbus solutions, PROFIBUS allows for direct integration of HART devices. In view of the large number of installed HART devices, the PROFIBUS HART specification was developed to enable the mapping of the HART client-master-server model on PROFIBUS. Installed in the engineering or asset management stations, a communications channel allows transparent remote access to diagnostic information and parameters.

## **PROFIBUS Targets Process Industries**

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Fieldbus technology is gaining traction in the process industries not only due to perceived benefits such as lower installation costs, but also other benefits such as enabling sophisticated tools like predictive maintenance through the use of intelligent asset management. PROFIBUS in particular offers a unique value proposition to various process industries.

### **Chemicals & Petrochemicals**

The chemical industry produces a wide range of products for consumer use as well as preliminary products for other industries such as automobile and building materials. These industries employ a variety of different manufacturing processes – from batch processes in fine and specialty chemicals to continuous processes in bulk chemicals. In addition, discrete applications such as filling, packaging and labeling are often integrated into these processes, especially in the manufacture of consumer products.

Chemical plants tend to be large, centralized facilities that place special demands on automation equipment and machines over lifecycles often in excess of 15 years. A single plant may employ thousands of simple actuators and sensors in addition to a wide range of



**PROFIBUS' Integrated Concept Offers Networking Solutions For a Variety of Manufacturing Environments**

more complex field instruments and analytical devices. These devices produce and consume large numbers of analog process and control variables that are communicated between controllers and devices. Many plants also employ smart motor control centers to provide controlled motion for mixers, pumps, valves and transportation equipment.

Plant equipment must be designed to operate in dusty, corrosive and often explosive environments. High availability of automation systems means employing redundant control systems and networks and is critical in chemical manufacturing, especially in continuous processes that may

run for years without stopping. To meet these requirements, PROFIBUS offers a large number of redundancy options such as two redundant, separate copper lines or fault tolerant optical ring structures.

The use of a fieldbus in chemical manufacturing offers users a number of tangible benefits. In most cases, networking field devices via a fieldbus can cut documentation, installation and material costs substantially. As a rule of thumb, the larger the application, the greater the benefits from a fieldbus, which is why many new projects or "bulldozer" revamps are planned around a fieldbus architecture. Start-up costs can also be lowered due to a reduction of the time needed to perform loop checks, while non-fieldbus legacy devices can be networked via remote I/O blocks that connect to the fieldbus. Finally, field devices can be calibrated more conveniently over the fieldbus rather than on-site, both during start-up and at regular calibration intervals during normal operations.

PROFIBUS' architecture is especially suited to meet the demands of chemical manufacturers. Data transfers rates of up to 12 Mbps allow a fast exchange of large data quantities between controller and devices, while the typically long distances between devices in a chemical plant can easily be bridged using repeaters and a fiber-optic bus medium. PROFIBUS offers wide range of application-specific profiles to meet specific needs, such as PROFIdrive for motion applications or PA Devices for intelligent field instruments that can take advantage of the network's high data rate while

allowing a larger number of devices to be connected to the network than other fieldbus solutions. PROFIsafe is profile for safety components that allows safe communication up to safety level SIL 3 according to IEC 61508. Users can also protect their investment in existing 4-20 mA or HART devices by directly interfacing these to PROFIBUS. By far the most important advantage of PROFIBUS for chemical manufacturers is its single communication layer, which allows integrated communication across all network media from the field level to the control level. This seamless communication provides the basis for asset management software to monitor the performance of field devices, helping to predict faults in advance and reduce maintenance costs.

## Oil & Gas

The oil & gas industry will see steady growth over the next five years as oil & gas exploration and production continue to expand worldwide. Many oil & gas companies are spending increasing capital in pursuit of new oil & gas reserves. A large percent of spending continues to go towards meeting environmental, safety and other statutory regulations. Maximizing the



**Highly Availability is a Critical Requirement of Automation Systems in Oil & Gas Applications**

availability of control systems is absolutely critical, as systems are kept in operation around the clock over many years. Another top priority is the protection and safety of personnel and the environment. In a typical refinery, for example, 15 to 20 percent of the process signals are safety-related. Finally, keeping lifecycle costs down to a minimum, especially costs of raw materials, energy and labor, is crucial to remaining competitive.

In the long term, using PROFIBUS can contribute substantially to lowering the Total Cost of Ownership (TCO) of refining assets by lowering maintenance costs through intelligent asset management, which has become a prerequisite for the

oil & gas industry. Moreover, feeding predictive maintenance solutions with accurate real-time field data can head off catastrophic equipment failures by allowing the user to study and analyze subtle, gradual decay in asset performance long in advance of a potential failure.

High availability and integrated safety are a must in these processes. Typical safety applications in the oil & gas industry include fire and gas, burner management, emergency shutdown and critical process control systems.

Other important system requirements include sophisticated asset management solutions to help end-users keep maintenance and operational costs down to a minimum. “High availability” refers to dual redundant control systems with redundant industrial networks. In a redundant control system, every element, from the operator station to field devices and including the fieldbus, is backed up by a duplicate.

PROFIBUS’ advantages for oil & gas users derive from its ability to seamlessly connect all types of plant devices without having to isolate process instruments from discrete devices with a second bus. In particular, PROFIBUS DP can be used to easily and reliably integrate motor control centers (MCC), variable speed drives and switching gear to control systems. PROFIBUS PA, which integrates seamlessly to DP, is used to network and provide power to field instruments. Both media types support the PROFIsafe profile for process safety, which allows the use of distributed fail-safe I/O.

## Power Generation

Investment in power generation assets are growing moderately at about 5 percent annually worldwide, due in part to the exploding need for energy in emerging markets while established power plants in other parts of the world are revamped and upgraded.



**In the Long Term, Using PROFIBUS Can Contribute Substantially to Lowering Total Cost of Ownership of Big-Ticket Assets Such as Steam Turbines Through Intelligent Asset Management**

Electrical power plants vary by the methods used to generate power, ranging from hydroelectric, nuclear, fossil-fired, and “waste to energy” plants to alternate energy sources. Although power generation is a classic continuous process, power plants have a surprisingly high “discrete” character. Hard-wired I/O points can account for two-thirds or more of the total hardwired signal count. This is due to the complex logic control structures employed in sequential operations like start-up and shut down of systems such as generator auxiliary systems, unit and boiler sequencers, fuel systems, auxiliaries, feedwater systems, turbines, turbine auxiliaries, vacuum systems, lubrication systems, and circulating and cooling water systems.

Fieldbus solutions offer a variety of benefits to

power industry users. Automation assets in power plants account for only about 7 percent of all plant-level capital expenditures, according to ARC's research. Despite this, lower wiring costs typically associated with using a fieldbus can still have an impact on reducing engineering and installation costs. ARC is aware of a 600 megawatt pulverized coal power plant that was able to reduce its overall costs by 40 percent and its cost per I/O point by 35 percent using a fieldbus. In the long term, using fieldbus technology can contribute substantially to lowering the Total Cost of Ownership (TCO) of big-ticket assets such as steam or gas turbines by lowering maintenance costs through intelligent asset management. More importantly, feeding predictive maintenance solutions with accurate real-time field data can head off catastrophic equipment failures by allowing the user to study and analyze subtle, gradual decay in asset performance.

PROFIBUS' particular advantage for power plant users derives from its ability to seamlessly connect all types of plant devices without having to isolate process instruments, such as flowmeters and control valves, from discrete devices like remote I/O and motor control centers. The benefits for the user include lower operation costs, improved equipment efficiency, reduced engineering costs due to simplified design and construction, lower lifecycle costs and reduced spending for training and service.

## Water & Wastewater

Water has always played an essential role for human beings and has lost none of its importance up to the present day. In developing countries, establishing and ensuring a steady supply of clean water is the most critical part of an expanding infrastructure, both for residential and industrial use. Essentially, there are two typical processes in the water industry: water treatment with the goal of supplying drinking water in highest quality, and waste water treatment to recycling waste water into a usable resource.



**Water and Sewage Treatment Plants are Ideal Candidates for Fieldbus Technology Due to the Harsh Operating Environments and the Long Distances Between Controllers and Devices**

Water and sewage treatment plants are ideal candidates for PROFIBUS due to the harsh operating environments and the long distances between controllers and devices. Either DCSs or PLCs are used to monitor control functions, while field devices range from pressure, flow and level meters to motor control centers driving pumping stations.

PROFIBUS offers particular advantages here due to its wide support from process and discrete controller suppliers, as well as its architecture that allows for seamless connectivity of both process field instruments and discrete devices. Costs along the entire lifecycle of water and sewage treatment plant assets can be reduced by a centralized approach to collection and evaluation of field information.



**PROFIBUS Can Greatly Reduce the Number Of Points Of Failure In Harsh Environments By Replacing Costly Wiring With A Single Cable**

## Cement & Glass

PROFIBUS has been used in the cement industry since 1997, when the technology was first applied in cement works in Asia. As in the chemical industry, cement works are known for their harsh environments and the heavy demands they place on automation equipment. A fieldbus can greatly reduce the number of possible points of failure in such harsh environments by replacing complex and costly wiring harnesses with a single cable.

Should a problem occur, faults can be located much more quickly with a fieldbus thanks to built-in diagnostics. Redundancy options for PROFIBUS DP mean that backbone availability is also not a problem.

Cement manufacturers will appreciate the ability to configure field devices remotely from a central control room via PROFIBUS, as instruments such as pressure transmitters and flow meters are often installed in difficult to reach locations. Gaining access to level measurement devices in homogenization and cement silos can be particularly cumbersome. Once devices are networked with PROFIBUS PA, for example, all programming or calibration can be taken care of from a single location using access tools such as Siemens' Process Device Management tool (PDM) or ABB's Control Builder F (CBF).



**Glass Manufacturing Combines the Demands of Continuous Processes With The Challenges of Material Handling**

Electrically controlled motors and drives are an integral part of the logistics automation in cement plants. One unique advantage of PROFIBUS is its ability to connect all field devices – whether process or discrete – to a single network. Other fieldbus solutions would require the use of a separate bus to network discrete devices like drives, requiring the user to invest in separate

wiring, software and employee skill sets to accomplish the same task.

The glass industry shares many of the harsh environmental demands of the cement industry, but adds a few more challenges. Glass employs applications common to both process and discrete industries in every stage of production, from the batch house through the furnace, float bath and annealing lehr up to the cross cutters and packaging units. To fully integrate these processes means to network pressure transmitters, control valves and flow meters on the batch side of the process with complex motor control centers on the handling side.

### Hybrid Industries

Few industries are “pure” process industries. Even heavy process industries like oil & gas or chemicals employ motor control centers and discrete sensors that are networked with discrete device networks. Many, such as food & beverage and pharmaceutical, are made up of a distinct process side, complemented by a series of purely discrete applications.



**Brewing Is A Classic Hybrid Industry Combining Elements Of Process and Discrete Applications**

Beer brewing, for example, is a classic process application in which control loops are programmed to maintain process variables at fixed values over long periods of time. Once the beer has fermented, however, the pace picks up. Glass bottles whirl at high speed around the carousel of a filler, are then capped and labeled, and finally packaged and palletized. These last few steps are classic discrete applications involving high-speed, often asynchronous coordination of bit-level signals.

Pharmaceutical is another hybrid industry that employs a blend of process and discrete applications. Manufacturing the substances used to make liquid, pill or powder-based medications involves continuous or batch applications, while the packaging and handling of final products is typical for high-speed discrete applications.

The hybrid industries have recognized the advantages of using a single fieldbus, PROFIBUS, across all of these applications. The advantages of a single fieldbus strategy include lower operational costs due to less training, faster troubleshooting, and fewer spare parts. Using just one bus also means that asset management software and engineering tools only need to

deal with one fieldbus tool to access data from both process instruments and discrete devices.

Further information and case studies about PROFIBUS in the hybrid industries are available in the ARC white paper “The Value Proposition of Fieldbus in the Hybrid Industries”.

## **PROFIBUS in the Process Industries: Four Case Studies**

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According to PROFIBUS International (PI), with more than 13 million installed nodes, PROFIBUS is the most widely deployed fieldbus in the world. PI further claims that 2.1 million of these nodes are deployed in the process industries and 400,000 of these are for PROFIBUS PA devices. This success is due in part to the backing of PROFIBUS International with its broad technical resources, the marketing strength of its 1200+ members, and the wide range of application profiles for PROFIBUS that address specific manufacturing needs. The following section looks at fieldbus applications of four end-users who have realized benefits from using PROFIBUS in typical process industry applications.

### **CenterPoint Energy Upgrades Legacy Systems with PROFIBUS**

CenterPoint Energy is a Texas-based energy delivery company with operations in electricity transmission and distribution, natural gas distribution and sales, interstate pipelines, and power generation. As the third-largest natural gas distributor in the United States, the company’s three distribution companies deliver natural gas to nearly 3 million commercial, residential and industrial customers.

At CenterPoint’s Unionville, Louisiana facilities, natural gas produced in Eastern Texas is stored in underground storage fields where it awaits delivery via pipelines to large wholesale customers and major cities. Delivery is regulated by a network of over 100 valves that control flow through conditioning, pressure regulation, treatment, metering, separation, and compression equipment at pressures of up to 3000 psi. The system is monitored and controlled by legacy TI 555 PLCs and workstations running Intellution’s FIX DMAPS visualization software.

The decision to go with PROFIBUS was based on CenterPoint's desire to install a modern process fieldbus that would centralize data collection, eliminate frequent trips to the field, and replace ancient and failing 4-20 mA instrumentation. One requirement was for the fieldbus to be compatible with legacy TI 555 controllers in operation since 1993. The solution was simple: upgrade the existing PLCs with PROFIBUS DP ports connected to field instruments through intrinsically safe PA segments over DP/PA couplers. Individual PROFIBUS PA bus segments transmit control signals, detailed valve performance, and diagnostic data to and from transmitters mounted on 46 orifice flange taps.



**PROFIBUS Allows CenterPoint to Centralize Data Collection for Better Prediction and Elimination of Premature Valve Failures**

This set-up has paid off in a number of ways for CenterPoint. By making this information available to the station control computers, technicians no longer have to make trips to distant meter runs to collect data with a hand-held device. More importantly, information collected on a regular basis helps predict and eliminate premature valve failures due to bad tuning.

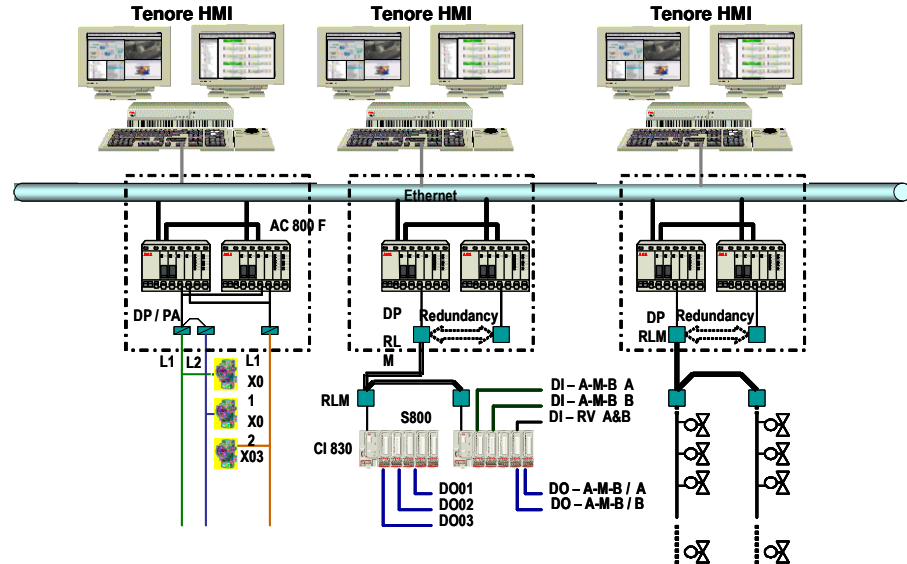
When used in conjunction with asset management software, smart valve positioners on fieldbus networks such as PROFIBUS are primary enablers for predictive maintenance. According to ARC estimates, as much as 40 percent of manufacturing revenues are devoted to maintenance and as much as 60 percent of scheduled maintenance checks on valves and motors prove unnecessary. The cost of performing predictive maintenance can be reduced to a fifth of preventive maintenance costs and a tenth of corrective maintenance costs - even without factoring in the costs of downtime.

### **Italian Power Plant Revamps with PROFIBUS**

Process control systems are known for their long lifecycles, but despite high revamp costs, it pays to renew systems when the benefits of operating and maintaining older technology have finally run out. A utilities company in Italy that generates and supplies electricity to parts of that country's power grid recently replaced aging oil-fired boilers with new gas turbines from Siemens and General Electric. This environmentally driven upgrade included the installation of a turbo gas unit, an air-cooled generator, a heat recovery steam generator (boiler), as well as the continued use of existing but de-rated steam turbines. The revamp resulted in a 17 percent increase in output power for each unit from 320 to 375 megawatts.

For its new control architecture, the power plant's engineers selected a control system based around ABB's Freelance AC 800F process control system using PROFIBUS to network all field devices. The system, in operation since November 2001, replaces old Hartmann & Braun controllers for closed loop and Daco System controllers for open loop. The architecture is designed in three levels:

- The bottom level consists of intelligent field devices including pressure transmitters, electro-pneumatic positioners for pneumatic control valves connected to PROFIBUS PA segments, as well as on/off valves with intelligent actuators, simple sensors and other discrete devices connected via 800S remote I/O blocks to PROFIBUS DP.
- The Freelance AC 800F process control systems occupy the middle level and serve as the master to the field devices on PROFIBUS DP and PA.
- The supervisory level consists of operator stations and engineering stations running Tenore HMI software. Tenore is an HMI solution for power generation plants developed locally by ABB in Italy and was recently renamed "Power Generation Portal". From these stations, plant engineers can configure and diagnose all field devices remotely.



#### **PROFIBUS Connects Both Process Field Instruments and Discrete Devices to the Freelance AC 800F Process Control System in this Power Plant Architecture**

The decision to use a fieldbus in this revamp project was based on a need to improve the flow of information from field devices. The power plant's engineers wanted to take advantage of new predictive maintenance solutions that would allow them to anticipate problems before they occur, rather than

waiting for devices to fail and then replacing them. In addition, they also desired to shorten the downtime caused by installing and configuring replacement devices. PROFIBUS was selected as the fieldbus because of its

More available information coming directly from the field

Easier troubleshooting and diagnosis functions

Lower costs in terms of cables, wire handling and testing, and interconnection cabinets

One remote integrated station for configuration and maintenance

No need to purchase and train personnel on multiple configuration handsets

Faster device configuration

Fast monitoring of segment and devices status

Easy simulation of process variables for further analysis

Top-down procedure for troubleshooting

Adjustable instrument ranges

Improved diagnostics due to the digital nature of the measurement chain

#### **An Italian Utility Company Reported a Long List of Fieldbus Benefits with PROFIBUS**

ability to network not just process field instruments, but also discrete devices on the same network. Now, with significantly improved remote diagnostic capabilities, the engineers report that the plant can be operated more efficiently and with fewer personnel, resulting in measurable operating cost savings.

#### **Shanghai Wujing Chemical Designs Control System Around PROFIBUS**

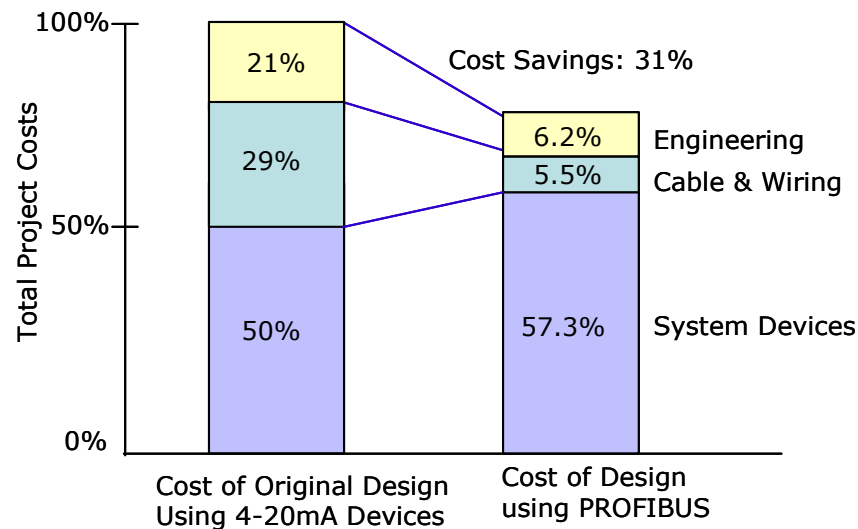
China's economy is growing in leaps and bounds and its chemical industry is no exception. Many people believe that due to China's low labor costs, manufacturers use low-cost automation systems or do not fully automate their manufacturing systems. In fact, the opposite is true. In the process industries, end-users are installing state-of-the-art automation systems to deliver products with consistent quality – a necessary trait to compete in a globalized world. In Shanghai, the Wujing Chemical

Company, Ltd. augments its process control systems with fieldbus technology to keep installation costs down and improve maintenance efficiency.

Wujing Chemical produces acetic acid, a basic chemical used to make chemical-based fibers commonly used in a wide variety of industries including textile and pharmaceutical. Part of the process involves using carbon monoxide as a reagent. To keep production costs down, Wujing added a recycling system to allow waste gases to be processed and reused.

Wujing initially laid out the recycling system with PLCs and field instruments using 4-20 mA technology, but decided to redesign the system around a process fieldbus and DCS after learning of the potential benefits. The choice came down to a Fisher-Rosemount system with Foundation Fieldbus versus a Siemens SIMATIC PCS 7 system with PROFIBUS. Even though Wujing had previous experience using field instruments and valves from Fisher-Rosemount, they decided on the Siemens/PROFIBUS solution for both costs reasons as well as PROFIBUS' single-bus approach for both process and discrete I/O devices.

For communication with standard I/O signals from the field, Wujing's engineers used I/O racks connected via PROFIBUS DP backbone. Since most of the recycling process takes place inside an explosive environment, temperature and pressure transmitters, control valves, and positioners were networked with PROFIBUS PA, which meets requirements for intrinsic safety and bus power. Several non-PROFIBUS instruments inside the explosive area were also connected to the fieldbus using intrinsically safe remote I/O modules from Pepperl + Fuchs. Finally, all PA segments were mated with the DP "trunkline" via link couplers, providing a single, seamless communications link back to the controller.



**According to Wujing Chemical's Calculations, the PROFIBUS-Based Solution Resulted in an Overall Cost Saving of 31 Percent**

To justify the fieldbus solution, Wujing conducted a cost comparison with the original PLC-based design. As expected, the total cost for system devices was higher – in this case by nearly 15 percent – using the DCS/fieldbus solution. However, wiring material costs using PROFIBUS were just a fifth of the cost of using 4-20 mA devices. Installation and start-up costs were also substantially lower, resulting in an overall savings of 31 percent for the whole project.

Now that the recycling system is up and running, process engineers at Wujing enjoy a variety of benefits from using a fieldbus. They claim that measurement values are more accurate since these values are transmitted digitally across the fieldbus to the controller rather than going through several stages of analog and digital conversion. Engineers can obtain device information at any time by using the PROFIBUS Process Device Manager (PDM). The PDM tool allows asset or maintenance management applications to read information remotely from field devices, or to set device

parameters for remote configuration or calibration. By remotely accessing field device parameters over PROFIBUS, Wujing's engineers expect to lower maintenance costs by identifying problems earlier and, when problems do occur, to minimize downtime through fast configuration and calibration.

### **Jedlicze Used-Oil Refinery Improves Maintenance with PROFIBUS**

In southern Poland, not far from the Slovakian border, the Jedlicze Refinery recycles used oils in its regeneration facility to produce new lubricant products. Using old oil collected from a network of companies, this hydro-refining installation can produce as much as 80,000 tons of regenerated oil per year. The process employs typical petrochemical applications to make several distillation cuts from waste oil, and then to remove sulfur from these cuts through hydrogen processing. The waste oil treatment facility consists of two independent plants: a thermal de-asphalting unit controlled by a Fisher-Rosemount RS3, and a hydro-finishing unit, controlled by a Siemens SIMATIC PCS 7.

In 2000, the Jedlicze refinery made the decision to build a new plant to batch-process used oil cuts coming from the thermal de-asphalting unit as well as from other feeds from the rest of the refinery plant. For the hydro-finishing unit, several bids for the control technology were considered, including solutions from Emerson, Honeywell, Yokogawa, and Siemens, before the company decided on a redundant Siemens SIMATIC PCS 7 control system using PROFIBUS. Jedlicze's engineers were especially keen to use a fieldbus, expecting to save cabinet space through less wiring while improving overall process control and maintenance by leveraging the increased amount of data that a fieldbus would make available to them.

In the plant's fieldbus architecture, PROFIBUS DP is used to network AC drives, an emergency shutdown PLC from HIMA, and numerous HART devices connected via the PROFIBUS network. A serial interface also connects a legacy Allen-Bradley PLC from the hydrogen production unit to PROFIBUS DP. On the process side, PROFIBUS PA networks field instruments such as pressure transmitters and valve positioners, most of which operate in explosive environments that require the use of intrinsically safe devices (zones 1 & 2). These PA segments are connected to the PROFIBUS DP trunkline via DP/PA links and couplers, which link together the dissimilar physical media and provide intrinsically safe power to the bus while transparently maintaining the same communications protocol.



PROFIBUS is that they can now detect problems earlier, often before they occur. This helps them to prevent expensive unplanned downtime – plant productivity’s classic nemesis.

## Recommendations

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- Fieldbus solutions can add long-term value to process systems by enabling real-time asset management. This means reducing downtime through better diagnostics, simplifying routine maintenance, and supporting predictive maintenance. To maximize long-term value, users should evaluate these benefits of fieldbus as they apply to whole processes – not just islands of automation.
- Process industry users can benefit from PROFIBUS’ unique value proposition in its ability to integrate process instrumentation seamlessly, like pressure transmitters and flow meters, with intelligent devices like motor control centers, remote I/O and variable speed drives. PROFIBUS’ common communications protocol creates a familiar environment that can help to lower engineering, training, and maintenance costs.
- New control systems can take advantage of the existing installed base of HART field devices while also incorporating PROFIBUS functionality. Users should consider these systems as a cost-effective method for fieldbus migration. Unlike other fieldbus solutions, PROFIBUS allows for direct integration of HART devices.
- PROFIBUS also offers a unique value proposition to users in the hybrid industries. Further information and case studies are available in the ARC white paper “The Value Proposition of Fieldbus in the Hybrid Industries”.

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

<b>API</b>	Application Program Interface	<b>MBP-IS</b>	Manchester Coded Bus-powered, Intrinsic safe
<b>APS</b>	Advanced Planning & Scheduling	<b>MIS</b>	Management Information System
<b>BPM</b>	Business Process Management	<b>OpX</b>	Operational Excellence
<b>CAGR</b>	Compound Annual Growth Rate	<b>OLE</b>	Object Linking & Embedding
<b>CAS</b>	Collaborative Automation System	<b>OPC</b>	OLE for Process Control
<b>CMM</b>	Collaborative Manufacturing Management	<b>PA</b>	Process Automation
<b>CPAS</b>	Collaborative Process Automation System	<b>PAM</b>	Plant Asset Management
<b>CPM</b>	Collaborative Production Mgmt	<b>PLC</b>	Programmable Logic Controller
<b>CRM</b>	Customer Relationship Mgmt	<b>PLM</b>	Product Lifecycle Management
<b>DCS</b>	Distributed Control System	<b>ROA</b>	Return on Assets
<b>EAI</b>	Enterprise Application Integration	<b>ROI</b>	Return on Investment
<b>EAM</b>	Enterprise Asset Management	<b>RPM</b>	Real-time Performance Mgmt
<b>ERP</b>	Enterprise Resource Planning	<b>SCE</b>	Supply Chain Execution
<b>HMI</b>	Human Machine Interface		

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