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SEPTEMBER 2016

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HART, FOUNDATION Fieldbus and FDI connect the Industrial Internet of Things

INSIDE

FDI EASES INTEGRATION, SUPPORTS FULL FUNCTIONALITY

SHELL FLOATS LIFECYCLE APPROACH WITH FOUNDATION FIELDBUS

PLANT OF THE YEAR RAISES BAR ON RELIABILITY

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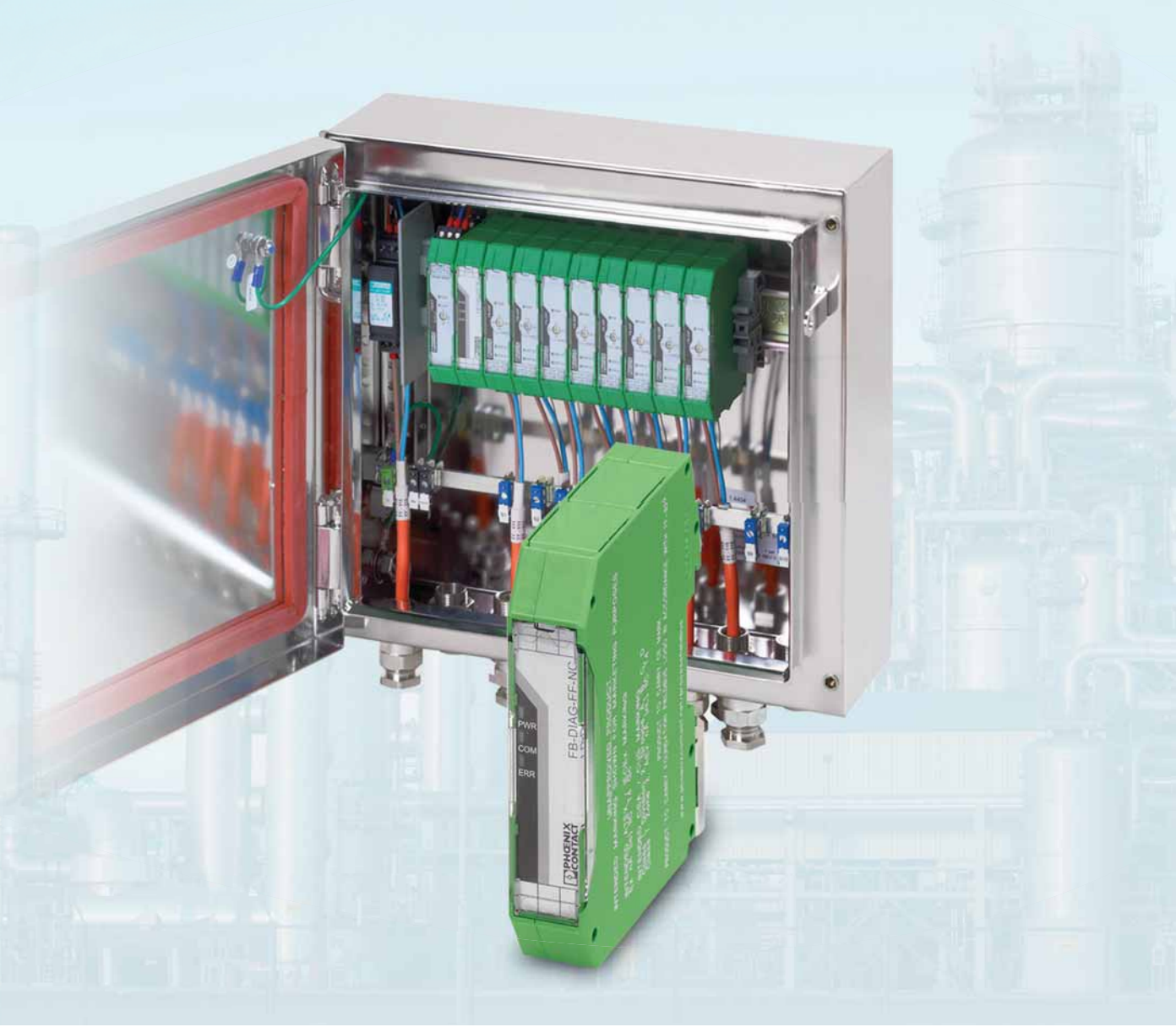

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PHOENIX CONTACT
INSPIRING INNOVATIONS

A Very Good Year

Ted Masters
President and CEO
FieldComm Group

BEFORE I SAT down to write this, I reviewed last year's supplement and several of the presentations I've had the privilege of giving this past year in an effort to determine what's changed—and what hasn't. Here's what I discovered.

Continued recognition of the value of FieldComm Group core technologies. End-users and end-user consortiums recognize the value of FieldComm Group technologies. This past year, NAMUR, a large European, chemical industry-focused consortium, and Exxon-Mobil each issued position papers outlining their respective visions for the next generation of process industry communication systems. Our new integration technology, FDI, is part of both visions.

Likewise, our members continue to develop HART and Foundation Fieldbus products. In fact, since 1996, the number of registered HART and Foundation Fieldbus products has grown 10-fold to more than 2,000 registered products.

The IIoT and Industrie 4.0 are just part of the broader initiative of digital transformation. Particularly here in the U.S., the hype around the Internet of Things (IoT), and our niche, the Industrial Internet of Things (IIoT), is not abating. The IIoT requires a deep understanding of the complex needs of process automation, where we deal with mission-critical information in environments of noise, chemicals and security. Evolution of our protocols through specifications and a tight process of registering compliant products to assure users of performance that meets the needs of this environment. New architectures will evolve with our protocols as the basis.

The process industries have two distinct communication technology groups—the operating technology (OT) group responsible for keeping the plant running, and the information technology (IT) group that we're all familiar with. Increasingly, more information is required by both OT and IT, thus the transformation to digital technology. Research indicates 50% of process industry facilities now use field-device, digital data for real-time applications. This is great progress and recognition of the value, yet there is still much room to improve by exploiting opportunities in IIoT.

Renewed emphasis on simplified device integration. In addition to simply connecting devices digitally, device information must be integrated with higher-level systems. As device complexity increases, so does integration complexity.

This year's *Control* survey asked about the challenges users face in device integration. The top three answers were: staff training, device driver installation and revision, and proprietary systems. FieldComm Group's FDI technology helps resolve the second and third issues by simplifying the process for finding and installing drivers, and requiring adherence to specific product registration requirements for FDI packages. This should reduce the training burden on end users as well.

Finally, there is much more content than we were able to fit, so please bookmark the newly redesigned FieldCommGroup.org website, and use it as your source for information about technologies, training programs, registered products and more.

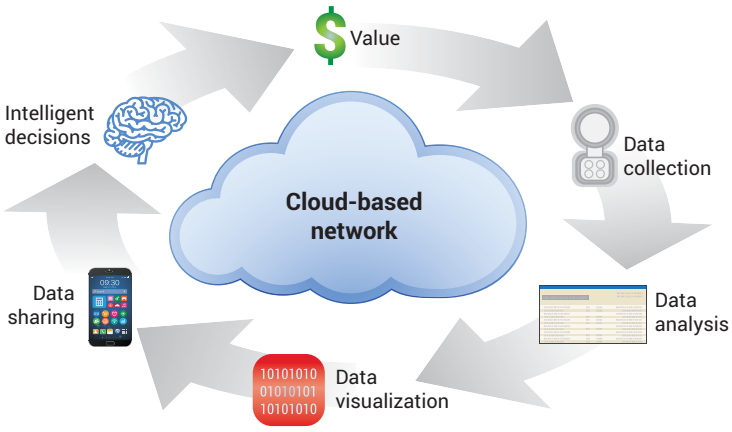
Open the Borders

FieldComm Group technologies let information flow throughout the Industrial Internet of Things.

IN ESSENCE, THE Industrial Internet of Things (IIoT) is a network, which means it needs input from plant-floor devices and systems, so users can make more profitable decisions. Data is what fills IIoT's tanks and gets it on the road, and much of that data has long been available from FieldComm Group technologies including Foundation Fieldbus, HART and *Wireless*HART.

"Foundation Fieldbus, HART and *Wireless*HART are the granddaddies of IIoT because they're the backbone that gets data to places that need to know what's going on with remote operations," says Dave Lancaster, PE, certified Foundation Fieldbus instructor at Trine University (www.trine.edu/fieldbus). "In the past, much of this data wasn't available, so we might not be able to tell what was happening. For example, a failing resistance temperature detector (RTD) on a gas dryer wouldn't be detected until after it shut down. Now, that RTD is one of five or six Foundation Fieldbus devices on one pair of wires with diagnostic data tied to graphics in the control room. When we see its temperature isn't as low as required, we click on the temperature sensor, pull up its diagnostics, and it reports there's a sensor failure. So we send out the maintenance guy, and he tightens the loose wire in the RTD without a costly shutdown. This whole problem is analyzed and fixed in 20 minutes, which isn't possible without Foundation Fieldbus."

It's good that FieldComm Group protocols are so proficient at delivering information, because IIoT is going to want a lot of it. "Oil prices have been down for 18 months, so there's pressure to eke out the last bits of profitability, but most want to do it with existing applications," says Arnold Offner, strategic marketing manager for Phoenix Contact (www.phoenixcontact.com). "This is why IIoT and its users want digital data. We can remind them that Foundation Fieldbus and HART have been providing behavioral information from flowmeters, pressure transmitters and valve positioners. However, it's going to take a lot of education, so we produced a video, "Introduction to HART Technology" (www.youtube.com/watch?v=JL9ev5yElK4HART). We also introduced a combined-function HART Multiplex Master last year, which can interrogate up to 40 devices, each with its own HART master (modem); get process data from anywhere; and scale it onto any device. This is what IIoT is."



FROM EDGE TO ENTERPRISE

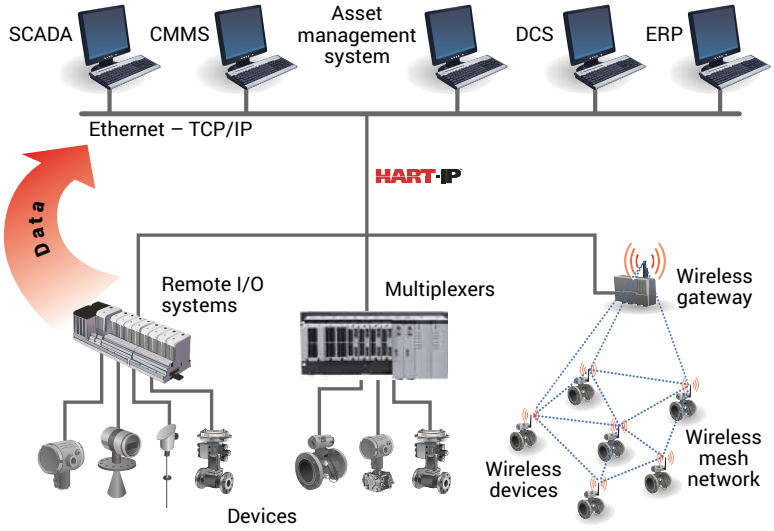
To streamline the trip from field or operations levels to business and management levels, FieldComm Group has also developed its HART-IP (Internet Protocol) specification.

"HART-IP simplifies and

provides complete access to data in devices via local automation networks and the Internet to enable tasks like predictive maintenance. It extends HART communication to the IP protocol, and that means worldwide access," says Kurt Polzer, senior consultant for device integration systems at Siemens Industry (www.siemens.com/us). "This lets operators talk to a HART device just by using *Wireless*HART adapters like Sitrans AW210. At the front-end, they can use our Simatic PDM software and the HART server provided by the FieldCom Group. Another big benefit is that data can be sent from the field to cloud applications like Siemens' MindSphere service that allows deeper insight into processes, and if needed, enables direct access to HART devices."

Jianwei Wei, industrial communications manager at Microcyber Corp. (www.microcyber.cn/en) in Shenyang, China, says the two main options for delivering field data to the enterprise are via gateways from fieldbuses to Ethernet or though a programmable logic controller (PLC) or distributed control system (DCS) that can communicate with a fieldbus, which can be done with components like Microcyber's Fieldbus Interface Module.

"These newer solutions are easier because they don't require as many communication details. You just connect and integrate, which is helpful because China's market for fieldbus and IoT is growing fast," says Wei. "Traditional field devices with analog interfaces and 4-20 mA networking only provide process values and only let users receive limited information, but don't have information about the device itself and whether those values are good or bad. The reason digital data from FOUNDATION Fieldbus, HART and *Wireless*HART are so valuable to the IIoT is because they provide much more process and device information, so users can know much more about what's going on in the field, which means better operations and maintenance. By using an intelligent transmitter with a gateway interface module and these protocols, users can gather information about whether pipes are blocked, for example, get operating data as it happens, or configure field devices from the control room."



Some devices have built-in Ethernet capabilities, such as ST100 flowmeters from Fluid Components International (FCI, www.fluidcomponents.com), which use Ethernet utilities as a remote configuration tool and bus communication protocols that can communicate with Ethernet networks via gateways. "We're sending data to PLCs and DCSs via HART and FOUNDATION Fieldbus, and merging multiple signals, devices and platforms. This lets users do real-time diagnostics, perform tasks like predictive maintenance, and send information to where it's needed," says Darrius Nowell, U.S. field service manager for FCI. "Our flowmeters have manufacturer-specific commands, which communicate a device's bus address, slot and index number, and ask about issues like deterioration, process flow, temperature and pressure. Together, HART and FOUNDATION Fieldbus are tremendously capable of accessing process data, such as device status, loop checks, simulation, signal integrity, etc., and these are vital to the future of IIoT."

STANDARDS SIMPLIFY DEVICE INTEGRATION

One of the major forces straightening and shortening the path

between field devices and the enterprise is increasingly uniform and standardized programming and data presentation methods, culminating recently in the FieldComm Group Field Device Integration (FDI) program and standards effort. Once process data is gathered and standardized, Ethernet gateways can move it to upper levels via Foundation Fieldbus' established High-Speed Ethernet (HSE) protocol, or send HART data using HART-IP.

"Once data reaches Ethernet, it can go anywhere," says Chuck Carter, consultant, teacher and former director of the Fieldbus Center at Lee College (www.fieldcommgroup.org/schools/fieldbus-center-lee-college). "This means temperature data can help determine if a thermocouple is degrading; alert local operators to be ready to fix it via Ethernet; share the overall failure rate of this thermocouple type with the purchasing department; and help users decide if it's time to change to another type. This is the true gist of what IIoT can do. However, it's FieldComm Group protocols that bring disparate parties and devices together, and let them coordinate their efforts.

Thad Frost, fieldbus and I/O connectivity director at Schneider Electric (www.schneider-electric.us), adds that, "Using smart instruments for configuration is really just the tip of the iceberg when you can also automate diagnostics, predictive maintenance and ordering. Knowing the number of times a valves has opened and closed, or that it will fail in three months, can increase purchasing lead times and maintenance flexibility. However, many users aren't prepared for all that instrument and asset data coming in, so we recently established our Maintenance Response Center to help analyze and use fieldbus data, and troubleshoot more effectively by identifying what equipment needs to be fixed. It includes a software interface to smart devices and dashboard to help identify and solve problems." (A video about the center is at www.youtube.com/watch?v=DP9Xy_ExJcQ.)

IIOT GOES WIRELESS

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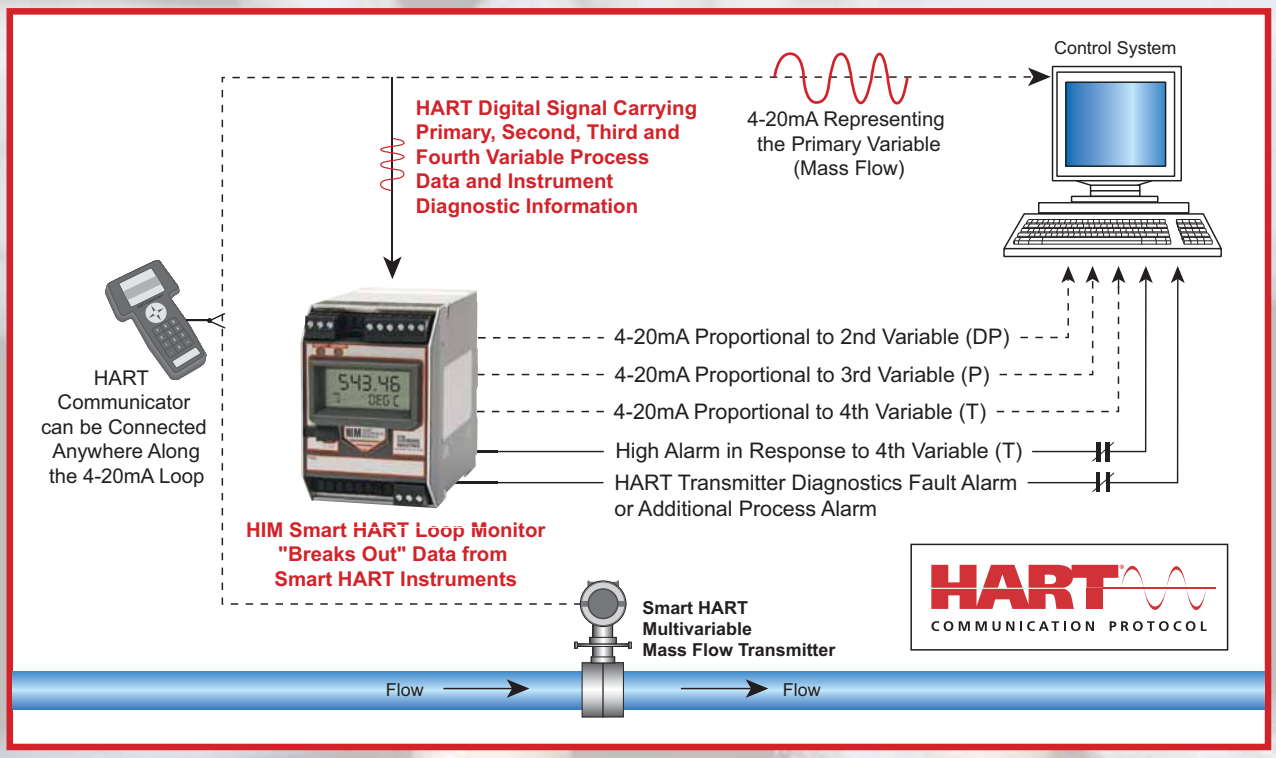

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- Provide High/Low Process Alarm Trips (Contact Closure)
- Convert HART to MODBUS RTU
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recent years, users can add "eyes and ears" more easily and inexpensively, and collect many more measurements. "This is where *Wireless*HART comes in and enables IIoT because it's a cost-effective way to add more sensors," adds Bob Karshnia, vice president and general manager of the wireless division at Emerson Process Management (www.emersonprocess.com). "It's simple because users don't have to learn a lot. Its security is built-in at a lower level. And, its robust, self-organizing, mesh technology is tolerant of things in a plant that often can't be controlled. This lays the groundwork for implementing analytics-based software, which can 'decide' which better equipment performance will improve financial value. IIoT is even changing the whole supplier business model because many are retaining equipment ownership, and instead selling answers and performance to their customers."

CONTROLS HELP HART ADD VALUE

To remove even more old hurdles between operations and business levels, some control systems are adjusting how they interact with HART to make it easier to pull in data, according to Mike Cushing, product marketing manager, Experion and I/O group at Honeywell Process Solutions (www.honeywellprocess.com).

"For instance, our Field Device Manager (FDM) software did maintenance by extracting process data via a multiplexer, but now that information can go directly to the controller without a multiplexer and the time, labor and hardware it requires," says Cushing. "One of the biggest traditional maintenance costs is for valves. If one is offline, then its data is usually pulled from its positioner. Now, with data coming in from a whole group of 25 valves and their positioners, for example, we can look at all of their open/close curves over time, and see which curves are changing due to loosening packing or seal loss. We can also check their stiction, travel and behavior, and know ahead of time which five need to be pulled and repaired, instead of pulling all of them as we used to do. We can also see which parts will be needed, which means faster turnarounds."

Calendar

For more information see www.fieldcommgroup.org

Smart Industry Conference and Expo
Chicago, IL, USA
September 26-28, 2016

Yokogawa Users Conference and Exhibition
Orlando, FL, USA
October 3-6, 2016

Introduction to FOUNDATION Fieldbus
Austin, TX, USA
October 11, 2016

Advanced Principles of FOUNDATION Fieldbus
Austin, TX, USA
October 12-14, 2016

2016 General Assembly End User Seminar
Rotterdam, The Netherlands
October 17, 2016

2016 Annual General Assembly and Working Group
Rotterdam, The Netherlands
October 17-21, 2016

Emerson Global Users Exchange
Austin, TX, USA
October 24-28, 2016

Rockwell Automation Process Solutions User Group
Atlanta, GA, USA
November 7-8, 2016

HART Fundamentals Workshop
Dusseldorf, Germany
November 7-10, 2016

Measurement and Control Show
Osaka, Japan
November 9-11, 2016

Device Integration - Writing EDD and FDI Package Workshop
Austin, TX, USA
December 5-8, 2016

FIELDCOMM GROUP
CURRENT COURSE OFFERINGS

Introduction to HART Protocol
This workshop is a two-day introduction course covering the basics of HART communication protocol. The course is designed to provide an overview of the HART market and technology.

HART Fundamentals and QA Testing Workshop
This workshop is an intensive four-day course covering all aspects of HART communication protocol. You will gain the information needed to develop new HART-enabled products, support existing products and design systems that utilize HART technology.

Device Integration - Writing EDD and FDI Package Workshop
An intensive four-day course where developers learn the step-by-step process for building a Device Description for a HART- or FOUNDATION Fieldbus-enabled device based on Electronic Device Description Language (IEC 61804-3, EDDL) that can be used across all DD-enabled host platforms.

Introduction to FOUNDATION Fieldbus
A one-day workshop for developers, end users, marketing professionals and applications engineers, this course assumes little or no prior knowledge of FOUNDATION Fieldbus, but students should be familiar with process control. Students will learn the basic concepts and terminology related to the FOUNDATION Fieldbus integrated architecture and gain a working knowledge of the technical foundation upon which the technology is built.

Advanced Principles of FOUNDATION Fieldbus
This workshop is an intensive three-day course covering all aspects of the FOUNDATION Fieldbus protocol. Students will learn the skills required to develop new FOUNDATION Fieldbus products, support existing products and design systems utilizing FOUNDATION Fieldbus technology.

Open Up the Options

FDI eases integration, supports full functionality, and opens the floor for IIoT

HART AND FOUNDATION Fieldbus are highly effective, but sometimes it takes more to integrate sophisticated field devices with the multitude of networks, operating systems and control systems used in the process industries. The Field Device Integration (FDI) specification helps bring previously inaccessible data into commonly reported and displayed information, so it can be used to add value for applications and businesses.

Now administered by FieldComm Group, FDI technology was developed and is supported by leading foundations and suppliers. FDI combines the advantages of an FDT Device Type Manager (DTM) and Electronic Device Description (EDD) in a single, scalable solution to handle the entire lifecycles of both simple and complex devices, including configuration, commissioning, diagnosis and calibration. EDD continues to be supported, ensuring backward compatibility.

"The value of FDI is especially realized by end users, in that devices across the spectrum of industrial standards—HART, FOUNDATION Fieldbus and PROFIBUS—can be engineered and maintained with a common, system- and device-independent set of tools," says Paul McLaughlin, director of architecture, Honeywell. "Equally important, FDI marries the simplicity and platform independence of EDD with the powerful functionality of FDT in a secure manner, providing end users with an open, future-proof standard for integration and superior user experience."

Published as the IEC 62769 standard, the FDI Specification is available from four owner organizations: FieldComm Group, PROFIBUS & PROFINET INTERNATIONAL (PI), FDT Group and the OPC Foundation. It supports FOUNDATION Fieldbus, HART and *Wireless*HART, and PROFIBUS and PROFINET. ISA100.11a is under preparation, and FDI also specifies gateway packages that allow data mapping between different communication protocols (see sidebar, "Global Adoption Accelerating").

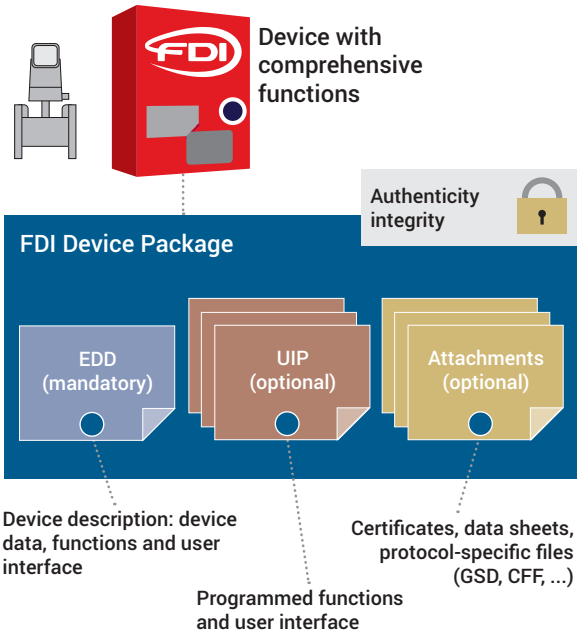
"FDI brings field devices to the Industrial Internet of Things (IIoT)," says Frank Fengler, head of device integration management, ABB. "FDI architecture foresees that each device type is represented by a device package. FDI specifies a Device Information Model, and uses OPC-UA communication to enable other applications to access it. This model is the single access point for external application, and can ensure security and protect the automation system against unwanted access."

PUT IT TO WORK

In practice, device vendors provide a package that virtually represents the device, and presents all the information needed by a host system. Running the FDI package provides all the device functionality, such as parameterization, diagnosis and maintenance.

For example, text-based EDD might be used to set up a device to measure physical properties like flow, pressure and temperature, but to calculate mass flow requires parameters from a database. FDI can combine text-based functions from the device and the database, then display parameters like mass flow. It can also support other functions such as valve diagnostics.

"EDD is text-based and independent of the Hosts and Operating Systems. However, in some cases it lacks the programmatic capability that may be needed for complex devices or diagnostics," says Scott Hokeness, business development manager, Emerson. "DTMs provide the programmatic applications for advanced and complex operations, but come with potential compat-



Powerful package

The core of the FDI Specification is the FDI Device Package, which is equivalent to a field device's organizational structure at its software level. It contains all the files a host system needs to talk to the device, such as electronic device descriptions (EDDs), user interface plug-ins (UIPs), attachments and security certificates. *Source: FieldComm Group*

ibility and cybersecurity issues. FDI adds this programmatic capability to EDD, but only when it's needed. FDI also addresses cybersecurity with manufacturer-signed packages that hosts validate to ensure they're genuine and haven't been altered. This reduces the maintenance costs and market confusion."

FDI wraps all this functionality in a single file. "No more search for the 'right' integration software product or the 'right' device that comes with the required integration software (FDT/DTM, EDD) that's supported by the control/asset management system," says Alexander Kaiser, head of product management and marketing, CodeWrights GmbH. "No more search on websites for manuals, certificates, GSD files (PROFIBUS) or CFF (Foundation Fieldbus), etc. Everything you need to work with a device can be contained in the FDI Device Package—a single *fdix file."

Combining the benefits of EDD and FDT/DTM in one file means simple devices that can be presented with EDD technology can be represented with FDI User Interface Descriptor (UID), while complex devices that need DTMs to present the functionality completely can be presented with FDI UID+FDI User Interface Plugins (UIP).

"Process industries thus need to deal with one technology instead of two," says Chris Schneider, senior product marketing manager, Honeywell Process Solutions. "Moreover, the FDI package the device vendor delivers can include attachments like calibration certificate, user manuals, images, etc., which can be opened in the FDI host without additional applications."

Device vendors use the same development software to create HART, Foundation Fieldbus, PROFIBUS and PROFINET FDI packages. This simplifies their work effort, reduces engineering hours, and speeds time-to-market, allowing for a more agile supplier better able to support users' evolving requirements. Similarly, process control engineers can use the same Host for devices supporting these protocols with transparency of the protocol underneath. And offline configuration brings in the benefits of both EDD and DTM.

READY FOR IIOT

FDI will play a critical role in the realization of IIoT and Industrie 4.0. "Multiple communication protocols exist and that's not going to change. However, FDI has the potential to be the single integration technology that can translate the binary data delivered by any communication protocol into tangible information that can be displayed and used by the end user on systems at varying levels throughout the enterprise," says Hokeness. "The major process automation host system suppliers are already behind FDI; we've all helped to develop it. We believe NAMUR has a similar vision for FDI."

Wilhelm Otten, chairman of the board, NAMUR, agrees that standardized, intelligent interfaces are the key success factor to achieve the benefits of Industrie 4.0 in the process industries. "They're the basis to make our core processes, supply chain and asset lifecycle, as well as vertical integration, more transparent and efficient," Otten says. "FDI is a big step to integrate field devices into automation systems automatically with standardized,

vendor-independent tools and procedures.

"To achieve a long-term benefit, certifications of host systems and device packages and implementation of an open, vendor-neutral interface (OPC UA) are the important steps. NAMUR as a user association of automation technology has driven this activity to merge existing standards and tools and will consequently promote and implement FDI."

If the control system or asset management tool supports the OPC UA interfaces, "Device health and topology data can be accessed via OPC UA mechanisms for further use in higher-level systems," says Kaiser. "We believe that FDI is the future standard for device integration and management for the process industry, but also beyond because the flexibility and scalability of the technology and FDI-based solutions will allow us to describe almost every device type available, in any automation context. We also see a big potential for IIoT and Industrie 4.0 applications because of the open and very well specified data model."

Thoralf Schulz, global technology manager, process automation, ABB, says, "FDI is the key technology to overcome the ever-repeating efforts for integrating field devices into control systems and asset optimization tools. In addition, FDI is the migration path for traditional field instruments into the Internet of Things, Services and People."

NEXT STEPS

Leading vendors are pressing on with additional FDI-enabled field devices, controllers and hosts. "The Process Device Manager Simatic PDM was the first Siemens prototype utilizing FDI functionality," says Axel Lorenz, vice president, process automation, Siemens. "This universal parametrize and service tool could already import FDI packages in November 2013. Siemens will release the first host system with FDI, as well as corresponding FDI packages to the field devices in 2017. We consider FDI as a decisive step towards less complexity and optimized customer service, and we'll continue to strengthen the joint activities accordingly."

Hokeness adds that Emerson's Instrument Inspector application configuration tool is the first HART and Foundation Fieldbus host based on the FDI standard. "We'll also support FDI with our premier intelligent device management package, AMS Device

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HONEYWELL IIoT READY

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Manager. This will deliver support for any connected host system. Emerson field devices will also support FDI in the near future."

According to McLaughlin, Honeywell actively plans uniform adoption of FDI technologies in its SmartLine instruments, its Experion DCS, and its Field Device Manager asset management suite.

At Endress+Hauser, "Seamless interoperability and data transparency on all levels are key factors in customer acceptance of upcoming technologies," says Rolf Birkhofer, managing director, process solutions. "Through its simplicity and ease of use, FDI enables customers to exceed their needs and requirements."

Also, a second version of ABB Field Information Manager FDI-based host software adds functions for easy device management and supporting use on handhelds. Generic Device Packages for ABB devices are now available for HART 5 and HART 7, as well as for pressure, level, temperature, flow and positioners.

GLOBAL ADOPTION ACCELERATING

FieldComm Group recently completed contracts between it and PROFIBUS & PROFINET INTERNATIONAL (PI) to manage the IP rights, roadmap and distribution of FDI technology, tools and host components; and between it and FDI technology partners PI, the OPC Foundation and the FDT Group to govern the process of FDI specification enhancement and leverage its Integration Working Group as the venue of collaboration.

FieldComm Group also completed a Memorandum of Understanding with the ISA100 Wireless Compliance Institute (WCI) to engage in technology discussions to incorporate ISA100 Wireless support into FDI Technology. The American National Standards Institute (ANSI) approved the FDI Technology standard in Plenary SC65E, "Device and Integration in enterprise systems," and NAMUR endorsed FDI Technology in its WG 2.6 Fieldbus Position Paper, "Requirements on an Ethernet Communication System for the Process Industry."

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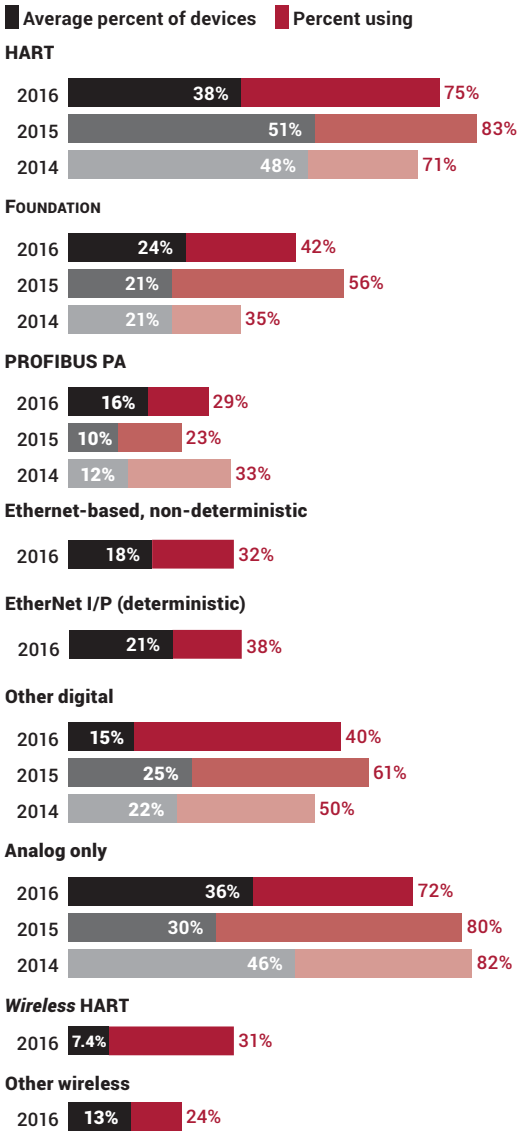
Users Weigh In

This year's annual protocol survey was completed by 156 members of *Control's* primarily North American subscriber list representing the process industries including Food, Chemicals, Pharmaceuticals, Primary metals, Petroleum, Utilities, etc.

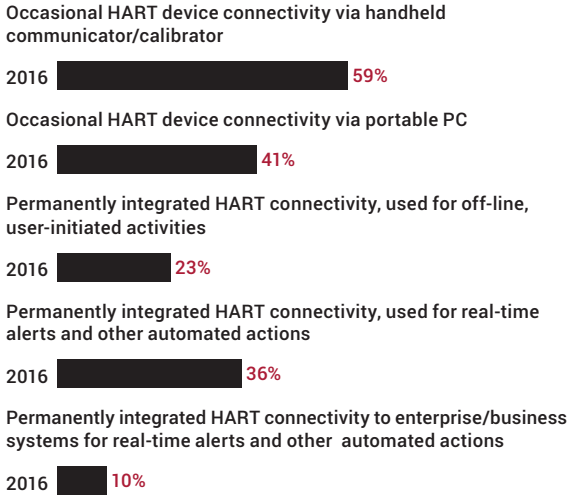
PROTOCOL POPULARITY

"Which of the following field instrument communication protocols are in use in your plant? (Please indicate the approximate percentage of field devices for each protocol.)"



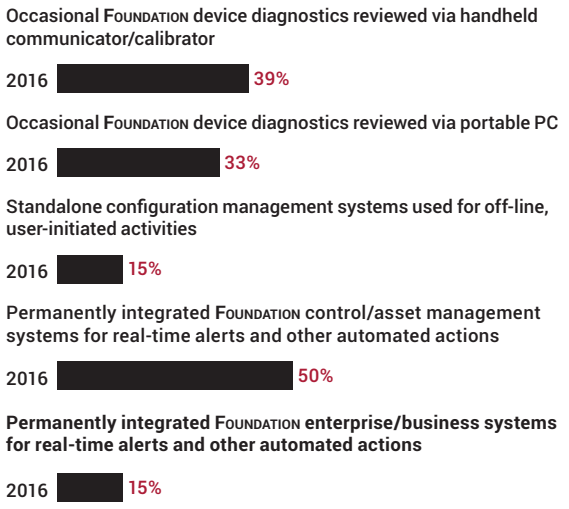
HOW INTEGRATED IS YOUR HART?

"If HART is in use at your plant, which of these statements describes your usage. (Please check all that apply.)"



HOW INTEGRATED IS YOUR FOUNDATION FIELDBUS?

"If FOUNDATION Fieldbus is in use at your plant, which of these statements describes your usage. (Please check all that apply.)"



WHAT PERCENT OF YOUR HART IS INTEGRATED?

"If permanently integrated HART connectivity is in use at your plant, what percentage of HART-based field devices is permanently integrated?"

WHAT PERCENT OF YOUR FOUNDATION FIELDBUS DIAGNOSTICS ARE YOU USING?

"If permanently integrated FOUNDATION systems are in use at your plant, what approximate percentage of the diagnostic capabilities are utilized from the devices?"

MAJOR CHALLENGES TO DEVICE INTEGRATION

"What are your major challenges to device integration? (Check all that apply.)"

Training and education

Dealing with device drivers and revisions

Legacy platforms limit protocol integration

Cost and installation of interface devices

Need proficiency in multiple protocols

Access/availability of tools/privileges

Available network options do not meet needs

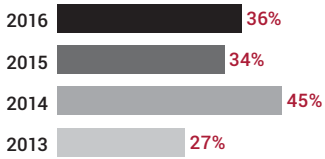
User interface hard or risky to use

Other

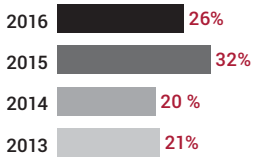
ARE YOU USING WIRELESS?

"Which of the following statements best characterizes your current or planned usage of wireless instrument networks? (Please check one.)"

Already have wireless field instrument networks up and running



Plan to test or use wireless

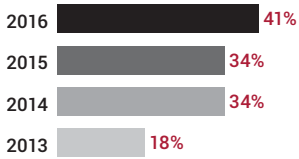


Do not intend to use wireless instrument networks

WHICH WIRELESS PROTOCOLS WILL YOU USE?

"Which of the following statements best characterizes your current or planned usage of wireless instrument networks? (Please check all that apply.)"

Use/will use IEC 625910-compliant *Wireless*HART solution

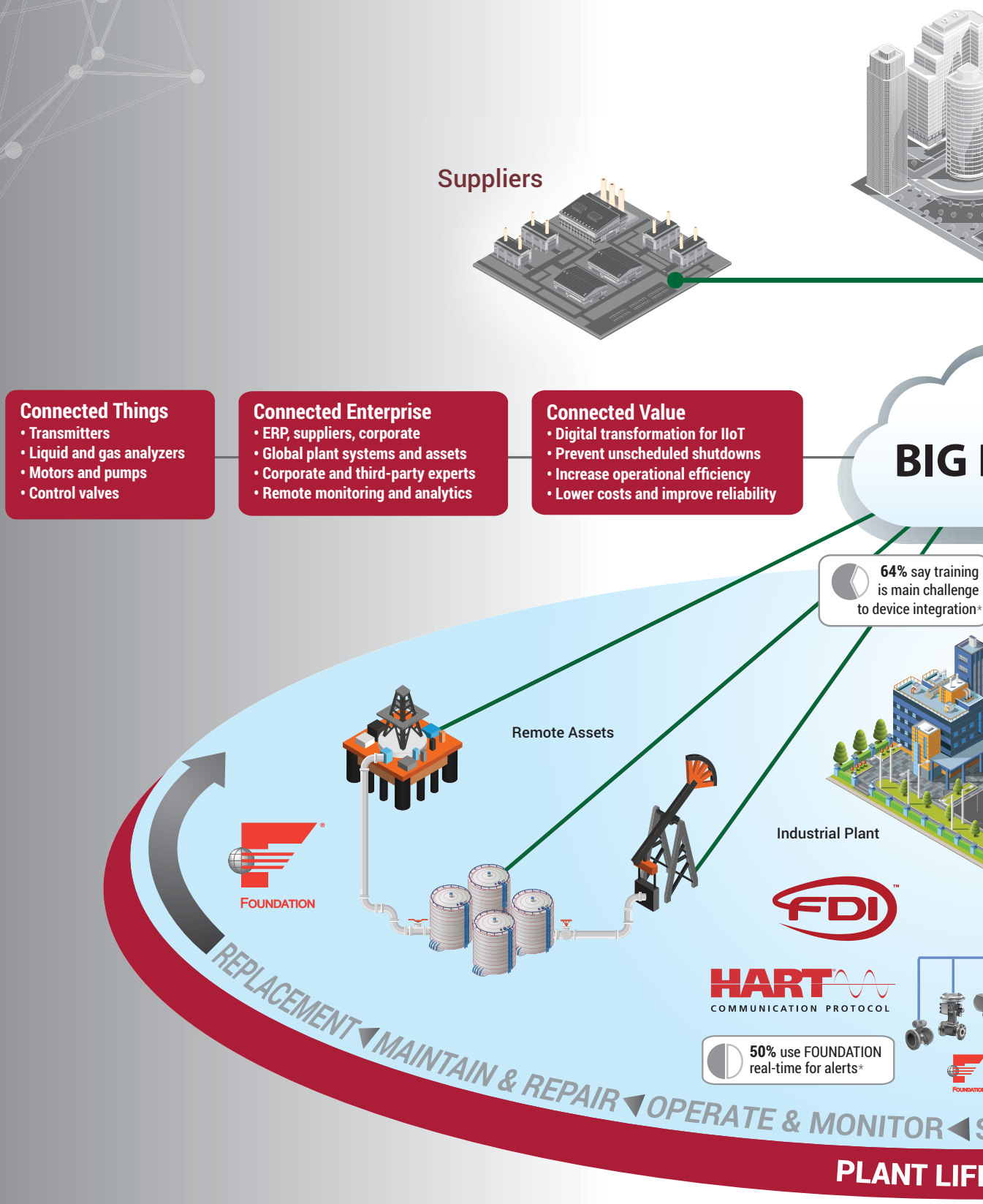


Use/will use ISA 100.11a-compliant wireless solution

Plan to wait until a single wireless instrument network standard emerges

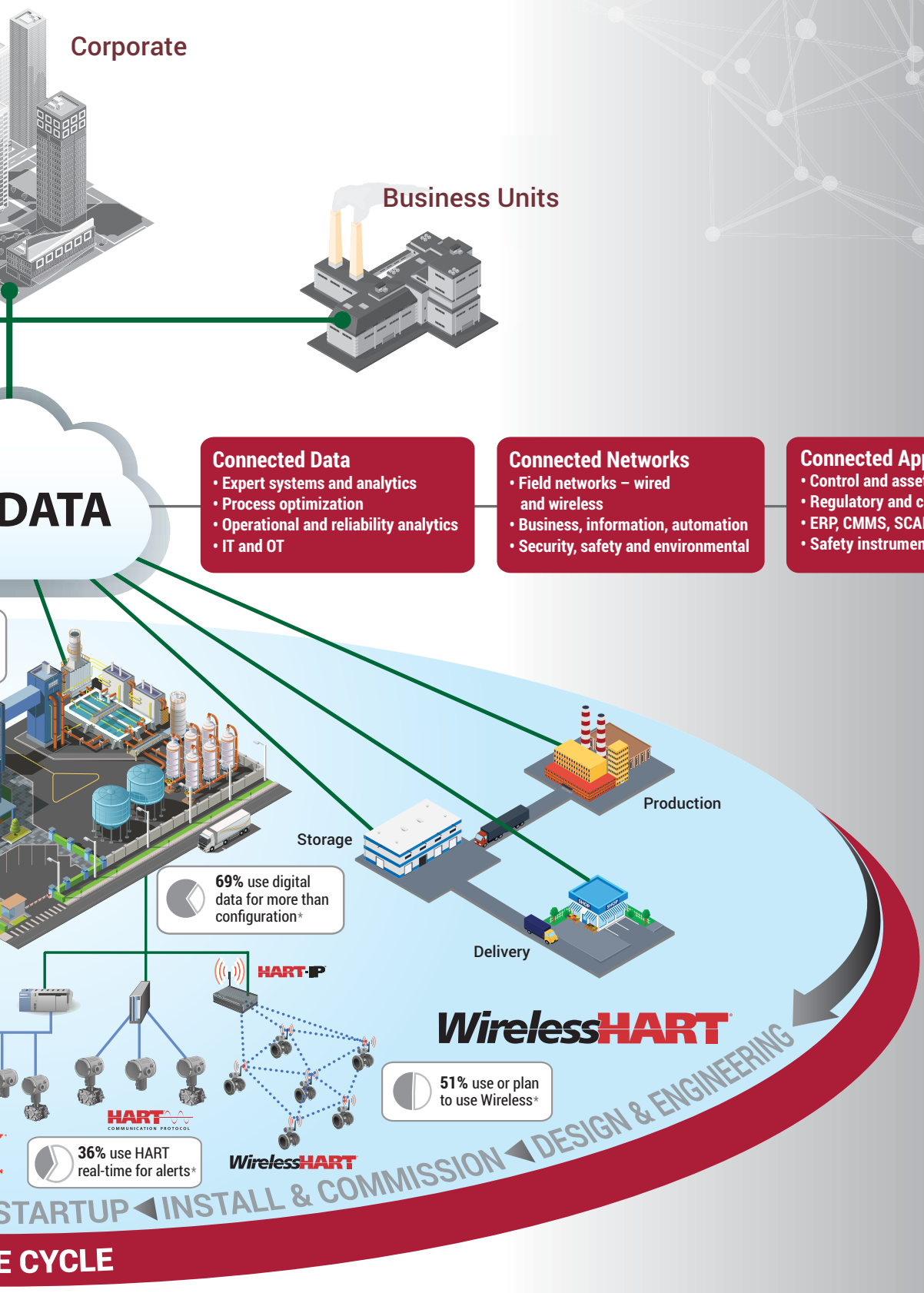
FieldComm Group™

Connecting the World



www.FieldCommGroup.org

# of Process Automation



*Control Magazine survey, August, 2016

Fieldbus Floats Shell's Boat

Shell's lifecycle approach on its Prelude liquified natural gas processing vessel is proving the value of brainpower and FieldComm Group technologies.

ROYAL DUTCH SHELL'S Prelude (Figure 1), the world's first floating liquid natural gas (FLNG) facility, measures 485 meters and hosts 14 production facilities about as tall as an eight-story building—each brimming with FieldComm Group technologies. When it's completed next year, it will be towed from its temporary berth in South Korea, and moored to underground wells in the Timor Sea off Australia's northwest coast.

From the earliest planning stages, Shell knew FieldComm Group technologies would achieve lifecycle benefits from design through testing, commissioning, operations and future upgrades. These benefits are only possible with full connectivity from HART and FOUNDATION Fieldbus instruments to control room and maintenance host systems.

"The main reason wasn't to reduce engineering or cable costs, but to make use of advanced diagnostics that will enable proactive, condition-based maintenance," says Rong Gul, subject matter expert for smart instrumentation and instrument asset management with Shell Global Solutions.

Vast vessel

Figure 1: Royal Dutch Shell's Prelude FLNG has 14 production facilities and tens of thousands of I/O points, with about half from FOUNDATION Fieldbus devices and the other half from hybrid, 4-20 mA, analog-digital HART devices. These smart devices are organized into work processes and automation systems, which generate reports and direct daily action plans. *Source: Shell*

About half of the vessel's tens of thousands of I/O points will come from FOUNDATION Fieldbus devices and the other half from hybrid, 4-20 mA, analog-digital HART devices, Gul explains. The latter are used for many applications, as well as safety, other skid-mounted systems and third-party PLCs.

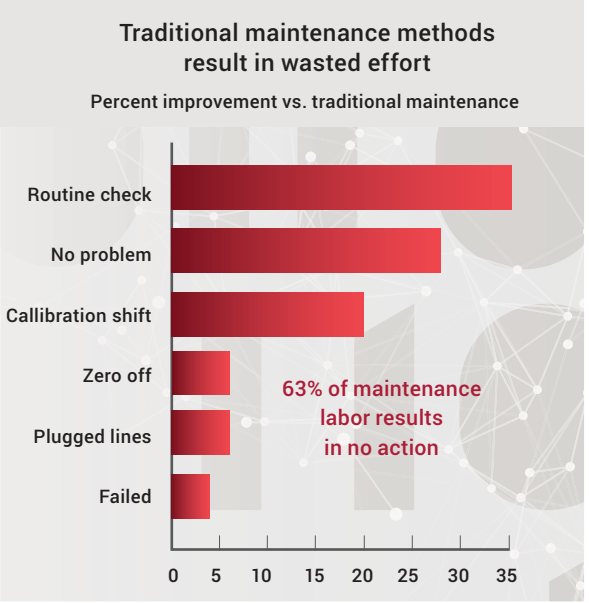
Challenges persist for users who perpetuate a culture of "do things the way they've always been done," and fail to fully implement FieldComm Group technologies, adds Gul. For instance, process plants fail to connect HART to their DCS and asset management systems, contributing to a staggering finding—up to 63% of trips to the field are wasted because operators unnecessarily send maintenance to diagnose problems, and no problems are found (Figure 2).

Progress is being made in two areas to tame the complexity of FieldComm Group technologies—clear work processes and simpler device replacement. These are being addressed by FieldComm guidelines, as well as work with U.S. and international standards committees.

Prelude has already demonstrated successful engineering and commissioning from testing through loop check. Gul adds it's achieved "massive savings, and we're now automating work processes." These include an 80% reduction in commissioning times by using templates that are slated to become available from FieldComm Group.

CLEAR WORK PROCESSES

What constitutes a clear work process? Gul defines it as "bringing the problem to the people." This means,



Too many trips

Figure 2: Many process plants fail to integrate the data from a HART-enabled device to their DCS and asset management systems, which contributes to wasting up to 63% of trips to the field.
Source: FieldComm Group

in a fieldbus, including an online HART scenario, all device data is visible in the distributed control system (DCS) and asset management system (AMS), so operations can interrogate off-spec devices, and may not need to call maintenance. If the problem isn't found, then the instrument tech can do further diagnostics and troubleshooting, perhaps solving the problem without a trip into a hazardous environment.

On Prelude, the tens of thousands of I/O points coming from smart devices are organized into actionable work processes. Staff will monitor diagnostics to prevent operators from ignoring or turning off functions. Also, criticality rankings are assigned to instruments and applications based on priority levels.

Shell is also working with Emerson Process Management, which supplied Prelude with multiple automation systems, to generate automated reports. These are built on condition-based device diagnostics and in accordance with the NAMUR 107 standard. The huge vessel's maintenance staff will convert this "pervasive data" flow into their daily activity plans.

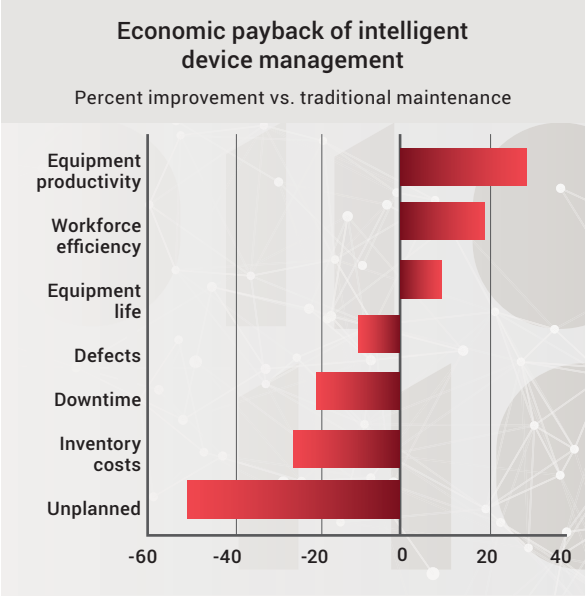
Plants seeking to gain full device diagnostics benefits need to have a role in the maintenance organization, Gul says, "who is assigned to work continuously on converting those diagnostics into work tickets. If you don't, you'll fail. This fact should be known by the entire organization from technicians to planners."

Shell plans to share its approach with the FieldComm Group, as well as the closely aligned ISA108 committee covering work processes that use diagnostic data from intelligent field devices.

SIMPLIFIED DEVICE REPLACEMENT

"There needs to be an easier way to perform field device replacement," adds Gul. The Prelude team is pursuing this by using the ISA 108 committee's incomplete standards to make FOUNDATION Fieldbus easier to configure, install and maintain in two primary ways.

First, Gul reports his team created work processes to make certain, "before a helicopter brings a new



Smart money on smart sensors

Figure 3: The economic payback of intelligent device management compared to traditional maintenance includes increased equipment productivity, workforce efficiency and equipment life, and decreased downtime, inventory costs and unplanned breakdowns.

Source: ARC Advisory Group

device, that someone will connect it on a workbench, and check the model and device description (DD) revision to ensure it will be compatible with the target host system." This is not a traditional instrument tech task, but Gul adds it's "absolutely necessary" to streamline the lifecycle, and deliver remote diagnostics and condition-based maintenance.

Second, the team developed reusable software templates that speed calibration, testing and installation of similar smart instruments. This paves the way for virtual marshalling or software-based distributed I/O connectivity—configuration of complete control strategies without physical devices.

Consequently, a technician on Prelude sets up communication with the default DD file, and then creates a standard template for each fieldbus device model and/or revision. At this point, 80% or more of parameters are entered for all similar devices, leaving only the need to enter information for individual devices. Reusable templates and offline configuration also verify all instrumentation is installed to specifications, and does it faster and without human-error-prone duplication of efforts.

While common-sense budgeting and prioritization dictate the use of HART and *Wireless*HART for half the floating facility's instruments, Gul says the extra up-front work of implementing FOUNDATION Fieldbus pays for itself during commissioning.

FOUNDATION Fieldbus offers:

- Faster factory acceptance testing (FAT) and device verification testing by a factor of "about eight devices compared to one," and
- Faster commissioning by a factor of three or four, depending on the device. Gul says a trained technician can tune a smart valve in "about 45 minutes versus three to four hours with HART."

Other than industry-specific requirements, such as

the American Gas Association's rules for natural gas facilities, Gul reports, "These procedures are all you need to do a successful Foundation Fieldbus project. It's as simple as that." Even better, while templates are not yet industry standards, Gul has offered to share them with FieldComm Group. Perhaps the next stop will be integration with ISA108.

EMBRACING NEW MINDSETS

With technical resources marshalled for FieldComm Group technologies, what's left to change are the minds of users. Gul emphasizes, "Awareness and training, training and more training. You can't start soon enough." He also calls for cultural change because without it, "You don't stand a chance." He holds two weekly classes on Prelude, one on theoretical training where staffers learn about installation, noise, jitter, imbalance and diagnostics for Foundation Fieldbus and HART, and a second with a DCS and instruments including DP pressure transmitters, guided-wave radar level transmitters and vortex flowmeters.

"You have to give people the right training, tools and confidence, or the gold-plated bells and whistles won't work," adds Gul. He reports this training culture is changing minds, including "an older guy, who came up to me after theoretical training and said, 'I wasn't a believer, but you converted me.'"

Several suppliers agree with Gul that human issues precede technology choices. For instance, as project teams design and plan systems, stakeholders need to be kept in the management loop to prevent mistakes such as uninformed engineering, procurement and construction (EPC) contractors overwriting preconfigured devices.

"To avoid such issues, it's important as early as possible to have a clear commissioning strategy that's aligned with all parties," says Christian Walter, field network engineer at Endress+Hauser Process Solutions. "There's no one size—or fieldbus—that fits all," but HART and Foundation Fieldbus can handle online diagnostics to optimize costs and benefits.

READY FOR THE FUTURE

Because human factors weigh heavily on the automation value chain, more recent trends like the Industrial Internet of Things (IIoT) come slower to process plants than elsewhere. Tim Shea, senior analyst at ARC Advisory Group, explains that smart sensors are the "tip of the spear for IIoT-enabled solutions." However, he laments the lack of users connecting smart sensors for online diagnostics—reportedly only 10-15%. Still, he offers a strong case for greater use of smart sensors as advanced by ISA108, including increased equipment productivity, workforce efficiency and equipment life, and decreased downtime, inventory costs and unplanned breakdowns (Figure 3).

Tom Watson, manager, corporate marketing, Moore Industries-International, adds, "FieldComm Group technologies let users quickly verify and validate control loop and device configuration. It's a good first step to bringing analog devices into the digital stream, from connecting 16 temperature sensor inputs on one twisted pair to taking instruments wireless."

STZ FUNCTIONAL SAFETY DUAL INPUT SMART HART TEMPERATURE TRANSMITTER

Designed and built in compliance with IEC 61508 for use in Safey Instrumented Systems (SIS), the SIL 3 capable STZ temperature transmitter offers dual sensor input that reduces process interruptions. Backup and Fail-Over Protection allows either of the sensors or inputs to be designated as the primary measurement, with the secondary input acting as backup sensor in case of primary sensor failure. The dual sensor input also allows for Average and Differential measurements and High-Select and Low-Select options. It has features designed for smarter control and monitoring including Sensor Drift and Corrosion detection which increases overall process availability.

The STZ is HART 7 compliant with exception-based reporting and dynamic variable mapping. It is HART and DTM programmable and can be configured and interrogated using the HART DD on the 4-20mA loop via any HART handheld communicator or HART compatible host.

Moore Industries, www.miinet.com/safetyseries

PHOENIX CONTACT FIELDBUS DIAGNOSTICS MODULE

If you have space for a deck of cards in a FOUNDATION™ Fieldbus junction box, then Phoenix Contact has the Fieldbus Diagnostics Module (FDM) to keep constant watch on your installation. The FB-DIAG/FF/LI product offers all standard physical layer diagnostics and supports NAMUR NE 107. No software license required, and installation is easy with just a three-wire connection. Your host system identifies the module at power up. Learn more at www.phoenixcontact.net/processfieldbus

Phoenix Contact
www.phoenixcontact.net

YOKOGAWA'S DEVICE MANAGEMENT WIZARD, FIELDMATE

FieldMate is practical software which assists configuration, adjustment, and management for smart field devices like FOUNDATION Fieldbus and HART. Moreover, it manages device configuration data, pictures and sound of the environment around the field devices. Users can review what happened in the field from FieldMate anytime, anywhere! Therefore, FieldMate is very useful for your plant maintenance work.

Highly portable devices such as tablets and notebook PCs are now available that facilitate maintenance work in the field. To facilitate such routine tasks as device patrol and maintenance, FieldMate PC-based software comes with a variety of new functions. Yokogawa offers "FieldMate free trial edition" downloading for a limited time! Definitely give it a try!

Yokogawa
www.yokogawa.com/fieldmate

FIELD XPERT'S RFID NFC TAG EDITOR SPEEDS UP DEVICE IDENTIFICATION

How much time do you spend identifying devices, especially when they are difficult to access or the nameplate is damaged? Nowadays this is wasted time! By reading Endress+Hauser's RFID NFC tags with Field Xpert, you can get all the required information by simply pointing Field Xpert at the device in question. Serial number, P&ID tag, order code and device documentation are instantly at hand, and with the new RFID NFC tag editor, the data on the tag can be easily edited or a new RFID NFC tag can be created.

Field Xpert is a rugged, out-of-the-box solution for quick and easy commissioning and maintenance of HART and FOUNDATION Fieldbus devices from different manufacturers. Available with Ex certification and IP65 protection, it is particularly suitable for the harsh environments encountered in the chemical and oil & gas industries.

Endress+Hauser, www.endress.com/SFX370

SMARTLINE AND EXPERION. EVEN SMARTER TOGETHER.

SmartLine® Connection Advantage combines SmartLine's industry-leading performance with the Experion® control system to reduce cost, increase safety and improve efficiency. No other transmitter even comes close. For more information, please visit www.hwll.co/smartlinewithexperion.

Honeywell

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Honeywell, www.hwll.co/smartlinewithexperion.

Innovation in the Field

Applications that improve operations and reduce costs.

WIRELESSHART SAVES BEARINGS, DOWNTIME AT HEAVY PLATE MILL

ILSENBURGER GROBBLECH GMBH has used *Wireless*HART to optimize plant availability for extremely capital-intensive bearings. The application required monitoring and predicting instances of downtime-inducing heat, which can damage the bearings if heat rises to an unsafe level. In one exceptionally demanding monitoring application, an Endress+Hauser wireless solution connects resistance thermometers to a *Wireless*HART adaptor and gateway to send signals via Modbus RTU to a system to record, display and trigger alarms if temperatures rise excessively. The capability of *Wireless*HART to assign communication paths and data packet transfer times proved ideal for easy retrofitting of new measuring points. See www.FieldCommGroup.org/posts/ilsenburger.

MINING OPERATION PROTECTS ASSETS, 'ROCKS' WITH COST SAVINGS

LUNDIN MINING CORP.'S Eagle Mine needed to monitor performance of critical assets including freeze protection for fire systems, sump pumps and crushing equipment at distances up to ¾ mile. *Wireless*HART was chosen over wiring and conduit due to a tight commissioning schedule and costs. The solution included 40 wireless temperature transmitters; an Emerson Asset Management System (AMS) for remote calibration and configuration; four gateways connecting a Rockwell Logix PLC, wireless instruments and a business network; and Emerson Thum adapters to simplify network expansion and addition of third-party devices. Savings over hardwiring included $83,000 on installations at the mine and $3,000 to $10,000 in cost avoidance per freeze incident at remote sites. See www.FieldCommGroup.org/posts/eagle-mine.

FOUNDATION FIELDBUS GIVES NEW LIFE TO AGING SHELL NORTH SEA PLATFORM

SHELL UK EXPLORATION and Production (Shell Expro) have upgraded Brent Alpha, its first-generation, North Sea, oil and gas production platform operating since 1978, using FOUNDATION Fieldbus. Control and safety shutdown systems were replaced with Yokogawa CENTUM CS 3000 and Prosafe-SLS. This converted the platform from onsite to remote management—its control room is unmanned and operated by Shell's nearby Brent Bravo platform, which controls Alpha's wells and transfer of hydrocarbon fluids. Shell chose FOUNDATION Fieldbus for its ability to provide ongoing cost reductions and flexibility to accommodate future technology advances for still further savings. See www.FieldCommGroup.org/posts/brent-alpha.

WIRELESSHART POSITIONERS TO DELIVER DIAGNOSTICS FOR DANUBE REFINERY

MOL'S DANUBE REFINERY was named HART Plant of the Year in 2010 and again this year (page S-27). Since 2009, when its first *Wireless*HART implementation used four temperature transmitters and one gateway to receive signals from a crude distillation unit, the system has expanded to six gateways receiving signals from 32 devices. It has been approved for diagnostic and measurement purposes, and was included in MOL standards specifying technical requirements for different applications that currently include measuring temperature and corrosion rates. Plans though 2017 include a major Field Instrument Maintenance System upgrade at the refinery level, adding 100 *Wireless*HART control valve positioners for online diagnostics and preventive maintenance of critical control valves. See www.FieldCommGroup.org/posts/mol-wirelesshart.

More Is Even Better

MOL Danube adds intelligence and wins its second Plant of the Year award.

IN ONE OF the all-time greatest cases of not resting on laurels, MOL Danube Refinery near Budapest has become the first repeat winner of FieldComm Group (FCG) Plant of the Year Award in its almost 15-year history. MOL Danube's engineers and technicians integrated more than 4,135 HART valves and instruments with its computerized maintenance management system (CMMS) and controls to win in 2010, and more recently, expanded and extended their proactive maintenance strategy to other applications and departments to achieve similar benefits.

Not only have they continued to add smart devices and enhanced their valve diagnostics and predictive maintenance, but they're saving $350,000 per year on potential shutdowns with smart device monitoring; set up a cross-functional, risk-assessment team that evaluates 20,000 device notifications per year, and started a digital transformation program.

Big HART in Hungary

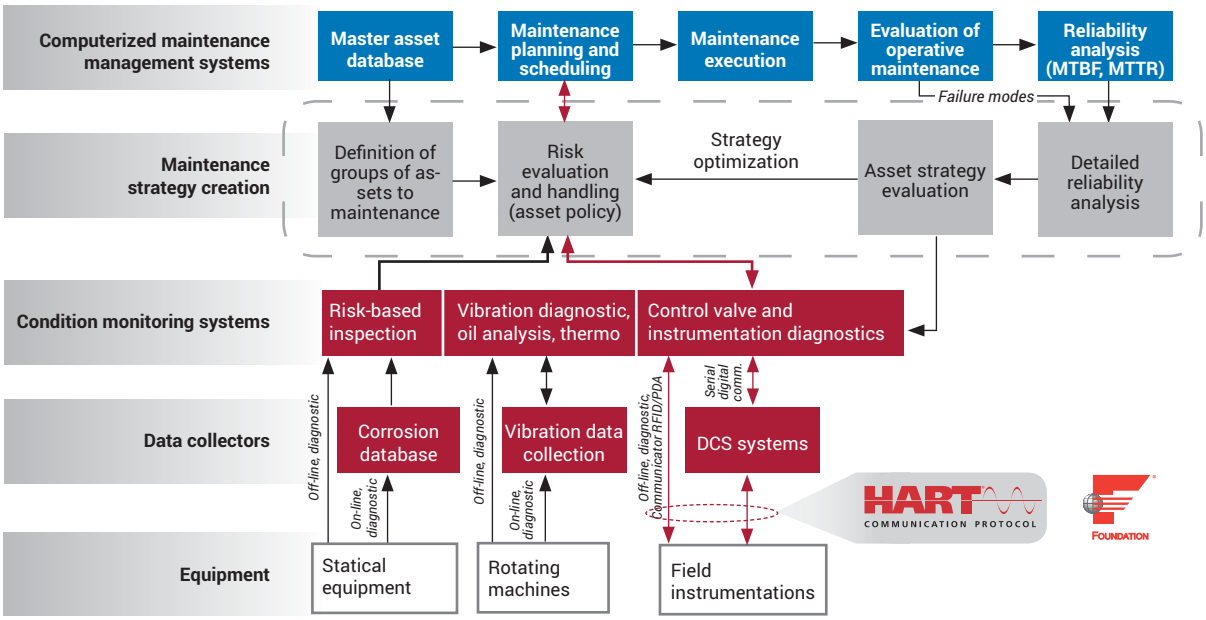
Figure 1: MOL Danube Refinery is the first-ever repeat winner of FieldComm Group's Plant of the Year Award, winning in 2010 for its integrated, HART-enabled valve and instrument diagnostics and maintenance program, and winning again in 2015 by expanding and extending HART and FOUNDATION Fieldbus to other applications at the refinery. *Source: MOL Group*

PHASE 1: CONNECTION AND INTEGRATION

Located in Százhalombatta, Hungary, MOL Danube was named 2010 Plant of the Year following a six-year effort to implement a Field Instrumentation Management System (FIMS) for its maintenance facilities, which were supported by HART and Foundation Fieldbus components, communications and data. MOL Danube's engineers and technicians networked 4,135 of the valves, instruments and other devices in critical control loops directly to the FIMS. This created an online diagnostic system with instrument signals connected directly to the plant's CMMS and controls. They also developed a two-way connection between FIMS and MOL's SAP enterprise resource planning (ERP) system, which uses SAP-PM preventive maintenance software.

Close to 2,575 of the valves and instruments are in Emerson Process Management's AMS with Valve-Link software for diagnostics, while 1,347 are connected via Yokogawa Electric's Plant Resource Manager (PRM), and 219 are connected to Honeywell Asset Manager. In all, 413 instruments are connected via Foundation Fieldbus.

"This project began by integrating process instrument diagnostics and device utilization with CMMS, AMS and SAP, combining islands



CMMS integration map at MOL Danube

Figure 2: Intelligent instruments, rotating devices and static devices at MOL Danube are networked up through data collectors and condition monitoring systems to the refinery's asset evaluation and maintenance level and its computerized maintenance management system (CMMS) using SAP-PM preventive maintenance software. *Source: MOL Group*

of systems that used to be separate, and creating triggers for launching transmitters, control valves and positioners," says Gábor Bereznai, head of maintenance engineering at MOL Danube. "This was done by having the diagnostic system inform the CMMS about the valves. This data could then be used in morning meetings with our maintenance guys and other staff, help us do risk assessments, and identify other problems."

József Bartók, head of maintenance instrumentation and electrical engineering at MOL Danube, adds, "On-line diagnostics provided by HART and FOUNDATION Fieldbus instruments do more than preventive maintenance. They ensure stable operation of the system and increase control precision. This adds directly to the bottom line. In a given unit, inaccuracy of loops controlling the applied separation processes, which are typically traced back to de-tuning the control valves, couldn't be identified without using intelligent valve positioners with HART. Now, valve failures can be screened out and losses can be minimized with repeated calibration."

Bereznai adds MOL Danube's integration began on one delayed-coker unit in 2000, later moved to include benzene isomerization unit, and now embraces 15 critical units, which make up most critical units of the refinery and covers total gasoline- and benzene-producing operations. In all, the facility has 58 total units with 95% using distributed control systems (DCS) and safety programmable logic controllers (PLCs). Overall, MOL Group has 40,000 instruments with most installed at MOL Danube, including 30,000 with HART 4-20 mA, 8,000 with pneumatic and standard 4-20 mA, and 2,000 with FOUNDATION Fieldbus. As the only Hungarian MOL refinery conducting crude distillation since 2001, MOL Danube's capacity is 8.1 million tonnes per annum (mtpa).

Thanks to its initial integration efforts, MOL Danube achieved several benefits, including:

- Saved $2 million in reduced maintenance costs and avoided unscheduled shutdowns;
- Reduced commissioning time 20% with HART;
- Increased plant's profit potential with increased loop-control accuracy and data availability;

- Saved two days of unscheduled downtime or at least €637,000 when data let staff diagnose and repair a head pressure control's intelligent positioner, instead of removing the entire valve;
- Reduced valves selected for repair during a planned shutdown from 60% to 5% for an estimated savings of €54,600 per unit per shutdown.

KEEP ON GOING

To forge ahead after winning their 2010 Plant of the Year Award, Bereznai, Bartók and their colleagues have launched expansions and multiple diagnostic and maintenance projects to bring similar benefits to other facilities at MOL Danube. So far, they've pushed its use of FieldComm Group technologies up to 3,680 HART devices, 413 FOUNDATION Fieldbus devices and 42 *Wireless*HART devices and six gateways, which receive signals from 32 wireless devices usually measuring temperature and corrosion. They're also planning to adopt HART-IP (Internet protocol) with their OSIsoft PI historian and software. This adds up to about 4,700 intelligent instruments on the 15 units connected to SAP-PM CMMS.

"MOL Danube has executed many reliability improvements since 2008 by using OSIsoft PI as an operations technology (OT) data infrastructure for predictive, proactive analytics," adds Tibor Komróczki, head of process information and automation at MOL Danube. "PI delivers strategic business value through 400,000 tags in four high-availability (HA) collectives. Server virtualization and HA configuration have reduced maintenance and hardware costs and increased system availability. The system contains 300 smart-element and 150 notification templates complemented by 61,000 event frames including dynamic solutions. MOL is also rolling out Microsoft Azure-based machine learning (ML) to let enterprise intelligence reinforce use of data and establish analytics-based

decisions. Digital transformation is reengineering workflow around enhanced and consistent information and changing data management paradigms."

PHASE 2: DUPLICATE AND BRANCH OUT

To provide its diagnostics, maintenance and integration methods to MOL Danube's other processes and departments, Bereznai reports at least 10 projects are planned, underway or completed. They include:

- Flow scanner development and implementation during turnarounds;
- Calibrating all pressure transmitters with Emerson AMS;
- Safety interlock monitoring by the process information department;
- Examining the plant's operations envelope, and checking for process technology deviations;
- Collect parameters in the distillation and hydrocracking units, and start an integrated operating window (IOW) program for maintenance to keep operations within those windows;
- Integrate the DCSs more closely with SAP-PM;
- Implement Uptime umbrella reliability to equip operating units with FIMS, including revamping I/O interfaces, installing *Wireless*HART adapters, and replacing control valve positioners;
- Further implementing *Wireless*HART and other wireless systems;
- Monitor control room and satellite control room temperatures, contract for HVAC services, and use OSIsoft PI to maintain setpoint temperatures.

"We decided to launch more projects because a wider circle of departments were interested and we got a lot of support from management," says Bereznai. "This all started with combining and integrating valve diagnostics and field instrumentation systems, but it's expanded beyond them to include safety interlocks, heat exchangers and other applications."

Recently Registered Technology

These products have been registered since September 1, 2015

New Registered Host Systems			
Protocol	**Manufacturer**	**Type**	**Model / Host Name**
FOUNDATION Fieldbus	Emerson Process Management	61b Integrated Host (H1)	DeltaV
FOUNDATION Fieldbus	Yokogawa Electric Corporation	61b Integrated Host (H1)	CENTUM VP
FOUNDATION Fieldbus	Yokogawa Electric Corporation	61b Integrated Host (H1)	STARDOM

New Registered Devices			
Protocol	**Manufacturer**	**Type**	**Model / Device Name**
HART	ABB Automation GmbH	Level Meter	LLT100
HART	ABB Automation GmbH	Level Meter	LMT
HART	ABB Engineering (Shanghai) Ltd.	Level Meter	LST300
HART	BD SENSORS GmbH	Submersible Probe	LMK387H
FOUNDATION Fieldbus	BERNARD CONTROLS	Actuator Communication Interface	INTELLI+ FF Interface
HART	BIFFI Italia	Position Transmitter	HRT_IMVS2000v2
FOUNDATION Fieldbus	Brooks Instrument	Metal Tube Variable Area Flowmeter	MT38xx
HART	Dandong Top Electronics Instrument (Group) Co., Ltd.	Level Meter	DTU100
FOUNDATION Fieldbus	Dräeger Safety	Gas Detector	Polytron 8000
HART	Draeger Safety AG & Co. KGaA	Gas Detector	Polytron 8000
HART	Electronstandart-pribor	Gas Analyzer	SSS903M series
HART	Elemer Research and Production Company	Temperature Transmitter	IP 0304/M1-H
FOUNDATION Fieldbus	Emerson Process Management	Multivariable Transmitter	3051S MV
HART	Emerson Process Management Valve Automation	Electric Actuator	CAM216
FOUNDATION Fieldbus	Endress+Hauser	Two-Wire Magnetic Flowmeter	Promag 200 FF
HART	Endress+Hauser	Loop Monitor	RIA15
HART	Endress+Hauser GmbH+Co. KG	Level Transmitter	Micropilot FMR20
HART	Endress+Hauser Process Solutions	Flowmeter	Promass 300/500
HART	Endress+Hauser Process Solutions	Flowmeter	Promag 300/500
HART	ESP Safety, Inc.	Gas Detector	Open Path Receiver
HART	Euromag International	Flowmeter	MC608
HART	Fluidwell bv	Flow Display	E018p
HART	Foxboro by Schneider Electric	Vortex Flowmeter	Vortex 84C
HART	Foxboro Eckardt GmbH	Level Meter	LG01
HART	Foxboro Eckardt GmbH	Level Radar Transmitter	LR01
HART	Fuji Electric Co., Ltd.	Oxygen Analyzer	Oxygen Analyzer / ZKM
HART	Fuji Electric Co., Ltd.	Pressure Transmitter	FCX-A3S
HART	GE Masoneilan	Valve Positioner	SVi1000
HART	GE Masoneilan	Valve Positioner	SVi1000 / H7
HART	GE Masoneilan	Valve positioner	SVI II AP / H7
HART	Hawk Measurement Systems P/L	Level Transmitter	Centurion Guided Radar
HART	Hitachi High-Tech Solutions Corporation	Pressure Transmitter	N8
HART	Honeywell	Temperature	STT750
HART	Honeywell	Pressure	SMV800
HART	HORIBA Advanced Techno, Co., Ltd.	Water Quality Meter	HQ-300
FOUNDATION Fieldbus	KROHNE Messtechnik	Vortex Flowmeter	OPTISWIRL 4200
FOUNDATION Fieldbus	KROHNE Messtechnik	Pressure Transmitter	OPTIBAR 5060
HART	Krohne Messtechnik GmbH	Level Radar Transmitter	OPTIWAVE 1010
HART	Krohne Messtechnik GmbH	Variable Area Flowmeter	ESK4A
HART	Lumasense Technologies GmbH	Temperature Transmitter	E2T Pulsar 4
FOUNDATION Fieldbus	Magnetrol	Through-Air-Radar Level Transmitter	Pulsar Model R96
HART	Magnetrol International	Level Meter	Pulsar Model R96
HART	Meggitt Maryland, Inc	Velocity Sensor, Vibration Transmitter	PCH420V
HART	Metso Flow Control Inc	Intelligent Valve Controller	NDX H6

HART	Metso Flow Control Inc	Intelligent Valve Controller	NDX H7
HART	Metso Flow Control Inc	Intelligent Valve Controller	NDX H7
HART	Metso Flow Control Inc	Intelligent Valve Controller	NDX H6
HART	Microcyber Corporation	Pressure Transmitter	NCS-PT105 II
HART	Moore Industries-International Inc.	Temperature Transmitter	STZ
HART	MSA(China) Safety Equipment Co., Ltd	Gas Detector	DF-8500 H
HART	New Cosmos Electric Co., Ltd	Gas Detector	KD-12
HART	PR Electronics A/S	Temperature Transmitter	PR 7501H7
HART	PSM Instrumentation Ltd	Liquid Level/Pressure Transmitter	ICT1070
FOUNDATION Fieldbus	R. STAHL Schaltgeraete GmbH	HSE Remote I/O (ROM Device)	9441/12-00-00 IS1
HART	RAE Systems (Shanghai) Inc	Gas Detector	RAEAlert
HART	RIKEN KEIKI CO., LTD.	Gas Detector	GD-88
HART	RIKEN KEIKI CO., LTD.	Gas Detector	D58-AC
HART	Rosemount Inc	Pulse Totalizer	705 Wireless Totalizing Transmitter
FOUNDATION Fieldbus	Schneider Electric	Electromagnetic Flowmeter	IMT33A
FOUNDATION Fieldbus	Schneider Electric	Electromagnetic Flowmeter	IMT31A
HART	Siemens AG	Level Meter	SITRANS LG2x0 (SIL)
HART	Sierra Instruments	Mass Flowmeter	SIERRA i Series
FOUNDATION Fieldbus	Sierra Instruments	Vortex Flowmeter	InnovaMass 240/241i
HART	SWISA Instrument Inc.	Level Meter	MAT
HART	Texas Instruments Inc.	Resistance Temperature Detector	TIDM-HRTTRANSMITTER
HART	Tokyo Keiso Company	Level	FW9000NN
FOUNDATION Fieldbus	Tracerco Ltd.	Nucleonic Density and Level Transmitter	T251
HART	Valve Automation	Valve Automation Electric Actuator	CAM16
HART	VEGA-Grieshaber KG	Level Transmitter	VEGAPULS 64
HART	Westlock Controls Corporation	Position Transmitter	Digital EPIC-2
HART	WIKA Alexander Wiegand SE & Co. KG	Pressure Transmitter	UPT-2x
HART	Yokogawa Electric Corporation	Pressure Transmitter	EJX-DRS
HART	Yokogawa Electric Corporation	Flow	ROTAMASS TI
HART	Yokogawa Electric Corporation	Pressure	EJX-DRS
FOUNDATION Fieldbus	Yokogawa Electric Corporation	Coriolis Mass Flowmeter	ROTAMASS TI R0
HART	Yokogawa Electric Corporation	Variable Area Flowmeter	RAMC
HART	Yokogawa Electric Corporation	Temperature Transmitter	YTA710

Updated Registered Devices

Protocol	Manufacturer	Type	Model / Device Name
HART	ABB Automation Products GmbH	Electropneumatic Positioner	TZIDC
HART	Azbil Corporation	Pressure Transmitter	AT9000
FOUNDATION Fieldbus	Cameron Measurement Systems	Flow Computer	Scanner 2000
HART	Daniel Measurement and Control Inc.	Ultrasonic Gas Flowmeter	3410 Series Gas USM
HART	Daniel Measurement and Control Inc.	Ultrasonic Gas Flowmeter	3810 Series Liquid USM
HART	Detector Electronics Corp.	Gas Detector	Eclipse
HART	Detector Electronics Corp.	Universal Display Transmitter	UD10
HART	Duon System Co. Ltd.	Pressure Transmitter	APT3200
HART	Duon System Co. Ltd.	Temperature Transmitter	ATT2200
HART	Emerson Process Management - Micro Motion Inc.	Density Meter	Density Gas Viscosity Meter
FOUNDATION Fieldbus	Endress+Hauser	pH/ORP Transmitter	Liquiline phORP
FOUNDATION Fieldbus	Endress+Hauser	Conductivity Transmitter	Liquiline Cond
FOUNDATION Fieldbus	Endress+Hauser	Oxygen Transmitter	Liquline Oxygen
FOUNDATION Fieldbus	Endress+Hauser	Eight-Channel Fieldbus Indicator	RID14, RID16
HART	Endress+Hauser GmbH+Co. KG	Level	Levelflex 5x
HART	Endress+Hauser GmbH+Co. KG	Level Meter	Micropilot 5x
HART	FLEXIM Flexible Industriemesstechnik GmbH	Ultrasonic Flowmeter	Fluxus
FOUNDATION Fieldbus	Flowserve Corporation	Positioner	Logix 3400MD
FOUNDATION Fieldbus	Flowserve Corporation	Positioner	Logix 3400MD
FOUNDATION Fieldbus	Honeywell Industrial Automation & Control	Temperature Transmitter	SmartLine/STT850
HART	Honeywell International Inc	Temperature Transmitter	STT750
HART	Honeywell International Inc.	Temperature Transmitter	STT850

HART	Honeywell International, Inc.	Pressure Transmitter	ST 700
HART	Magnetrol International	Mass Flowmeter	TA2 2.x Thermatel® Mass Flow Meter
FOUNDATION Fieldbus	Metso Flow Control	Digital Valve Positioner	ND9000FF
HART	PR Electronics A/S	Temperature	PR5335 / PR7501H5
HART	Rosemount	Pressure Transmitter	520
HART	Rosemount-business unit of Emerson Process Mgmt	Mass Flowmeter	8800D HR7
HART	Seojin Instech Co. Ltd.	Level	SDT420
FOUNDATION Fieldbus	Schneider Electric	Foxboro/Series S Single Pressure Transmitter	IDP10S
FOUNDATION Fieldbus	Schneider Electric	Foxboro/Series S Single Pressure Transmitter	IAP10S
FOUNDATION Fieldbus	Schneider Electric	Foxboro/Series S Single Pressure Transmitter	IGP10S
FOUNDATION Fieldbus	Siemens AG	Guided Microwave Level Transmitter	SITRANS LG SERIES
FOUNDATION Fieldbus	Siemens AG	Valve Positioner	SIPART PS2 FF
HART	Siemens AG	Level Meter	SITRANS LG2x0 series
FOUNDATION Fieldbus	VEGA Grieshaber KG	Radar Level Transmitter	VEGAPULS 69
HART	VEGA-Grieshaber KG	Pressure Transmitter	VEGABAR 80 series
HART	VEGA-Grieshaber KG	Pressure Transmitter	VEGABAR 80 series SIL
HART	VEGA-Grieshaber KG	Level Meter	VEGAFLEX 80 series
HART	VEGA-Grieshaber KG	Level Meter	VEGAFLEX 80 series SIL
HART	VEGA-Grieshaber KG	Level Transmitter	VEGAPULS 69
HART	VorTek Instruments, LLC	Mass Flowmeter	Pro-V
FOUNDATION Fieldbus	Yokogawa Electric Corporation	Temperature Transmitter	YTA710

Updated Electronic Device Description (EDD)

Protocol	Manufacturer	Type	Model / Device Name
FOUNDATION Fieldbus	BERNARD CONTROLS	Actuator Communication Interface	INTELLI+ FF Interface
FOUNDATION Fieldbus	Emerson Process Management	Vortex Flow Transmitter	8800 Vortex
FOUNDATION Fieldbus	Emerson Process Management	Displacement Level Transmitter/Controller	DLC3020f
FOUNDATION Fieldbus	Endress+Hauser	pH/ORP Transmitter	Liquiline phORP
FOUNDATION Fieldbus	Endress+Hauser	Conductivity Transmitter	Liquiline Cond
FOUNDATION Fieldbus	Endress+Hauser	Oxygen Transmitter	Liquline Oxygen
FOUNDATION Fieldbus	Endress+Hauser	Pressure Transmitter	Cerabar M 5x
FOUNDATION Fieldbus	Endress+Hauser	Differential Pressure Transmitter	Deltabar M 5x
FOUNDATION Fieldbus	Endress+Hauser	Hydrostatic Level Transmitter	Deltapilot M 5x
FOUNDATION Fieldbus	Endress+Hauser	2-Channel Temperature Transmitter	TMT85
FOUNDATION Fieldbus	Endress+Hauser	Temperature Head Transmitter	TMT162
FOUNDATION Fieldbus	GE Sensing	Ultrasonic Gas Flowmeter	XGM868i
FOUNDATION Fieldbus	GE Sensing	Ultrasonic Flare Gas Flowmeter	XGF868i
FOUNDATION Fieldbus	GE Sensing	Ultrasonic Steam Gas Flowmeter	XGS868i
FOUNDATION Fieldbus	GE Sensing	Ultrasonic Gas Flowmeter	GM868
FOUNDATION Fieldbus	GE Sensing	Ultrasonic Flare Gas Flowmeter	GF868
FOUNDATION Fieldbus	GE Sensing	Ultrasonic Steam Gas Flowmeter	GS868
FOUNDATION Fieldbus	GE Sensing	Ultrasonic Clamp On Gas Flowmeter	GC868
FOUNDATION Fieldbus	Schneider Electric	2-Channel Temperature Transmitter	RTT80
FOUNDATION Fieldbus	KROHNE Messtechnik	Coriolis Mass Flowmeter	OptiMASS MFC400
FOUNDATION Fieldbus	KROHNE Messtechnik	Vortex Flow Meter	OPTISWIRL VFC4200 FF
FOUNDATION Fieldbus	Metso Flow Control	Intelligent Safety Solenoid with PST	VG9000F
FOUNDATION Fieldbus	Schneider Electric / Foxboro	2-Channel Temperature Transmitter	RTT80
FOUNDATION Fieldbus	VEGA Grieshaber KG	Pressure Transmitter	Vegabar 80 Series
FOUNDATION Fieldbus	VEGA Grieshaber KG	Radar Level Transmitter	VEGAPULS 69
FOUNDATION Fieldbus	VEGA Grieshaber KG	Pressure Transmitter	Vegabar 80 Series

New Physical Layer Components

Protocol	Manufacturer	Type	Model / Host Name
FOUNDATION Fieldbus	Belden	Type A Foundation Fieldbus H1 Cable	50076XX
FOUNDATION Fieldbus	LEONI Kerpen GmbH	Foundation Fieldbus Cable	ICON BUS FoamPO STP PVC or LSZH, (series 51A or B1A)
FOUNDATION Fieldbus	LS Cable & System, Ltd.	Foundation Fieldbus H1 Cable	X6-0.25-TTCOCBO(C)-0.8(1P, 7P)NB

Visit www.fieldbus.org to view FOUNDATION Fieldbus registered products and www.hartcomm.org for HART registered products.

NEW SMART ESD* DEVICE FOR SAFETY INSTRUMENTED SYSTEM

Azbil Corporation's Smart ESD Device 700 series (700SIS) is now available. Devices in this series act as the interface for an emergency shutdown valve in a safety instrumented system. They're compliant with the IEC61508 international standard for functional safety. The 700SIS has been certified for applications that require SIL (Safety Integrity Level) 3 according to IEC 61508.

*ESD: Emergency Shut Down

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www.EmersonProcess.com/Rosemount-Wireless-Pressure-Gauge

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The next-gen ST100 Series flowmeter for air/gas flow measurement and plant communication features both FOUNDATION Fieldbus and HART. The triple-variable instrument measures mass flow, temperature and pressure. Totalized flow and pressure measurement up to 1,000 psi (70 bar) is available. Its logger stores 21 million readings on a removable card.

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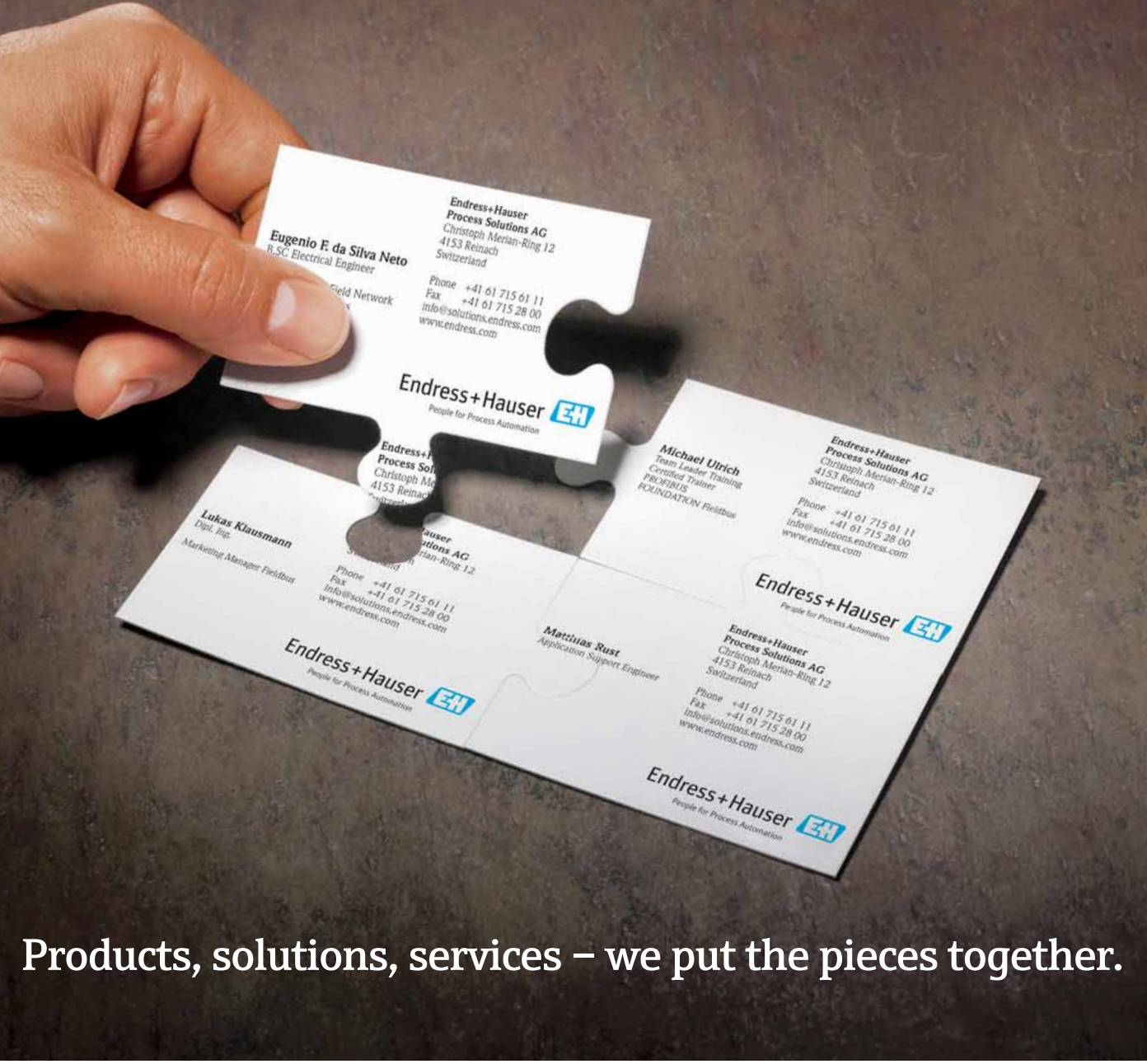

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