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The instrumentation team at HMEL's Guru Gobind Singh refinery has saved the company millions of dollars using FieldComm Group technologies

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Transformation and preservation

FieldComm Group is the home of process automation standards. We're solely focused on the global process automation industry. We're growing every year and we're working hand in hand with our partner members to develop, validate and maintain the technologies you've come to rely on—and bring them into the future as well.

Meanwhile, it's critical that we consider the installed base of over 50 million field devices as we pursue the process industry's digital transformation agenda. Nobody's ripping out field devices to digitally transform their plants. Rather, FieldComm Group is preparing the new technologies that can bring higher performance to that massive installed base, to be complementary and backward compatible. The new field devices of today can communicate in much the same manner as that installed base, leveraging the same information models and crossing the integration chasm between the worlds of OT and IT.

FieldComm has also evolved its perspective on digitalization. We started out developing digital device protocols but have since extended our scope into common data standards such as FDI. FDI technology delivers instrument data to host systems, to cloud and mobile applications, in a common way. It configures and manages all those assets with the same package—regardless of supplier, regardless of protocol. It is truly the integration standard for our industry. PA-DIM takes that goal a step further, mapping all that data into a common format across all protocols, and all manufacturers in a machine-readable way so that advanced analytics can reveal insights across diverse fleets of instruments and assets.

A digital revolution is upon us, but we need a planned and stepwise way to proceed. We've evolved before, from pneumatics to electronics to hybrid analog/digital devices with the HART protocol. And now, we're developing solutions for the future. We'll continue to liberate HART data still stranded in existing devices, even as we transform it into PA-DIM's standard information model. PA-DIM's value has been widely recognized across industry and every day is being integrated into more and more solutions.

We're also accelerating HART to 10-Mbps speed with Ethernet-APL. By combining the two, we have the performance needed to dramatically increase the value of field device data for the future while maintaining and leveraging the familiarity and interoperability that we've come to expect with HART. We're also looking further into the future, toward new developments like field devices that don't even need a protocol.

It's truly an exciting time for the process automation industry, and at FieldComm Group we're excited to help the supplier community bring more value and performance to the field devices the user community already owns—as well as the new ones they'll rely on in the future.

TED MASTERS
President & CEO
FieldComm Group

India's HMEL named Plant of the Year

Modern refinery leverages FieldComm Group technologies to boost capacity while reducing energy consumption, environmental impact, downtime and costs

Strategically positioned in Bathinda, Punjab, HMEL's Guru Gobind Singh refinery is an industrial anchor for the economic development of northern India. It sits at the northern terminus of a 1,017-km pipeline from Mundra, Gujarat, on India's west coast, where tankers deliver the refinery's raw inputs from abroad.

Formed in 2007 as a public-private partnership joint venture between Hindustan Petroleum Corp. Ltd. (HPCL, a government of India enterprise) and Mittal Energy Investments Pte. Ltd. (MEIL) of Singapore, HPCL-Mittal Energy Ltd. (HMEL) broke ground on the new refinery in 2008 and commenced operations in 2012.

From the start, process automation had been at the heart of HMEL's strategic vision of building a smart refinery. Leveraging the latest technology and partnering with the best helps the organization to deliver superior operational performance and profitability with strict adherence to environmental and safety standards. And at $5 billion USD, the 225,000-bpd refinery represents Punjab's largest capital investment at a single location, and features a who's who of technology licensors and partners—from UOP to IBM and SAP.

But if Krishan Tuteja, VP-Operations & Maintenance, has his way, they'll be adding FCG to that list of acronyms on the company's website. Indeed, the Guru Gobind Singh refinery credits FieldComm Group technologies with increasing company margins by $25M USD annually, and has just been named the 20th annual winner of Plant of the Year honors by the FieldComm Group. Each year, the leading standards development organization for process instrumentation recognizes an end-user company for exceptional and innovative use of the organization's FDI, Foundation Fieldbus and HART technologies in real-time applications that improve operations, lower costs and increase availability. HMEL's implementations accomplish all three.

"In our endeavor to maximize value creation, we continuously look to improve our processes, including more high value end-products, and pursue opportunities to expand our business," explains Jatinder Kansal, Assistant General Manager, Instrumentation, who is responsible for implementing advanced analytical communication protocols. "As a young and technology-driven organization, HMEL moves swiftly to respond to the ever-changing energy market. Working with the communities around us, we aspire to build an organization that would shape a bright energy future for the country."

Realizing the Industrial IoT

In addition to investments in state-of-the-art process automation, WirelessHART implementations at HMEL fall into the category of the Industrial Internet of Things (IIoT) and are part of a framework that HMEL calls the Digital Refinery of the Future. These use cases include using wireless sensors to track the sounds made by steams traps and valves, the temperature and vibration signatures of fin fan

heat exchangers, and even the real-time location of plant personnel.

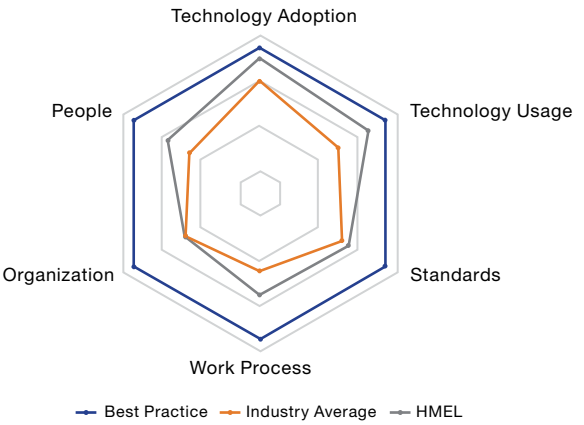
Leveraging the data from WirelessHART acoustic sensors from Emerson has allowed HMEL to monitor 138 control valves and pressure safety valves across eight refinery units for the passing of hydrocarbons. This can help to proactively manage environmental issues, advance the realization of odorless operations and recover the value of hydrocarbons that would otherwise be lost to flaring. The associated management application, part of Emerson's Plantweb Insight offering, can alert personnel to issues via persona-based email notifications.

Steam traps, too, make different noises when they're working than when they're not. HMEL is also using WirelessHART-based acoustic sensors to monitor 23 steam traps across the FCC unit; stuck traps are flagged for fixing to control energy losses.

Performance monitoring of 16 critical fin-fan heat exchangers draws on the wireless data created by magnet-mounted vibration probes as well as clamp-on-style temperature transmitters with surface-contacting RTDs. Five temperature transmitters and two probes per fan can detect and diagnose inefficiencies and emerging malfunctions before they escalate into an equipment outage.

Finally, field personnel at the fluidized catalytic cracking (FCC) unit are fitted with active RFID tags that a network of 66 location anchors and gateways can resolve to within 10 meters. The associated Plantweb Insight application can monitor the employee head count within the monitored area, alert when personnel cross into or out of their designated zone and facilitate safety mustering. And by pushing a safety alert button on their RFID tag, an employee can inform personnel that help is needed—and the system knows just where to find them.

Kansal attributes these successes not just to the choice of FieldComm Group technologies and their multi-vendor interoperability, but also to leadership support and to cross-discipline teams, including those responsible for instrumentation, process, operations and IT. In the days to come, HMEL plans to further its Digital Refinery ambitions by extending its successful valve and heat exchange monitoring to more assets across the site, and to implement real-time location services in the sulfur recovery unit. It's also on the lookout to develop more IIoT use cases within the refinery, and well as for associated petrochemical units.



According to FieldComm Group's Intelligent Device Maturity Index, HMEL is pushing the envelope of best practices when it comes to leveraging the capabilities of digital field devices. To see how your organization stacks up, visit: bit.ly/FCG-IDML

Focus on innovation and efficiency

HMEL has also implemented world-class methodologies in areas such as manufacturing execution systems, operator training simulation and corrosion inspection management. "We optimize operations using a multitasking and cross-training of operations and maintenance personnel," Kansal adds. "A best-in-class integration framework and enterprise performance management and reporting systems further support informed decision-making."

In the realm of process automation and instrumentation, the refinery's many systems include those for distributed control (DCS), machine monitoring, anti-surge control, tank farm management,

fire & gas detection, governor control and emergency shutdown. Advanced instrumentation technologies at work include Coriolis, vortex and clamp-on ultrasonic flowmeters, nuclear and radar level gauges plus online stack gas and process analyzers.

The refinery's installed instrumentation totals 61,521 devices, 24,440 of which are process instruments that communicate via 4-20mA HART (64%), Foundation Fieldbus (31%), WirelessHART (2%) or standard 4-20mA (3%). The other 36,081 devices are switches and other on/off devices (digital I/O). The refinery also features Yokogawa's Plant Resource Manager (PRM) instrument asset management system; all Foundation Fieldbus and 80% of the plant's HART devices are continuously connected.

Optimized for polypropylene

Polypropylene is one of the high value products for HMEL because of its wide range of application in petrochemicals. Consequently, the refinery's FCC unit operates in high polypropylene production mode to serve the company's captive polymerization units. It also relies heavily on Foundation Fieldbus for safe, reliable and robust process control, with 80% of the unit's instruments on Foundation Fieldbus.

Because operation of the FCC process is particularly critical and complex, some Foundation Fieldbus instruments execute closed-loop control in the field overseen via advanced process control algorithms in remote cascade mode. These process instruments and associated control logic are configured in the unit's CentumVP DCS leveraging fieldbus infrastructure from Pepperl+Fuchs. "We use fieldbus blocks where control is within field devices only," Kansal says. "This helps in maintaining closed process loops in case of hardware failure in the DCS. All of our Fieldbus Foundation segments are designed with multiple link masters so that in case of DCS master card failure, Link Active Scheduling can be handled by any of the link master segment devices."

Foundation Fieldbus instrument alarms are configured in the DCS with suitable priority according to EEMUA-191 guidelines so that early detection of instrument failures can be ensured. These Foundation device alarms are available not only for real-time monitoring, but are also connected to the refinery's Yokogawa Exaquantum Alarms & Reporting Analytics (ARA) server for proactively deciding maintenance actions to head off potential failures.

Analog 4-20mA HART instrumentation is also used in the FCC unit. For example, to realize three-element control logic of steam-drum level in the unit's flue gas heat recovery boilers, which provide both economic and environmental benefits. In short, the required boiler feed water flow is calculated based on both steam demand and drum level setpoint.

Other units, such as for hexane recovery and liquified petroleum gas (LPG) treatment also run with Foundation Fieldbus devices in closed-loop applications. "By following good maintenance practices and ensuring increased availability of Foundation instruments, we are able to sustain refinery operations and are continually improving our refining capacity in a safe and clean manner," Kansal says.

Benefits from execution through maintenance

The early decision to use Foundation Fieldbus instruments when the refinery was first designed provided advantages in terms of execution schedule and project cost, according to Kansal. "With various good engineering practices and meritorious maintenance techniques, we at HMEL not only reduced capital expenditure by selecting Foundation Fieldbus technology for complex process applications, but also increased availability of instruments and reduced maintenance costs."

One tangible demonstration of the power of Foundation Fieldbus data was in February 2021 when FCC throughput was restricted due to flooding issues in the debutanizer and depropanizer columns. Staff were able to diagnose and resolve the problem in short order owing to the higher availability plus higher accuracy, repeatability and response time of Foundation Fieldbus instrumentation. Quickly resolving the column problems led

cutting-edge corrosion management maximizing operational output.

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Emerson.com/WeSeeCorrosion

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to an incremental improvement in FCC throughput of 7%, which in turn translated to a $11.2M USD gain in annual output.

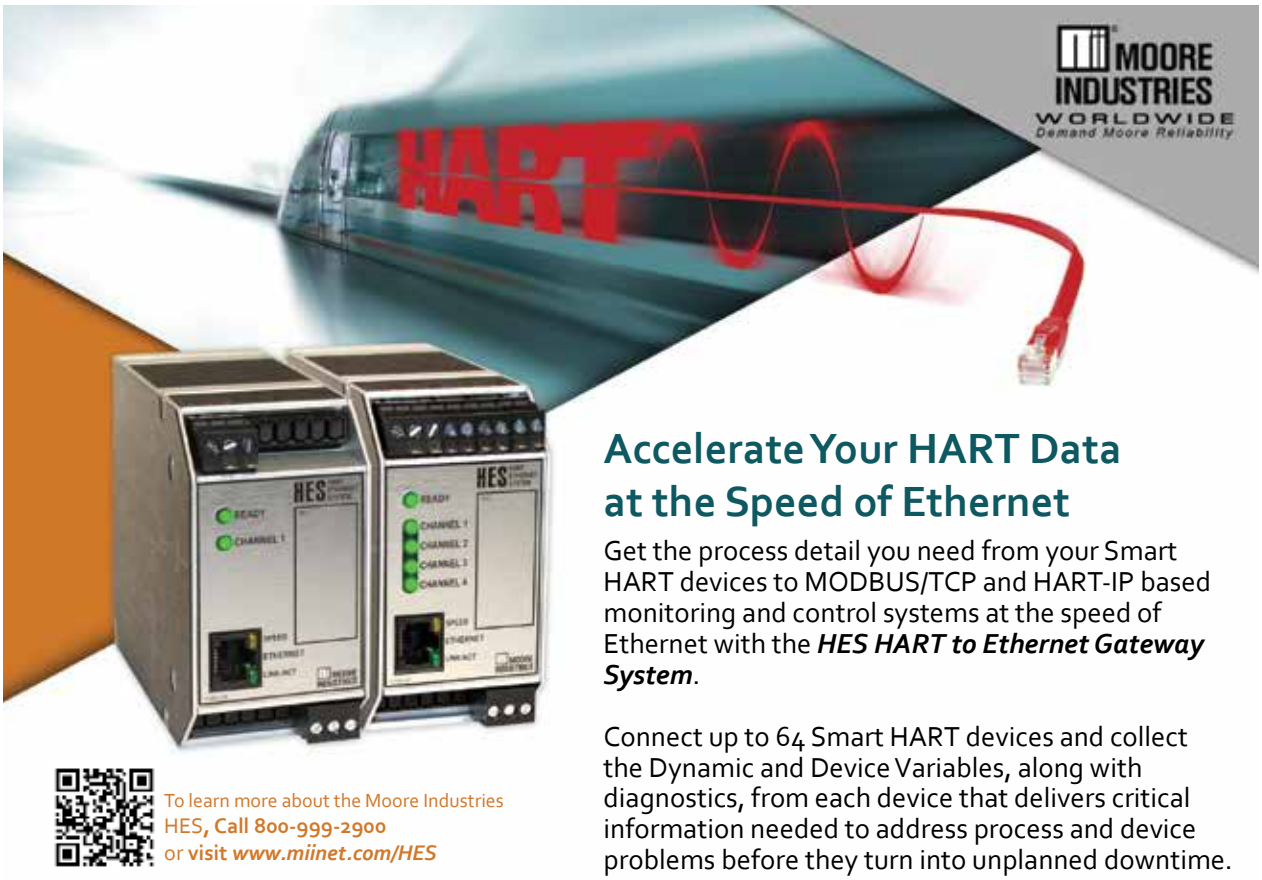
Some of the best practices and design improvements for Foundation Fieldbus carried out at HMEL for increased availability of the refinery process include:

- Use of trunk/spur signal ground correction to avoid noise issues,
- Use of field barrier terminators for signal level improvement,
- Use of silica gel bags and canopies for Foundation Fieldbus junction boxes and instruments to increase life of electronic components due to varying ambient conditions,
- Installation of spur-level protection barriers to protect Foundation Fieldbus devices in same segment, and,
- Ensuring lightning protection device integrity for field junction boxes.

Field instruments with HART capabilities also offer high availability, accuracy, response time and repeatability. Further, the ability to digitally share HART diagnostics data facilitates real-time monitoring of field instruments and their performance.

For HMEL, the combination of Foundation Fieldbus and 4-20mA HART technologies offered the following qualitative benefits:

- Reduction in capital expenditure,
- Fast project execution to schedule,
- Higher availability of instruments (i.e., lower downtime),
- Reduction in maintenance expenditures,
- Uninterrupted plant operation,
- Reliable, stable plant operations for more effective optimization efforts,
- Higher accuracy, repeatability and response time,
- Ability to detect failures in advance,



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Accelerate Your HART Data at the Speed of Ethernet

Get the process detail you need from your Smart HART devices to MODBUS/TCP and HART-IP based monitoring and control systems at the speed of Ethernet with the ***HES HART to Ethernet Gateway System***.

Connect up to 64 Smart HART devices and collect the Dynamic and Device Variables, along with diagnostics, from each device that delivers critical information needed to address process and device problems before they turn into unplanned downtime.

- Easy and quick diagnostics/ troubleshooting, and
- Higher rate of on-spec production.

A role for wireless

While wired FieldComm Group technologies are widely used and contribute significantly to HMEL's safe and reliable operations, FieldComm Group's WirelessHART technology has also been used to troubleshoot problems and implement solutions impractical or impossible with wired solutions.

Back at the FCC, for example, the flow of catalyst between the unit's reactor and regenerator are controlled through slide valves installed at the regenerated catalyst and spent catalyst standpipes. Air and nitrogen purges promote proper fluidization and helping to minimize blockages and ensure smooth transfer of catalyst. During normal operations, it became important to continuously monitor purge pressures so that any blockage of catalyst can be detected and dealt with early.

For this situation, HMEL turned to Rosemount WirelessHART pressure transmitters as well as wireless repeaters and gateway from Emerson, which were connected to the DCS via a Yokogawa Modbus TCP card. Wireless pressure transmitters were installed at 13 different points to understand the pressure profiles more completely.

Using wireless instruments significantly improved execution schedule with minimum manpower compared to conventional wired instruments for this same application. More than 2-km of control cabling was avoided, saving nearly $100,000 USD in project costs. More importantly, the ability to characterize the pressure profile more completely in the standpipes has allowed the operators to proactively clear any imminent blockages during a relatively brief pit-stop—rather than the 20-day shutdown required to clear a larger, more complete blockage. With downtime due to this issue effectively cut in half, HMEL estimates a $14M USD gain in refinery output for the year.

Microcyber's NCS-TT106x temperature module is a high performance fieldbus temperature transmitter with Microcyber's own communication controller.
It supports multiple thermal resistances and thermocouples. Thermal resistance supports 2/3/4-wire connection mode, thermocouple can use cold end compensation function.

Multiple protocols

- NCS-TT106H: HART Protocol
- NCS-TT106F: FF H1 Protocol
- NCS-TT106P: Profibus PA Protoco

High Accuracy (for common thermal resistance and thermocouple)

- ±0.04Ω for 0~500Ω
- ±0.35Ω for 0~4000Ω
- ±0.15 for PT100(-200 ~850)
- ±0.15 for PT1000(-200 ~850)
- ±0.025mV for-100mV~+100mV
- ±0.4 for K-Thermocouple(-200 ~1372)
- ±0.7 for S-Thermocouple(0 ~1768)

Easy Integration
Provide multiple electrical integration files, such as DD, EDD, CFF, GSD.

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http://www.microcyber.cn/temperaturetransmitter2/

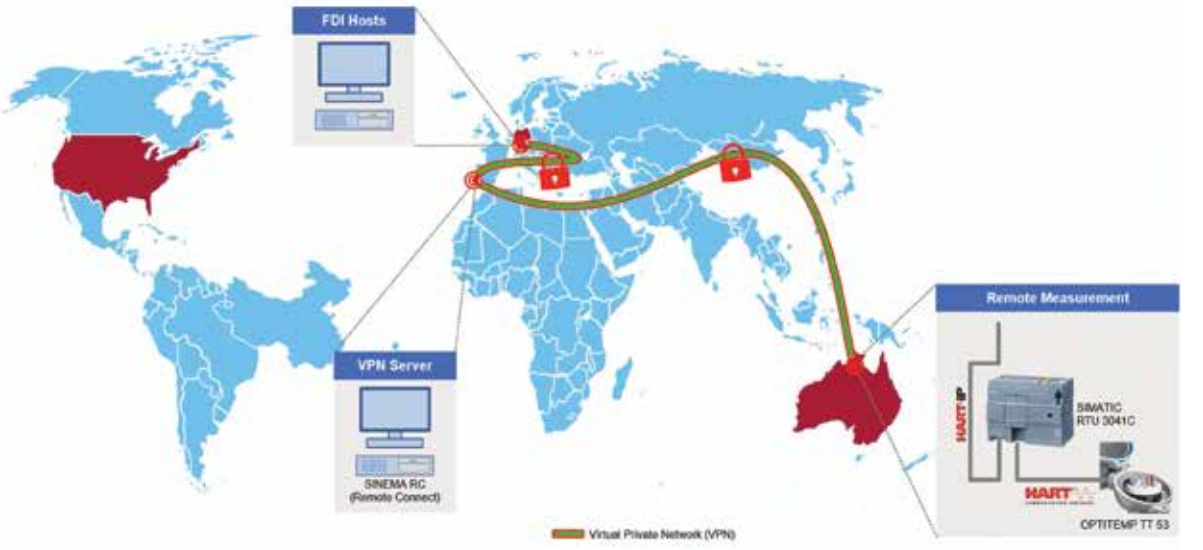
HART for the 21st century

Today's HART standard spans the process industry's control and instrumentation communication needs, from 4-20mA analog loops to wireless and now Ethernet-APL and the cloud, too

The HART protocol was first released to the control and instrumentation community back in the late 1980s, when a common digital communications protocol for so called "smart" instruments was envisioned to unify the proprietary efforts of the major instrumentation and control system suppliers.

So began HART's push to establish and preserve the interoperability among various suppliers' products that end users had come to expect from their strictly analog instruments—a central mission for the digital age that continues in the work of FieldComm Group. Throughout HART's various incarnations that were yet to come, the HART protocol maintains what has become the industry's best example of ecosystem interoperability among different suppliers' devices and systems.

The original HART protocol still communicates via a digital signal superimposed on the 4-20mA analog instrumentation current loops first standardized in the 1950s. Today, tens of



During a recent virtual workshop, Kurt Polzer, digitalization consultant and principal of Polzer Automation explained how HART-IP can be used to securely monitor remote assets. The scenario pictured involved a temperature transmitter and RTU in Australia, security server in Portugal, FDI server in Germany plus a cloud-based IIoT platform and travelling engineer in the U.S. Watch at: bit.ly/remoteHART-IP

millions of 4-20mA HART instruments constitute the vast majority of instruments installed around the world. Even today, it dominates shipments of new instruments to the global process industries.

So, when the need to connect wireless sensors arose in the 2000s, industry called on HART once again, this time implemented over a wireless mesh network as WirelessHART. But once gathered at a WirelessHART access point, there was a need to transmit move that data onto the plant's Ethernet-based control and information infrastructure. So was born HART-IP, which was simply the long-trusted HART "application layer" protocol, this time deployed over the Internet Protocol (IP) network-layer on Ethernet.

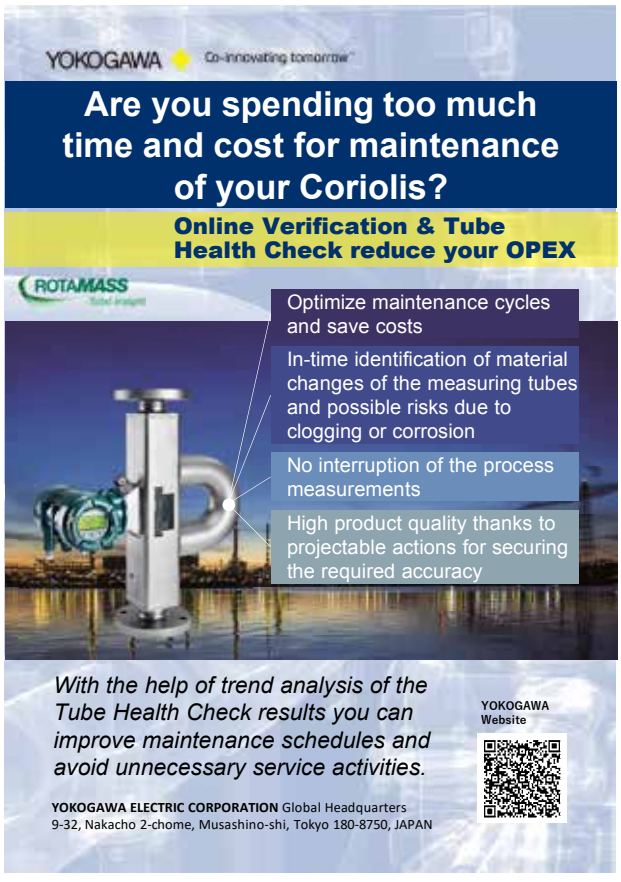
Enabling digital transformation

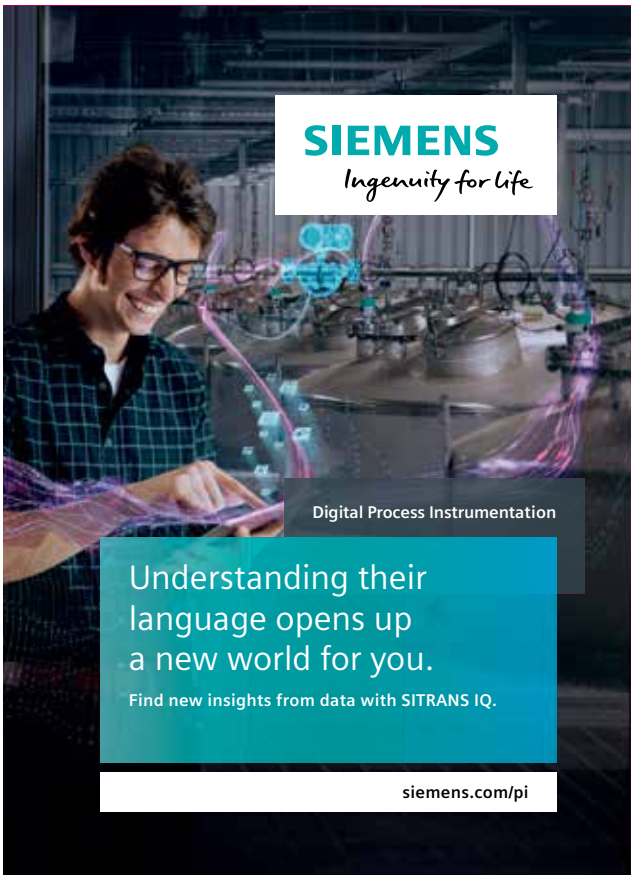
The leap to Ethernet has positioned HART to continue to lead the process industry's ongoing digital transformation in two very important ways.

First, with Ethernet-APL now providing intrinsically safe, two-wire, 10-Mbps field communications at the device level (see companion article on p16), HART-IP is positioned to enable the high-speed, high-power field communications revolution that Ethernet-APL promises, while also preserving the familiar tools and established work processes of instrumentation techs and control engineers worldwide.

At the field level, today's HART-IP paired with Ethernet-APL replaces the 4-20mA analog signal used for process variables with

an all-digital signal. It also now includes a standardized methodology for writing instructions to final control elements. In short, HART functionality is no longer limited to monitoring and diagnostics—with HART-IP it does control, too. Tests performed on Ethernet-APL indicate bandwidth that is more than sufficient for closing the loop on most process control applications. (Visit go.fieldcommgroup.org/HART-IP-Control to download paper.) For example,



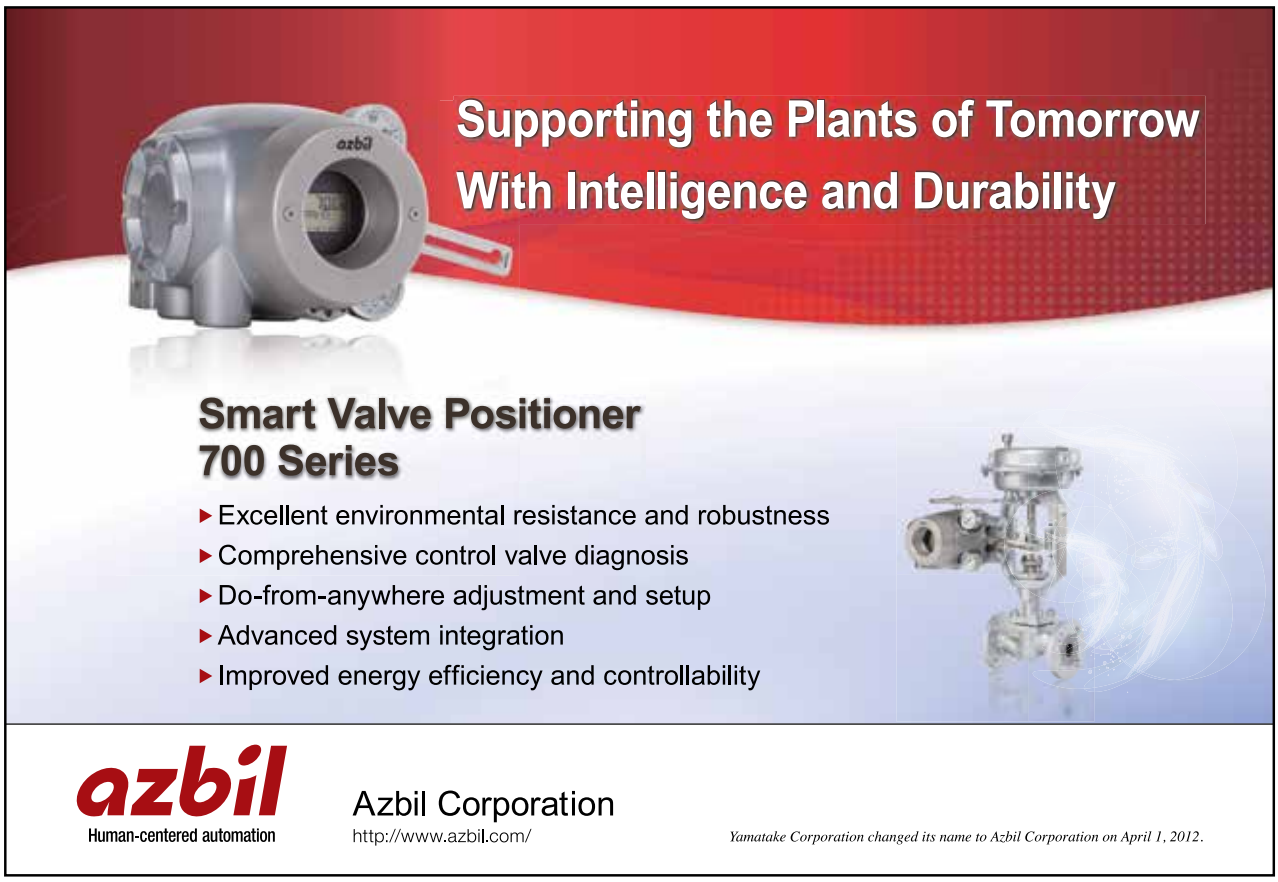


even with 150 devices reporting 20 updates per second over a 10 Mbps segment, only 30% of available bandwidth was consumed. Version 7.7 of the HART standard also includes an integrated security model for HART-IP, paving the way for a proper cybersecurity posture on the coming generation of Ethernet-APL field devices.

The second way in which HART-IP is helping to advance industry's digital transformation, is to securely communicate HART data out to enterprise systems and cloud-based Industrial IoT applications to help analyze and benchmark performance across units, sites and entire enterprises. A growing number of progressive process manufacturers already are using multiplexer technology to extract all that rich, digital HART data from their 4-20mA analog loops—and are using that data to effectively advance their digital transformation initiatives. Increasingly, digital transformation of operations entails performance-driven analytics and prescriptive maintenance enabled by HART data.

HART-IP also facilitates secure communications with enterprise systems and private or public cloud services, such as AWS, Microsoft Azure and Google Cloud. Here, HART-IP complements IIoT technologies such as MQTT, AMQT, JSON and OPC UA.

And as HART-IP usage spreads to field networks and up into enterprise systems and the cloud, that access will only be simpler, faster and easier.



Getting started with Ethernet-APL

Even if there's no greenfield unit in your immediate future, consider trying out Ethernet-APL when adding new measurement points to an existing installation

While the big play for Ethernet-APL will ultimately be in new greenfield projects, those clean-sheet designs with fully converged IT/OT architectures are still a few years out. Meanwhile, select instruments are set to hit the market by mid-2022, and progressive end-user organizations will be looking for more isolated use cases at brownfield facilities to test out and prove the new technology's worth.

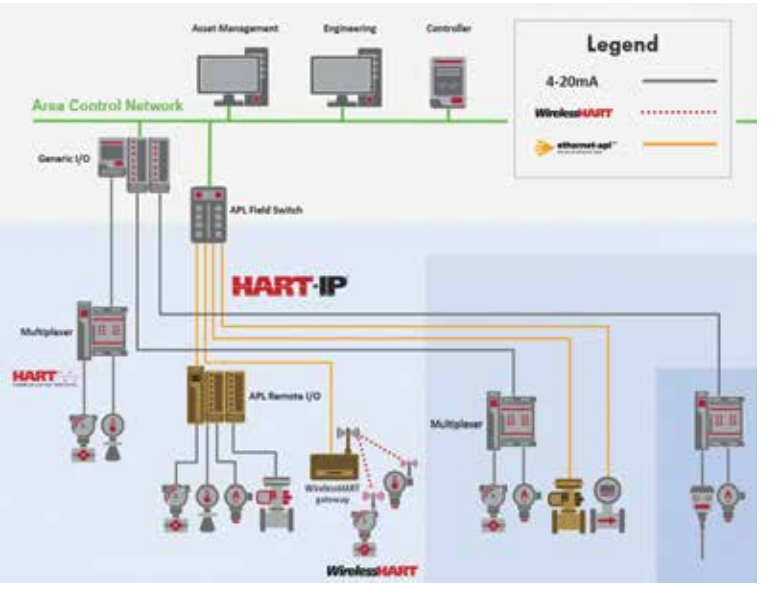
Many of the most apparent use cases for HART-IP over Ethernet-APL derive from the increased availability of data that higher bandwidth affords. In a brownfield context, this is most relevant when adding complex new instruments that generate more data of diagnostic significance—especially in hazardous area installations that require Ethernet-APL's intrinsic safety capabilities.

Real-time access to valve signature data from a valve controller, for example, can be used to diagnose a range of issues before they lead to unscheduled process downtime. The same can be said for Coriolis meters, magnetic flowmeters and radar level gauges. Process analyzers, in particular, will benefit from the order of magnitude increase in power made available to instruments by Ethernet-APL relative to 4-20mA, representing a less expensive installation than the power supply plus four-wire Ethernet connections that otherwise might have been needed.

But the larger context of increased secondary data bandwidth is the ability to collaborate more effectively, and to send that more nuanced secondary data more easily to the individuals—and applications—that can make effective use of it.

Hybrid environments

For most end users—especially in the US, where few greenfield facilities are expected to be built in the near term—their first experiences of Ethernet-APL will be in hybrid environ-



Short of a clean-sheet unit design with fully realized Ethernet-APL field networks, new instruments that can benefit from the higher power and bandwidth of this new physical layer can coexist with traditional 4-20mA HART instrumentation.

ments that also include 4-20mA HART devices. On the positive side, with the debut of fully configurable input/output (I/O) systems some 10 years ago, industry already is on its way to moving I/O from control room environments out into field junction boxes.

Configurable I/O has delivered substantial benefits of its own, helping to decouple hardware design from system software development and taking instrumentation and control system design off the critical path of project execution. It's also reduced costs and system footprint, eliminating traditional marshalling cabinets in many newer facilities. Like fieldbus before it, Ethernet-APL effectively distributes I/O even further, relocating the transition between analog sensor signals and the digital world of ones and zeroes into the field devices themselves.

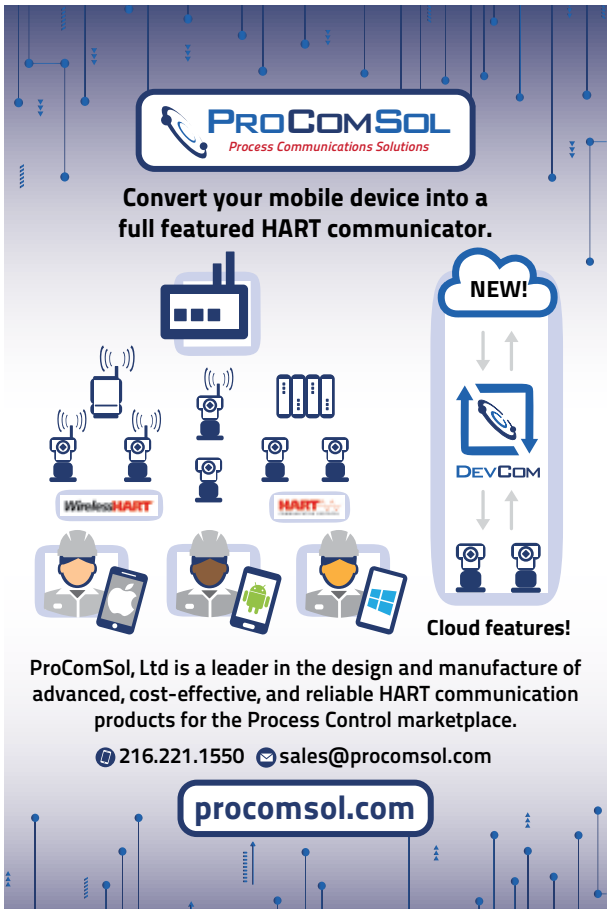
From a practical perspective, this means that the remote junction box is where 4-20mA HART and Ethernet-APL are most likely to converge. That remote junction box could relatively easily include both configurable I/O as well as an Ethernet-APL switch—both of which speak HART-IP over Ethernet up into the control system architecture. Further, a potential mix of Ethernet-APL with traditional 4-20mA HART devices will likely entail a range of network infrastructure devices designed to accommodate the transitional hybrid architectures required.

While dual devices sharing an Ethernet connection in the same box are easy to imagine hybrid approaches are also likely. Analog Devices, one of the suppliers of chipsets for Ethernet-APL as well as the multiplexers that extract HART data from 4-20mA loops, has envisioned a device with hybrid functionality. And for suppliers like Emerson, which uses a physical module to characterize its remote I/O channels (rather than software), a new Ethernet-APL module under development will allow these new digital channels to coexist side-by-side with their 4-20mA HART counterparts.

In all three of these scenarios, a shared commitment to the HART ecosystem and data model will ease the industry's ultimate transition to Ethernet-APL as the standard physical layer for field instrument communications

Toward a clean-sheet design

In the not-too-distant future, a greenfield facility or new production unit offers the most fertile ground for Ethernet-APL technology, since the baseline will involve comparing proven Ethernet-APL plus HART-IP technologies with the 4-20mA plus HART status quo. A greenfield design need not weigh sunk costs against new benefits. Rather, a clean-sheet design will allow end users to realize the full benefits of a secure, high-speed digital

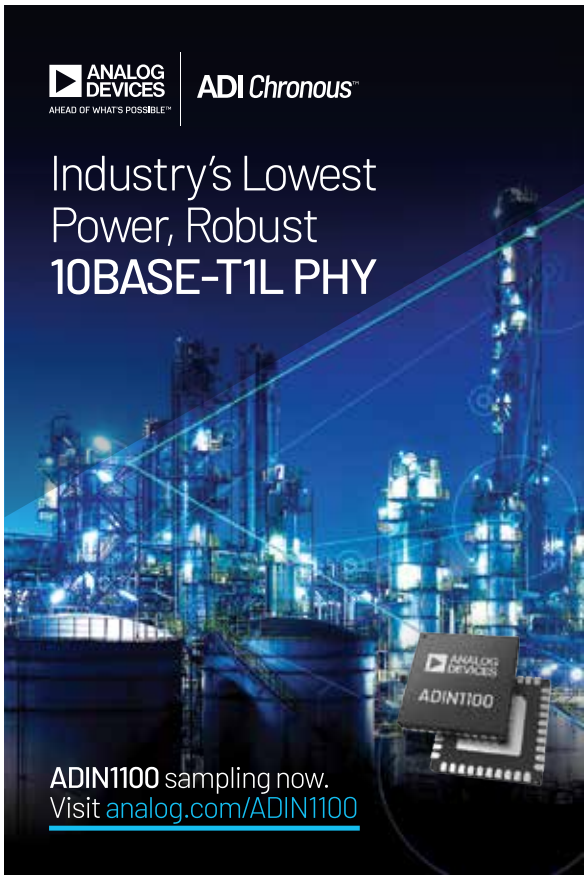


The remote junction box is where 4-20mA HART and Ethernet-APL are most likely to converge.

infrastructure that reaches from field devices to enterprise systems and the cloud.

From an architecture perspective, tomorrow's Ethernet-APL systems won't look all that different from the remote, configurable I/O systems of today. Indeed, replacing remote enclosures filled with configurable I/O with remote enclosures filled with Ethernet-APL switches may even allow system designers more flexibility when it comes to how many devices can be connected through a remote enclosure of given dimensions.

In any case, the transition to Ethernet-APL spurs (out to individual instruments) should be a relatively straightforward adjustment from a design perspective. The addition of the APL trunk concept will allow for new distribution models in areas lacking infrastructure for power and communications. And when it comes to installing and commissioning this new breed of devices in a greenfield facility, users will really begin to benefit from the dramatic improvements in communications speed that the move to Ethernet-APL represents. ■



The unifying power of PA-DIM

A common language to describe data that is independent of protocol, type of device or manufacturer can greatly simplify device management—and enable advanced enterprise analytics as well

An experienced technician or engineer immediately understands that "level" means the same as "liquid height" in two different tank gauges' data tables. But a computer? Not so much.

Hence the need for the Process Automation Device Information Model, or PA-DIM. At its simplest, PA-DIM is a common language for describing device data regardless of protocol, type of device or manufacturer. And as organizations endeavor to use advanced analytic tools to gauge the relative performance of devices and assets across diverse fleets, PA-DIM effectively eliminates the semantic ambiguities that would otherwise make such comparisons meaningless or impossible.

Recent FieldComm Group technology registrations

Testing and registration is key to interoperability and ensures specific devices and systems conform to the same standard. FieldComm Group is one of the only automation industry organizations with a registration program requiring mandatory testing of critical elements of its technologies. Today, FieldComm Group's testing and registration effort encompasses FDI, Foundation Fieldbus and HART host systems and field devices, as well as physical layer components such as power supplies, cables, and device couplers. One of the founding principles of FieldComm Group is the support of interoperability—the ability to operate multiple devices from multiple manufacturers, in the same system, without loss of functionality.

Products bearing the Foundation Fieldbus or HART Product Registration symbols have undergone a series of common tests administered by FieldComm Group. End users can select the best device for a specific measurement or control task and know that device will provide a consistent level of functionality and interoperability regardless of the host system or other devices used. Testing and registration enables a user to achieve the best return on their investment. FDI-enabled products further ensure that products can be integrated in a consistent and familiar way across varying systems—thus enabling enterprise-wide support and data access to operate more effectively.

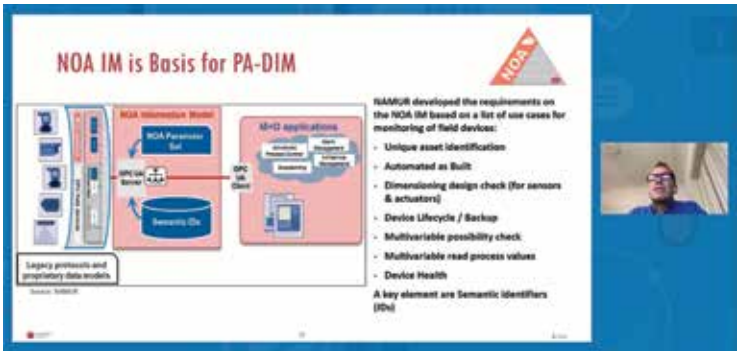
More than 100 registrations of products ranging from actuators to temperature transmitters were completed between September 1, 2020, and September 30, 2021. For a listing of these recently registered products, visit www.controlglobal.com/assets/FieldCommRegistrations2021.pdf

FDI REGISTERED

FOUNDATION

HART REGISTERED

For a complete list of all registered hosts and devices, visit the Registered Products section of www.fieldcommgroup.org.



Explore PA-DIM with Frank Fengler (ABB) and how you can achieve NAMUR's Open Architecture (NOA) use cases. Andreas Isenmann (VEGA Grieshaber) further explains and demonstrates the power of PA-DIM implemented in a product with data visible in a client application in the cloud. Watch it at: bit.ly/PA-DIM

The process automation industry uses several standards-based automation protocols, including HART, Foundation fieldbus and PROFIBUS PA to represent information made available by field instrumentation. Since each automation protocol represents field device information differently, consistently integrating that data with higher level IT systems is difficult at best.

PA-DIM is the information model that makes such tasks possible. It was created by a joint working group of FieldComm Group and the OPC Foundation in 2017 and they completed version 1.0 of the PA-DIM Specification in June of 2020. Work continues to add support for additional device types, and the active participation of FieldComm Group and OPC Foundation member companies is encouraged.

The scope of the working group is to:

- Prepare and propose enhancements to the OPC UA Unified Architecture for Devices companion specification.
- Ensure compatibility between FDI technology specifications and the OPC UA Unified Architecture for Devices companion specification.
- Specify and maintain OPC UA information models for process automation devices, initially based on NAMUR Core Parameters as set forth in NE document 131, "NAMUR standard device – Field devices for standard applications," including assignment of semantic identifiers according to the IEC Common Data dictionary and/or eCl@ss.
- Enhance the OPC UA information model for FDI based on requirements from industry, such as NAMUR Open Architecture, Industrie 4.0 and IIoT initiatives.

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Integration that's secure and scalable

FieldComm Group technologies are helping pave the way to device integration and security approaches that are aligned across industry and scalable from field to cloud

Key to effectively managing industry's next-generation digital field will be a unified approach to device integration and cybersecurity that is aligned industrywide. FieldComm Group already is active in the development of both, and the Group's HART, FDI and PA-DIM standards will all play a role in reaching this important goal.

More than 30 years ago, the original HART was created as a command/response protocol superimposed on the 4-20mA analog signal used by electronic instruments to communicate process variable and control instructions between host control systems and field instruments. To manage those communications, each host and client needed an address, as defined in the original HART specification.

Fast forward to 2007, when HART was adapted to Internet Protocol (IP) over Ethernet to backhaul data from WirelessHART gateways (itself inherently secure), the addressing scheme defined by HART was no longer required. Rather, IP-addressing was used, and HART-IP was born. And while Ethernet and IP represent much of what's good in the networking world, IP-addressable devices also come with the need to address potential cybersecurity concerns.

HART communications secured

So, with the 2020 revision 7.7 of the HART specifications, requirements for always-on security suites are now specified to provide communication security, audit logs and syslogging. These measures are designed to secure not only instrument communications via WirelessHART gateways and the new breed of gateways that extract HART data from analog loops, but also to the new generation of Ethernet-APL instruments poised to extend HART-IP all the way to the field instruments themselves.

HART-IP communication security requires that new devices support the industry standard Internet Protocol Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS) suites. HART commands have been added to simplify security deployment and aid users in navigating multiple security options. Additional diagnostics and forensic requirements are also included.

Devices also are required to capture audit logs that summarize communications activities, including records such as client identification, connection start/stop times and whether the device configuration was changed in that session.

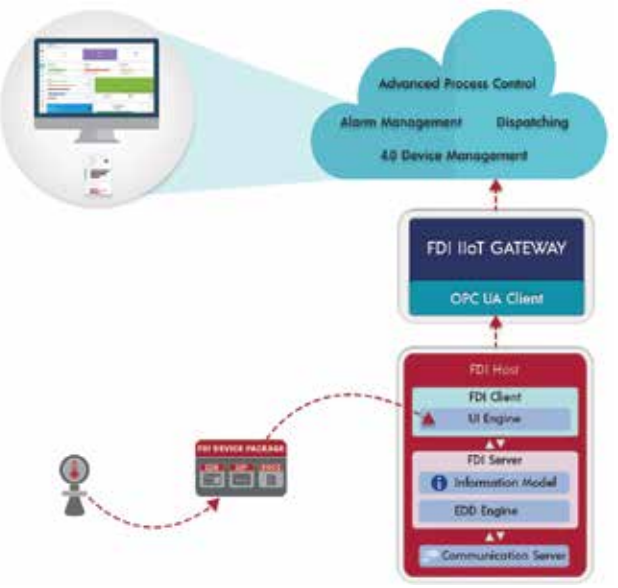
Finally, HART-IP devices must support syslogging, an industry standard means of publishing device events to a network's security information and event management (SIEM) system. All HART-IP devices must support network time using either Network Time Protocol (NTP) or Precision Time Protocol (PTP). Consequently, all syslog messages from all network devices are time synchronized, enabling forensics on network-wide behavior and activities.

Combining communication security, audit logs and syslogging results in robust security for HART-IP enabled products that doesn't stop at the plant's fence line. Add appropriate firewalls, together with data diodes to ensure outside instrument data access is read-only, and HART-IP can successfully transition to remote enterprise servers or cloud-based applications.

Device integration solved

And while HART-IP addresses the problem of device data security from the field to the cloud, other FieldComm Group technologies and standards, notably FDI and PA-DIM, help solve the problem of integrating field device information across the broader range of network protocols, host devices and other applications that will interact with them over their entire lifecycle, including for tasks such as device configuration, replacement and maintenance. This also includes Industrial IoT gateways for deliveroing data to cloud-based monitoring, diagnostics and analytics applications (Figure).

In FDI technology, there are two parts to the system: the field side (Device Package) and the host side (Server). On the field side, a device's specific software and documentation are encapsulated into its FDI Device Package. On the host side, the FDI Server imports the FDI Device Package and hosts the FDI Information Model, which is accessible by any FDI or generic OPC UA Client application. In this way, FDI Industrial IoT gateways are able to fetch device information from the FDI Information Model via OPC UA Services and publish it to the cloud for further processing. This enables any enterprise application to access field data for business operations.



FDI technology helps to securely bridge the gap between field devices and Industrial IoT applications in the cloud, regardless of protocol or manufacturer.

Information modeled

At the level of Industrial IoT and related cloud applications, OPC UA has emerged as the preferred information modeling framework—not only for process instruments and associated data but for many other industrial assets as well. The FieldComm Group's Process Automation Device Information Model, or PA-DIM, is only one of several dozen OPC Companion Specifications that describe the functions and data flows of equipment ranging from compressed air systems to machine tools.

But OPC UA does more than just information modeling. More broadly speaking it's described as an interoperability standard for the secure and reliable exchange of data in the industrial automation space and in other industries, ensuring the seamless flow of information among devices from multiple vendors. Included in the OPC UA framework are its own "extensible" communication and security mechanisms, which means it's designed so that innovative new technologies and methodologies such as new transport protocols, security algorithms, encoding standards, or application-services can be incorporated into OPC UA while maintaining backwards compatibility for existing products.

FDI technology is already tied to OPC UA through its device information model, which can be mapped to PA-DIM, which is also based on OPC UA. Further out, FieldComm Group is developing concepts for a NexGen field instrument technology that would extend not only Ethernet to the field level, but the OPC UA architecture as well. Ultimately, HART, along with other protocols developed specifically for industry may be reinvented once again, this time as as information models that guide the converged IT/OT data architectures of tomorrow.

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Azbil
www.azbil.com/products/bi/iap/products/hfbs/index.html

HART-IP DEVELOPER KIT

FieldComm Group, the leading worldwide member organization for developers of process automation instrumentation and owner of the HART (place registration symbol here) Protocol has a platform for HART-IP (place registration symbol here) enabled instruments - HART-IP Developer Kit. The kit is a great choice for anyone looking to start implementing HART-IP technology as a step towards digital transformation.

FieldComm Group
go.fieldcommgroup.org/devkit

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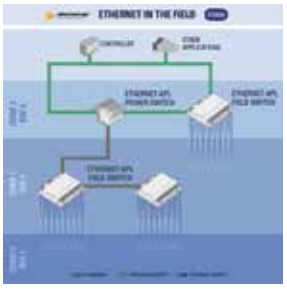
G1100 Smart Mesh WirelessHART Gateway provides related security assurance. Obtain real-time process data, wireless communication reliability as high as 99.9%. Connect with the existing host system by industry standard protocol including OPC, Modbus TCP/IP, Modbus RTU, TCP/IP and HART-IP. Easily configure wireless network and data integration by embedded Web interface. And support 500 points of wirelessHART device at largest.

Microcyber Corp.
http://www.microcyber-fieldbus.com/product/wirelesshart-devices-gateway

ETHERNET-APL FIELD SWITCHES COMING SOON



The new 2-wire Ethernet-APL is the key technology for digitalization of process plants up to the field level incl. explosive atmospheres. As a member of the APL-project, R. STAHL is involved in the developments of Ethernet-APL standards and the intrinsic safety concept 2-WISE (2-Wire Intrinsically Safe Ethernet). R.STAHL will introduce new Field Switches and Power Switches for Ethernet-APL in the second half of 2021 – stay tuned.

R. Stahl
r-stahl.com/en/global/systems/automation-system-solutions/ethernet-apt/

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