Smart industry
TECHNOLOGY REPORT

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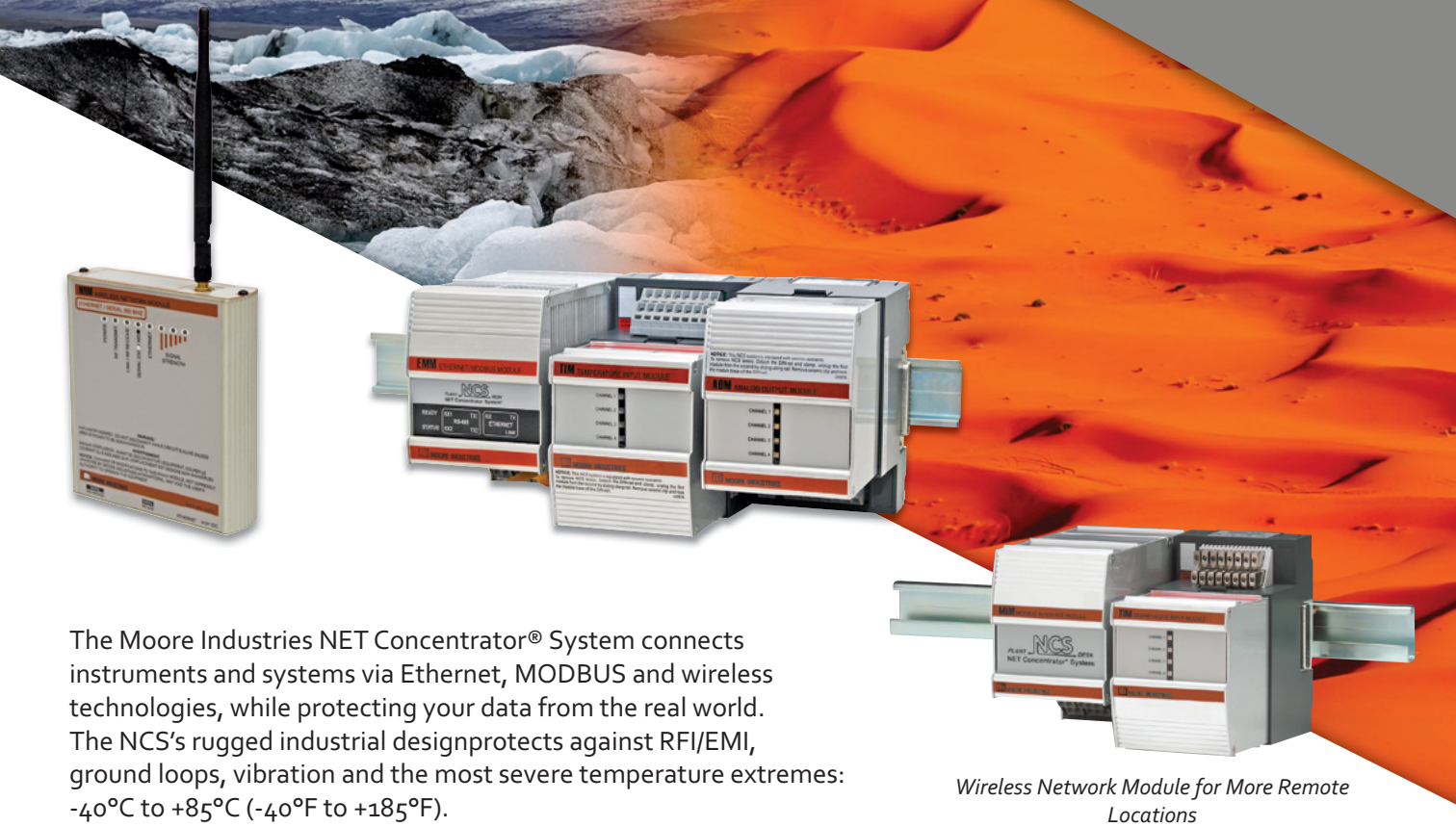

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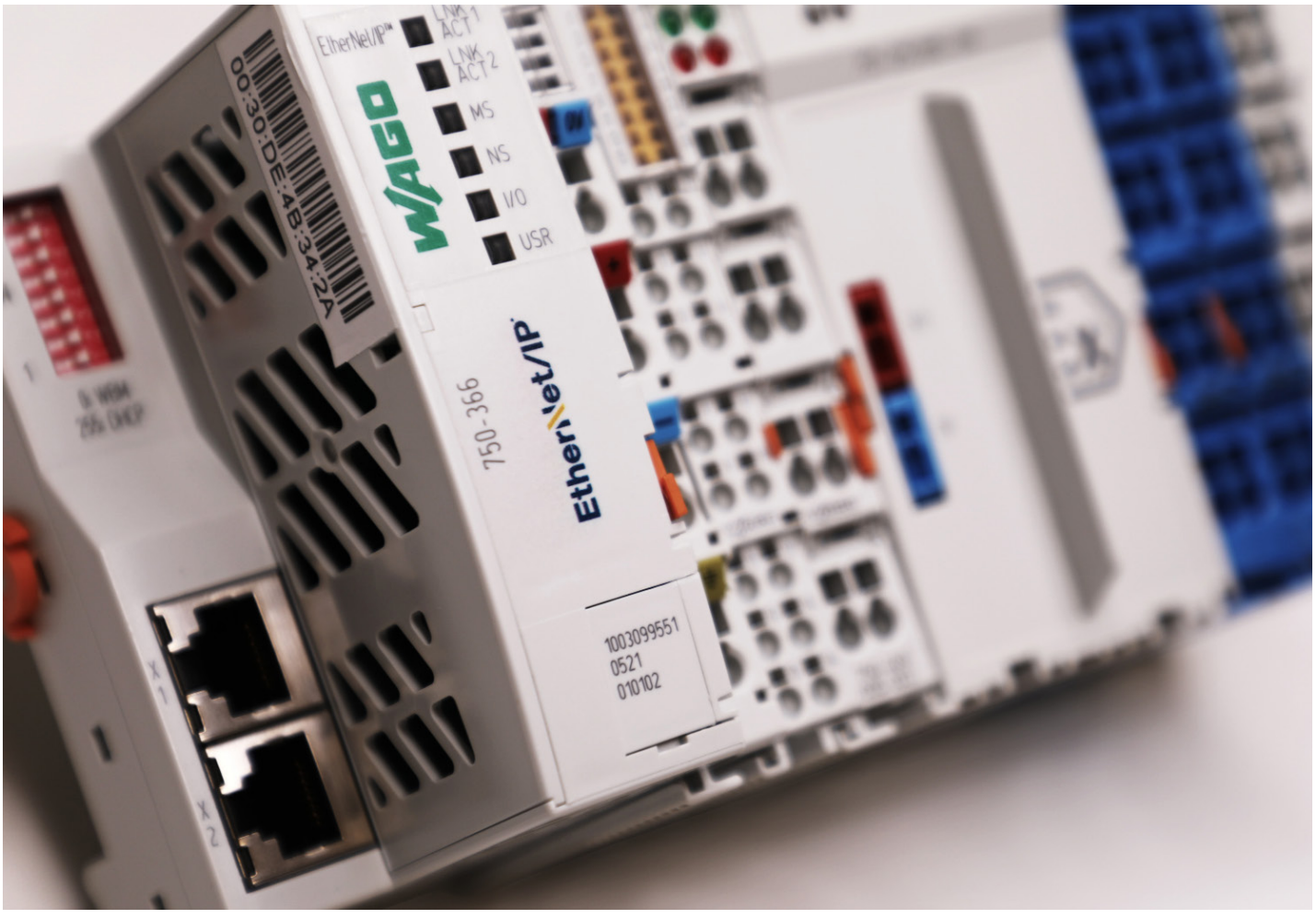

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Manufacturing Organizations Need Information Architecture Before Artificial Intelligence

By Anand Mahurkar, CEO of Findability Sciences

Growth in manufacturing depends on continuously looking for new ways to increase earnings, reduce risks and errors, and improve production efficiency. Artificial intelligence-powered solutions machines are the perfect way to achieve these goals, as they enable companies to leverage their vast legacy of manufacturing data to automate complex tasks, self-optimize, and initiate independent decision-making.

AI in the manufacturing market is valued at $2.3 billion in 2022 and is projected to reach $16.3 billion by 2027. Post-pandemic, the demand for AI is surging, and not just in manufacturing. Many enterprises now see the need for AI to keep pace with the current business landscape. According to a recent PwC report, AI technology is estimated to contribute up to $15.7 trillion to the global economy by 2030 and will continue to change the game by accelerating productivity.

AI in the manufacturing arena can enable predictions with high accuracy, resource-requirement forecasting, and energy and commodity price predictions. But obstacles to smart implementation of AI strategies persist.

Consider this aspect: AI requires machine learning, machine learning requires analytics, and analytics requires the right data and information architecture (or IA). Simply put, there is no AI without IA.

AI requires machine learning, machine learning requires analytics, and analytics requires the right data and information architecture.

AI solution-providers should aim to help organizations become data-driven so the organizations can leverage AI to the fullest and be able to use their data to drive insights and predictions. But for the organization to succeed in its AI journey, they have to prepare its system for AI innovation. This means working on their IA before the AI.

Not prioritizing the information architecture can prompt the AI journey to end up like the 60-80% of AI projects…failures. Many manufacturers are loaded with data but do not have the right infrastructure to make sense of it. Data needs to be collected, cleaned, and analyzed in order to be properly fed to algorithms; as you are likely aware, collection and data storage aren't always handled properly.

There is also this complicating issue: many companies have invested in many diverse technologies but are not sure how to use these technologies to create an AI program. For instance, a company may have secured licenses with huge data companies such as IBM or Snowflake, but don't know how to use them to create a sustainable AI program.

The vast majority of industrial organizations believe that data quality is an obstacle to

AI-solution providers can bring to the table all the technology, skills and expertise to help the company migrate to modern, cloud-based, data-storage solutions.

their data integration projects. Most don't analyze their data. Those that do spend too much time on data cleaning, integration and preparation. And most enterprises are hindered by data silos—data from different departments that isn't shared with the whole organization.

SEEKING AI SOLUTIONS

The right AI-solution provider can help a manufacturing company in their AI journey by:

- Creating a collaborative team: The AI solutions provider can team up with the organization's employees to create a network experts. The solutions provider can teach and train the employees on how to manage the AI program. Different experts can provide different insights into helping the company further its goals. This collaborative team can help create a roadmap for the company's AI solutions.
- Organizing an information architecture: Manufacturing organizations can get ahead by utilizing "wide data"—data with a healthy variety in terms of source, type and even format. Both structured and unstructured data constitute "wide data." Collecting massive volumes of data—big data—isn't enough for an AI journey to be successful. AI-solution providers can help the organization create an information architecture so they can leverage both wide and big data.
- Implementing a partner strategy and cloud migration: A trend in the tech space is going from on-prem to cloud. On-premises is a means of deploying technology through hardware such as flash drives or CDs. Businesses have spent a fortune on tech the likes of an Oracle database or SQL database. But with cloud technology, software and licenses have become more accessible across multiple devices. Platforms such as Snowflake, EDB, Amazon Redshift, DB2, Netezza, and IIAS (IBM Integrated Analytics Systems) can help for a seamless AI journey by bringing both data and system to the cloud.

Since they have partnerships with these platforms, AI-solution providers can bring to the table all the technology, skills and expertise to help the company migrate to modern, cloud-based, data-storage solutions. They know how to connect all the technologies necessary for a flawless AI implementation, from planning to execution.

Overall, the AI journey for the manufacturing industry is still full of potholes. Manufacturing companies still struggle with data silos as well as faulty investments on technologies that are not AI-ready.

Manufacturing companies will greatly benefit from AI, but there are several steps they need to take in order to start their AI journey. Seeing the bigger picture—all the benefits the AI technology can offer the industry—should be a powerful motivator for manufacturing companies to push through with accelerating their digital transformations. ☐

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SECURE INDUSTRIAL **IoT** REDEFINED

Are You Getting All Of Your Remote Process Data? Forwarding OT Data From The Edge To IT

By Andrew Thomas, CEO & CTO, Skkynet Cloud Solutions, Inc.

The promise of IoT, Industry 4.0 and OT/IT data connectivity is appealing. Pulling data from live processes, you can analyze it in real time and immediately see what's actually going on, right now, in the plant, or even across the enterprise as a whole.

This kind of knowledge depends on consistent data. If there are gaps in the data flow, there will be gaps in your records, leading to gaps in understanding. And these gaps are bound to happen because networks are not 100% reliable 24/7, 365 days a year. Sometimes network connections drop.

The remedy is store and forward. If the network goes down, a store-and-forward mechanism begins collecting data. Once the network is back up, the mechanism forwards the data, ordered in sequence, to the historian.

There are several tools available that can store and forward industrial data from OT to IT. When choosing such a tool you should consider the following:

EDGE-STORAGE MANAGEMENT

As real-time systems can generate large quantities of data very quickly, the edge historian must properly manage that data, storing it temporarily and deleting it periodically. Usually there is no need to store the whole data set locally, and rarely is there much space available for it anyway.

Some systems for edge-data collection use database replication, maintaining identical data sets at the edge and at the destination.

If the network goes down, a store-and-forward mechanism begins collecting data. Once the network is back up, the mechanism forwards the data to the historian.

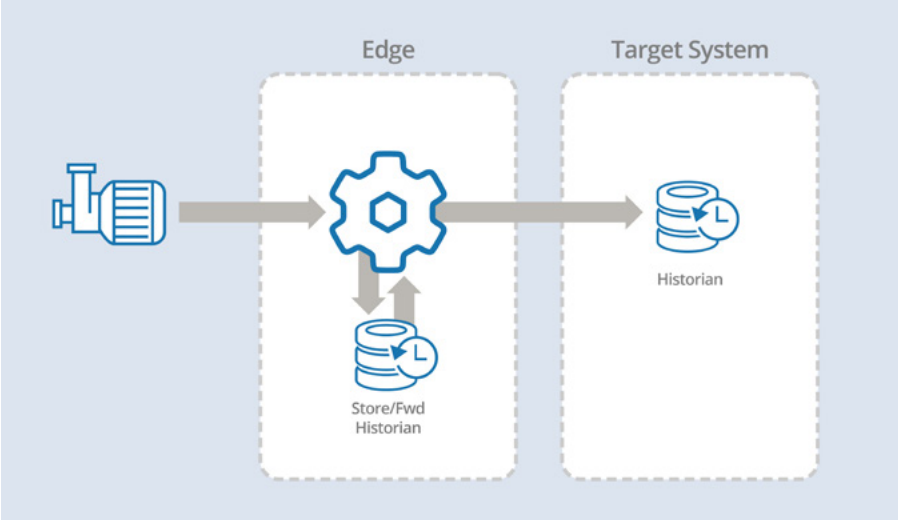
These are not feasible for logging real-time data to IT or cloud systems, since any data deleted at the edge also gets deleted at the destination.

Instead, edge-collection systems designed for real-time applications first transmit and then delete their temporarily stored data. Some delete the data as soon as it is transmitted, while others keep the data (for some time) at the edge to make it available for local consumption, before finally deleting it.

CONNECTING THROUGH A DMZ

The most secure way to connect OT and IT, recommended by security experts, industry leaders, and governmental agencies alike, is to segregate networks using a DMZ. However, some replication tools cannot effectively operate through a DMZ, and require a direct connection between the IT and OT participants.

One way to fully integrate a DMZ is to use edge-collection technology that can provide both push and pull connections. This approach uses a middleware



component on the DMZ, which becomes the target of a push from OT and the source of a pull from IT, enabling the data to be transferred without opening firewall ports into OT or IT. This is the best method for most applications.

ACCESSING THE DATA LOCALLY

The method for moving logged time-series data from OT to IT is to run an edge collector in OT that stores the data temporarily and then pushes it to IT. Storing data at the edge serves as a temporary buffer for store and forward, and it may or may not be accessible for any other purpose.

Some edge collectors store the data locally in a proprietary format, making it inaccessible for third-party use, while others may make it available through an API. A third option is to store the data in a stand-alone instance of the database or historian, making the data as easy to access locally, as it is at the final destination. For example, if your final target historian is InfluxDB, your software may have the ability to store the data in a local instance of InfluxDB, making it available at that point to any application that supports InfluxDB.

UPDATE FREQUENCY

Different replication tools run on different cycles. Some expect to run large replication batches infrequently, while others send the data in small batches with relatively low latency. Some may also provide the option to set the batch size and/or polling rate manually, or even automatically according to available CPU resources.

TARGETED DATABASE(S)

Store-and-forward mechanisms are typically targeted at a single technology, writing only to their matching target server. However, edge-collection software does exist that can store and forward the data to various historians, such as AVEVA Historian and Insight, OSIsoft PI, InfluxDB, Amazon Kinesis, REST clients, or others. Such software provides more flexibility for collecting and storing real-time process data from remote locations.

If you plan to access OT data and send it to IT, and want to collect your *entire* data set, then you'll need some kind of store-and-forward mechanism. Data historians and collectors running at the edge can help ensure against any loss of data. Choosing the right product gives the added benefits of secure connections through a DMZ, high performance, and convenient availability of the data at the edge. ◻

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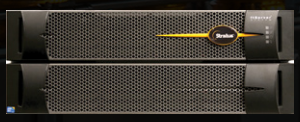

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Three Trends That Will Shift The Edge-Computing Industry

By Jason Andersen, Stratus Technologies vice president of business line management

Edge computing is a technology that has been on the market for several years but has recently seen rapid adoption as businesses are finding unique new use cases. Since the platform operates outside the data center, sometimes on the plant floor close to where the data is collected and used for real-time decision-making, industry experts are forecasting that the technology will continue to see massive expansion.

In fact, new data from Stratus Technologies and Espalier (formerly Boston Analytics) highlights key use cases and verticals projected to drive edge-computing adoption, with the industry projected to grow by almost $10 billion through 2026. Industries like supply chain, oil and gas, digital manufacturing, and life sciences will drive edge computing's growth as they adopt the technology to reduce latency, ensure uptime and expand operations outside the plant floor.

However, as more organizations invest in edge-computing platforms, it's important that they understand where the technology is today and what the future of it looks like, so executives and employees can make informed decisions with their data. As demand for edge-computing platforms grows significantly, businesses should look to understand key industry trends when they are selecting the right platform for their business. Three trends that the edge-computing industry is currently experiencing include the need for more capacity, an increase in data storage and an IT trickle-down effect. Let's explore…

Increasing data-storage capabilities will enable organizations greater visibility into assessing macro trends and data analytics.

THE NEED FOR MORE CAPACITY

Recently, edge-computing users have been looking for platforms that offer more capacity while reducing their infrastructure without disrupting operations, and several factors are playing a role in driving this need. First is the pent-up demand stemming from the COVID-19 pandemic. The manufacturing industry was one of the biggest victims of supply chain delays caused by the pandemic, and there has been an increased demand for goods across the board. Businesses with complex supply chains in the manufacturing industry experienced the most challenges, as their production is vulnerable to disruption due to shortages and inputs from other businesses.

As companies adjust following more than two years of disruptions, they are starting to deliver more goods and looking to digitally transform through platforms (like edge computing) to enhance operations and remain competitive. As a result, data volume has increased as more data is being collected and stored by

smart devices, and edge-computing users need more capacity to make the most informed decisions to drive business results.

Next, data frequency, the notion that data is being collected from devices and programmable logic controllers (PLCs) in shorter intervals, is pushing processing, networking and memory requirements. Also, the combination of new workloads to satisfy new requirements around analytics and digital twins is driving the need for more memory and virtualization. With IT standardization, along with the addition of IT tools for security, backup and remote monitoring is driving the need for more memory, processing, virtualization and containerization, as these tools may not have been required before. Pent-up demand following the pandemic is creating increased data volume, coupled with greater data frequency, workload diversity and IT standardization. This is the perfect storm for creating a need for more data capacity. And with the need for more data capacity, edge-computing users are also looking for better ways to store their data.

THE DEMAND FOR MORE DATA STORAGE

Along with the need for more data capacity comes an increased demand for more data storage. As edge computing has scaled, so too has the amount of data, providing businesses with the opportunity to get more value from their data than ever before. Tools such as artificial intelligence (AI) and machine learning (ML) enable users to create more actionable data so they can make better decisions to improve operations. With an influx in the amount of data being collected, edge-computing users need to find new ways to manage and store that data.

By storing data locally, applications can continue to operate in the case of unplanned downtime. Increasing data-storage capabilities will also enable organizations greater visibility into assessing macro trends and data analytics, enabling them to act smarter and faster. As a result, businesses can leverage real-time data to create actionable results.

THE IT TRICKLE-DOWN EFFECT

Edge-computing users have also been experiencing an IT trickle-down effect, meaning that enterprise demand has trickled down from the top, and users need capabilities in smaller sites. The value of the data and the ability to share that data offsite enables organizations to make more agile or real-time decisions, a trend that will continue into the foreseeable future. However, in the past, the computing and data resources were segregated with minimal or no contact with other sites. Additionally, the compute workloads onsite were basic and limited in scope. The new requirements are creating new demand for secure connectivity and data sharing.

This new factor is leading to the IT trickle-down effect, and with it comes several ramifications at the edge, most notably an increased focus on cybersecurity. When there is the risk of a single device compromising an entire organization, businesses need to be armed with the right resources to ensure continuous operations. More importantly, several new considerations come to light, including the responsibility for buying and operating this new infrastructure, and questions about the technology's lifecycle and maintenance policies. As the lines between IT and OT teams blur, an edge-computing platform can help businesses fsocus their efforts on sustainability, manageability, and serviceability, rather than commodity IT computing.

As businesses continue to digitally transform, edge-computing platforms will be critical for ensuring uptime and providing key insights and visibility into daily processes at the location where products are being made, and customers are being served. With increased capacity and data storage, businesses across industries such as digital manufacturing, oil and gas, and life sciences are thriving by investing in edge-computing platforms that enable maximized operational efficiency and "always on" availability. ◻

Bridging The Gap Between HART Devices And IIoT Platforms

By Tom Watson, manager of corporate marketing at Moore Industries Worldwide

The growth of industrial Ethernet and wireless networks in process manufacturing plants and automation facilities has exponentially broadened data exchange within facilities and even throughout global corporate networks. This free flow of information has introduced new possibilities for using data in existing field devices in IIoT platforms, developing context to enable truly smart factories reliant on cloud-based automation.

The flow of process and diagnostics data from smart HART digital field instruments can now be shared with mid- and higher-level control, asset management and data information systems without having to upgrade to expensive process-control interface equipment.

PLANT OF THE FUTURE

The typical process control model that involves decision making for the process at the local or centralized level by programmable-logic controllers (PLCs) or Basic Process Control Systems (BPCS) continues to evolve. These systems were never intended to manage the modern amount of data. There are newer ERP, MES and asset management systems that collect some of this data now, but the more critical challenge that local manufacturing facilities face is manpower, particularly in this post-pandemic period; many manufacturing facilities have just enough personnel to keep running. They no longer have the time, personnel or resources to analyze data that informs IIoT platforms.

We are seeing companies offer leasing or annual agreements that involve collecting, storing, and analyzing all sorts of process data.

For this reason we are seeing companies offer leasing or annual agreements that involve collecting, storing, and analyzing all sorts of process data, which is part of a larger predictive-analytics strategy that can not only forewarn operators of problems to come, but also optimize the process itself. This type of cloud automation looks to gather as much data as possible to reduce operating expenditures and future capital expenditures for plant builds.

So the challenge remains: how do existing and new manufacturing facilities find a cost-effective way to get critical plant floor data up to higher level information systems? The answer is to take advantage of the digital HART data you already have installed but either didn't know was there or couldn't afford the equipment upgrades to gain access to.

HART PROTOCOL

With more than 40 million installed HART devices worldwide, HART continues to get updated revisions that continually enhance data-exchange capacity, speed, number of devices on a network, support over Ethernet, and

Standalone HART gateways often provide the most economical pathway to extracting HART data from field devices, making the data readily available to higher-level systems.

wireless capability. It enables end users to have unfettered access to process and diagnostic data that can be shared with all areas of the new smart factory that support IIoT endeavors.

In many cases, HART instruments were installed simply because they could be easily configured and diagnosed with a HART handheld communicator (HHC). However, the HART digital signal often contains additional process measurements and other variables that may include instrument status, diagnostic data, alarms, calibration values and alert messages. A simple and cost-effective solution for gathering HART information is to use a HART interface device. HART data can then be made available to the control system, asset manager or plant Ethernet backbone where it can then be shared with higher level systems or corporate WANs (Wide Area Network).

HART INTERFACE OPTIONS

There are several ways to interface with HART smart field devices in order to acquire the digital process and diagnostic information. They vary from HART enabled 4-20mA input cards, HART multiplexer (Mux) systems, slide-in PLC gateway cards, custom coded software interfaces for asset management and MES/ERP systems and standalone gateways that typically convert the HART data to some other proprietary or open industry format.

HART multiplexers are common and, typically, their interface is a custom RS-422, RS- 485 or RS-232 serial connection that is configured for a particular vendor's hardware interface, asset-management system or control system. Each of these options is quite costly and often avoided. The most expensive but also most specific HART interface is one written by a programmer, which can then be customized to exact user and hardware specifications.

Standalone HART gateways often provide the most economical pathway to extracting HART data from field devices, making the data readily available to higher-level systems. These products usually offer one to four channels or ports that enable several HART devices to be multi-dropped for maximum data concentration. ◻